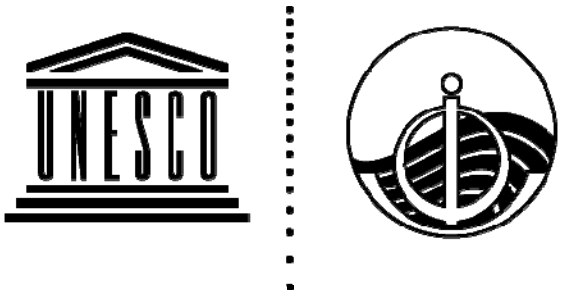
Intergovernmental Oceanographic Commission
Technical Series

92



# 27 February 2010 Chile Earthquake and Tsunami Event

# Post-Event Assessment of PTWS Performance

UNESCO

Intergovernmental Oceanographic Commission
Technical Series

92

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# Post-Event Assessment of PTWS Performance

Pacific Tsunami Warning and Mitigation System (PTWS)

UNESCO 2010

IOC Technical Series, 92
Paris, March 2010
English only*



**For bibliographic purposes, this document should be cited as follows:**

*27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance*. IOC Technical Series No 92. UNESCO/IOC 2010 (English only)

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Printed in 2011
by United Nations Educational, Scientific
and Cultural Organization
7, Place de Fontenoy, 75352 Paris 07 SP



(IOC/2010/TS/92)

* An Executif Summary in French, Spanish and Russian is available at the beginning of the publication

## TABLE OF CONTENTS

page



**ANNEXES**

## Executive Summary

A series of severe earthquakes hit Central Chile on Saturday, 27th February 2010. The main shock off Concepcion at 06:34 UTC (3:34 AM local time) had a magnitude of 8.8 Mw. The Pacific Tsunami Warning Center PTWC in Hawaii, USA issued a regional warning at 06:46 UTC (12 minutes after the event). This was the first ocean wide test of a system that was put in place nearly 45 years ago by UNESCO's Member States through its Intergovernmental Oceanographic Commission (IOC), after a 9.5 magnitude earthquake on 22 May 22 1960 off Chile triggered a wide ocean tsunami that caused 61 fatalities in Hawaii and 142 fatalities in Japan, several hours after the earthquake.

As indicated above, 12 minutes after the 27th February 2010 earthquake the Pacific Ocean Tsunami Warning System (PTWS) went into action, with timely and adequate information produced and disseminated across the Pacific Ocean. There were no fatalities reported far from the epicenter, however, near the epicenter off the Chilean coast, official accounts indicate over 156 fatalities due to the tsunami. Preliminary measures of a Rapid Survey Team deployed the week after the event by UNESCO showed run up measurements as high as 30 meters with most common measurements between 6 and 10 meters in the most affected area of the Chilean coast.

This earthquake and tsunami event presented an ideal opportunity to assess the performance of the PTWS. To that end the UNESCO/IOC Secretariat for the PTWS sent out a post-event survey questionnaire to the Tsunami Warning Focal Points (TWFPs) and Tsunami National Contacts (TNCs) from its 32 Member States and territories. This report has been prepared by the Secretariat based on the responses received from 19 TWFPs and TNCs. Factual details of the earthquake event and the tsunami are presented and the results of the survey are listed in tables and displayed as timelines and maps.

We underscore that all TWFPs received the first PTWC bulletin. In addition, most of the countries reported PTWC as source of awareness of the earthquake. Fourteen countries issued a tsunami warning and in 9 Member States coastal zones were evacuated. It would be pertinent that each Member State analyze if an evacuation would have been necessary in zones where no evacuation was made. In four countries, some areas were evacuated preventively (self-evacuation). Moreover, it was observed that sea level was monitored by most of the countries. In addition, some countries used results from numerical modelling and calculated earthquake parameters.

Based on data and information collected from Member States the PTWS acted promptly and efficiently throughout the Pacific. However, and at the same time, this event demonstrated the need to reinforce the work of PTWS for near field events, particularly with denser sea level real time networks close to active subduction areas. Indeed, as it has been demonstrated by the case of the sea level station located in Talcahuano, Chile, sea level stations close to the epicenter may be partially or totally destroyed by the impact of an earthquake and/or a tsunami. Given the critical role sea level readings have in all tsunami warning systems, the sea level monitoring networks should be densified close to active subduction areas and redundancy of sensors and transmission paths be strongly considered.

Most of the issues revealed by the survey can be addressed both by the PTWS and at the national level through increased regional cooperation and training where needed. Post-event assessments assist in this process by highlighting the strengths and weaknesses of the PTWS at regional, national and local levels and by raising the awareness of how Member States responded, both individually and collectively. The true value of such assessments is that it allows Member States to share information and experiences for the mutual benefit of improving the PTWS performance for all members.

## Résumé exécutif

Une série de violents séismes a frappé le centre du Chili le samedi 27 février 2010. Le plus important, d'une magnitude de 8.8 Mw, a eu lieu au large de Concepción à 6 h 34 TUC (3 h 34 heure locale). Le Centre d'alerte aux tsunamis dans le Pacifique (PTWC) basé à Hawaii (États-Unis) a émis une alerte régionale à 6 h 46 TUC (soit 12 minutes plus tard). C'est la première fois qu'était expérimenté à l'échelle de tout le basin océanique un système mis en place près de 45 ans plus tôt par les États membres de l'UNESCO, par l'intermédiaire de la Commission océanographique intergouvernementale (COI), après un séisme de magnitude 9.5, survenu le 22 mai 1960 au large du Chili ; ce dernier avait alors déclenché un important tsunami responsable de la mort de 61 personnes à Hawaii et de 142 autres au Japon, plusieurs heures plus tard.

Comme indiqué ci-dessus, douze minutes après le séisme du 27 février 2010, le Système d'alerte aux tsunamis et de mitigation dans le Pacifique (PTWS) est entré en action, produisant et diffusant en temps voulu des informations appropriées à travers tout l'océan Pacifique. Aucune victime n'a été à déplorer à distance de l'épicentre ; en revanche, à proximité de l'épicentre qui se trouvait au large des côtes chiliennes, les rapports officiels font état de 156 victimes suite au tsunami. Les premières mesures effectuées par une équipe d'enquête rapide déployée par l'UNESCO la semaine qui a suivi l'événement ont montré que la hauteur de déferlement des vagues, comprise le plus souvent entre 6 et 10 mètres avait atteint 30 mètres dans la zone la plus touchée du littoral chilien.

Ce séisme accompagné d'un tsunami a constitué une occasion idéale d'évaluer l'efficacité du PTWS. À cette fin, le Secrétariat de l'UNESCO/COI pour le PTWS a adressé, après l'événement, un questionnaire aux points focaux pour l'alerte aux tsunamis (TWFP) et aux contacts nationaux pour les tsunamis (TNC) des 32 États membres et territoires du Système. Le présent rapport a été élaboré par le Secrétariat à partir des réponses reçues de 19 TWFP et TNC. Il contient des détails factuels concernant le séisme et le tsunami et présente les résultats de l'enquête sous forme de tableaux, de graphiques chronologiques et de cartes.

Nous insistons sur le fait que tous les TWFP ont reçu le premier bulletin du PTWC. En outre, la plupart des pays ont indiqué qu'ils avaient eu connaissance du séisme grâce au PTWC. Quatorze pays ont lancé une alerte au tsunami et dans neuf États membres, les zones côtières ont été évacuées. Il serait intéressant que chaque État membre étudie la question de savoir si une évacuation aurait été nécessaire dans les zones où il n'y en a pas eu. Dans quatre pays, certaines zones ont été évacuées préventivement (auto-évacuation). Par ailleurs, il a été observé que le niveau de la mer avait été surveillé par la plupart des pays, certains d'entre eux ayant même utilisé des modèles numériques et calculé les paramètres relatifs aux séismes.

Grâce aux données et aux informations recueillies auprès des États membres, le PTWS est intervenu rapidement et efficacement dans tout le Pacifique. Cependant, cet événement a aussi révélé la nécessité de renforcer l'action du PTWS pour les phénomènes en champ proche, en particulier au moyen de réseaux de surveillance temps réel du niveau de la mer plus denses à proximité des zones de subduction active. En effet, comme l'a démontré l'exemple de la station d'observation du niveau de la mer située à Talcahuano (Chili), les stations d'observation proches de l'épicentre risquent d'être partiellement ou totalement détruites par un tsunami. Compte tenu du rôle essentiel des mesures du niveau de la mer dans tous les systèmes d'alerte aux tsunamis, il faudrait augmenter la densité des réseaux de surveillance du niveau de la mer à proximité des zones de subduction active et se pencher sérieusement sur la question des capteurs et des voies de transmission redondantes.

La plupart des difficultés révélées par l'enquête peuvent être résolues tant par le PTWS qu'au niveau national si l'on développe la coopération régionale et, au besoin, la formation. Les évaluations a posteriori facilitent ce processus en faisant ressortir les points forts et les points faibles du PTWS aux niveaux régional, national et local et en montrant comment les États membres ont répondu, tant individuellement que collectivement. Le véritable avantage de ces évaluations est qu'elles permettent aux États membres de partager des informations et des expériences, ce qui a pour effet d'améliorer l'efficacité du PTWS dans l'intérêt de tous les membres.

## Resumen ejecutivo

El sábado 27 de febrero de 2010 una serie de graves terremotos sacudió el centro de Chile. El que se produjo frente a la costa de Concepción a las 6.34 UTC (3.34 hora local) fue el de más intensidad y alcanzó una magnitud de 8,8 Mw. El Centro de Alerta contra los Tsunamis en el Pacífico (PTWC) de Hawai (Estados Unidos) emitió una alerta regional a las 6.46 UTC (12 minutos después de que se produjera el fenómeno). Era la primera vez que se sometía a prueba en todo el océano un sistema establecido hace casi 45 años por los Estados Miembros de la UNESCO por conducto de su Comisión Oceanográfica Intergubernamental (COI), después de que se produjera un terremoto de magnitud 9,5 el 22 de mayo de 1960 frente a la costa de Chile, provocando un enorme tsunami en todo el océano, que se saldó con 61 muertos en Hawai y 142 en el Japón varias horas después del seísmo.

Como se ha indicado, 12 minutos después del terremoto del 27 de febrero de 2010, entró en juego el Centro de Alerta contra los Tsunamis en el Pacífico (PTWC), que elaboró y difundió información actualizada y adecuada en todo el Océano Pacífico. A pesar de que no se registraron víctimas lejos del epicentro, cerca del mismo y frente a la costa chilena las cifras oficiales indican que el tsunami se cobró la vida de 156 personas. Un equipo de reconocimiento rápido enviado por la UNESCO la semana después del fenómeno realizó mediciones preliminares de crecidas de hasta 30 metros, oscilando entre 6 y 10 metros las mediciones más corrientes en la zona más afectada de la costa chilena.

El terremoto y el tsunami constituyeron una oportunidad ideal para evaluar el funcionamiento del PTWS. Con ese fin, la Secretaría de la COI de la UNESCO para el PTWS envió una encuesta posterior al fenómeno a los puntos focales de alerta contra los tsunamis (TWFP) y a los contactos nacionales sobre tsunamis (TNC) de sus 32 Estados Miembros y territorios. La Secretaría ha preparado este informe basándose en las respuestas recibidas de 19 TWFP y TNC. Se presentan detalles concretos del terremoto y el tsunami, y los resultados de la encuesta figuran en cuadros y se ilustran con cronologías y mapas.

Cabe destacar que todos los TWFP recibieron el primer boletín del PTWC. Además, la mayoría de los países informaron de que gracias al PTWC habían tenido conocimiento del terremoto. Un total de 14 países emitieron una alerta de tsunami y en nueve Estados Miembros se evacuaron zonas costeras. Convendría que cada Estado Miembro analice si habría sido necesario evacuar zonas que no se evacuaron. En cuatro países, se evacuaron algunas zonas de modo preventivo (autoevacuación). Además, se observó que en la mayoría de los países se vigiló el nivel del mar. Por otra parte, algunos países utilizaron los resultados procedentes de modelos numéricos y calcularon los parámetros del terremoto.

Sobre la base de los datos e informaciones obtenidos de los Estados Miembros, el PTWS actuó inmediata y eficazmente en todo el Pacífico. No obstante, al mismo tiempo, el fenómeno puso de manifiesto la necesidad de fortalecer la labor del PTWS para los fenómenos que se produjeran en regiones cercanas a la fuente, especialmente estableciendo muchas más redes de vigilancia del nivel del mar en tiempo real cerca de las zonas de subducción activas. De hecho, el caso de la estación de medición del nivel del mar situada en Talcahuano (Chile) ha demostrado que tanto el terremoto como el tsunami pueden destruir total o parcialmente las estaciones situadas cerca del epicentro. Dada la función capital que las lecturas del nivel del mar desempeñan en todos los sistemas de alerta contra los tsunamis, se deberían establecer más estaciones de observación del nivel del mar cerca de las zonas de subducción activas y habría que contemplar seriamente el uso de sensores y medios de transmisión redundantes.

El PTWS y las instancias nacionales pueden resolver la mayoría de los problemas que se pusieron de manifiesto en la encuesta mediante la intensificación de la cooperación regional y el suministro de formación cuando sea necesario. Las evaluaciones posteriores a los

fenómenos contribuyen a ese proceso al mostrar los puntos fuertes y débiles del PTWS en los ámbitos regional, nacional y local y dar a conocer mejor la manera en que los Estados Miembros respondieron individual y colectivamente. Esas evaluaciones son realmente valiosas porque permiten a los Estados Miembros intercambiar información y experiencias en beneficio mutuo a fin de mejorar el funcionamiento del PTWS para todos los miembros.

## Рабочее резюме

В субботу 27 февраля 2010 г. в центральной части Чили произошла серия сильных землетрясений. Самое крупное из них в море в районе города Консепсьон произошло в 06:34 по Всемирному координированному времени (ВКВ) (3:34 – местное время) и имело магнитуду 8,8 балла. Центр предупреждения о цунами в Тихом океане (ПТВЦ) на Гавайях (США) разослал региональное предупреждение в 06:46 ВКВ (через 12 минут после землетрясения). Это было первое проведенное в масштабах всего океана тестирование системы, созданной почти 45 лет тому назад государствами – членами ЮНЕСКО с помощью ее Межправительственной океанографической комиссии (МОК) после того, как 22 мая 1960 г. землетрясение магнитудой 9,5 балла у побережья Чили вызвало океанское цунами, в результате которого через несколько часов после землетрясения погибли 61 человек на Гавайях и 142 в Японии.

Как указывалось выше, через 12 минут после землетрясения, произошедшего 27 февраля 2010 г., вступила в действие Система предупреждения о цунами в Тихом океане (СПЦТО), при этом была подготовлена и своевременно распространена во всем регионе Тихого океана надлежащая информация. Вдали от эпицентра не отмечалось смертельных случаев, однако вблизи от эпицентра у побережья Чили, согласно официальным сводкам, от этого цунами погибло более 156 человек. Предварительные замеры, проведенные группой быстрого обследования, направленной в этот район ЮНЕСКО через неделю после землетрясения, показали, что в наиболее сильно пострадавших районах чилийского побережья высота нагонной волны достигала 30 метров, а на большинстве участков составляла от 6 до 10 метров.

Это землетрясение и цунами представляют идеальную возможность для оценки эффективности СПТЦО. С этой целью Секретариат МОК ЮНЕСКО для СПЦТО подготовил вопросник по обследованию последствий стихийного бедствия, который был направлен координаторам предупреждения о цунами (КПЦ) и национальным контактам по цунами (НКЦ) 32 государств-членов и территорий, входящих в эту систему. Этот доклад был подготовлен Секретариатом на основе ответов, полученных от 19 КПЦ и НКЦ. Представлены подробные фактические данные о землетрясении и цунами, а результаты обследования указаны в таблицах и отражены на графиках и картах.

Мы подчеркиваем, что первый бюллетень ПТВЦ получили все КПЦ. Кроме того, большинство стран указали ПТВЦ в качестве источника информации о землетрясении. 14 стран выпустили предупреждение о цунами, а в девяти государствах-членах была проведена эвакуация населения в прибрежных зонах. Было бы целесообразным, чтобы каждое государство-член проанализировало необходимость эвакуации в тех зонах, где она не проводилась. В четырех странах население нескольких районов было эвакуировано в превентивном порядке (самостоятельная эвакуация). Кроме того, отмечалось, что большинство стран проводили мониторинг уровня моря. Наряду с этим некоторые страны использовали результаты цифрового моделирования и расчеты параметров землетрясения.

На основе данных и информации, собранных от государств-членов, СПЦТО предприняла быстрые и эффективные меры во всем Тихоокеанском регионе. Однако это событие в то же время продемонстрировало необходимость усиления работы СПЦТО в отношении событий, происходящих на небольшом удалении, особенно потребность в создании более плотных сетей мониторинга уровня моря в реальном времени вблизи активных районов субдукции. Действительно, как было отмечено в случае станции наблюдения за уровнем моря, расположенной в Талкахуано (Чили),

такие станции, находящиеся вблизи эпицентра, могут быть частично или полностью уничтожены в результате воздействия цунами или землетрясения. Учитывая важнейшую роль, которую данные наблюдения за уровнем моря играют во всех системах предупреждения о цунами, необходимо внимательно изучить вопрос о повышении плотности сетей мониторинга уровня моря вблизи активных районов субдукции, а также повысить устойчивость датчиков и каналов передачи данных.

Большинство вопросов, выявленных в результате обследования, может быть решено как в рамках СПЦТО, так и на национальном уровне посредством более активного регионального сотрудничества и подготовки кадров, где это необходимо. Оценки, проводимые после событий, содействуют этому процессу, показывая сильные и слабые стороны СПЦТО на региональном, национальном и местном уровнях и повышая информированность о том, как государства-члены реагировали индивидуально и коллективно. Подлинная ценность таких оценок заключается в том, что они позволяют государствам-членам осуществлять взаимовыгодный обмен информацией и опытом в целях повышения эффективности СПЦТО для всех членов.

# 1. INTRODUCTION

## 1.1 BACKGROUND

The earthquake with Mw 8.8 on 27 February, 2010 was the largest earthquake in the Pacific rim since the 1960 Chilean earthquake of 50 years ago in the region.

The 1960 Chilean earthquake with Mw 9.5 occurred off the coast of South-Central Chile at 19:11 (UTC) on May 22, 1960. This was the largest earthquake in recorded history and generated a devastating tsunami that crossed the entire Pacific. The tsunami hit Chile about 15-20 minutes after the earthquake and the Hawaiian Islands about 15 hours after, and the Pacific coasts of Japan and Philippines almost 24 hours after the occurrence. The maximum run-up height was 25 m in Mocha Island, Chile. Altogether the earthquake and tsunami killed about 1,655 people, injured 3,000 and 2,000,000 were displaced in southern Chile. The tsunami caused 61 deaths in Hawaii, 142 deaths in Japan and 32 dead or missing in the Philippines.

In 1965, under the umbrella of UNESCO-IOC, the Tsunami Warning System in the Pacific was started, and it remained the only working system in the world until 2005.

The 26 December 2004 Indian Ocean Tsunami killed over 230,000 people, displaced more than 1 million people and left a trail of destruction around the coasts of the entire Indian Ocean. Although the tsunami took over 2 hours to cross the Bay of Bengal, more than 50,000 in Malaysia, Thailand, India, Sri Lanka, Maldives and East Africa lost their lives. An early warning system would have saved many thousands of lives, but none was in place at that time.

Recognizing the need for an early warning system, the coastal nations of the Indian Ocean responded quickly. Following two intergovernmental meetings in Paris and Mauritius, the Intergovernmental Oceanographic Commission (IOC) of UNESCO was given the mandate to help all UNESCO Member States of the Indian Ocean rim to establish their own Indian Ocean Tsunami Early Warning and Mitigation System (IOTWS), and an Intergovernmental Coordination Group (ICG) for the IOTWS was formally established at the IOC Assembly in Paris, in June 2005. ICGs for North-Easthern Atlantic and Mediterranean (NEAMTWS) and the Caribbean (CARIBE-EWS) were formally established at the same time.

## 1.2 STATUS OF PTWS

The ICG/PTWS was established by IOC Resolution IV-6 in 1965 as a subsidiary body of the IOC, and has met every two years since 1968. Each Member State is represented by a Tsunami National Contact (TNC) who serves as the intergovernmental contact person for the coordination of international tsunami warning and mitigation activities. Within each country, a Tsunami Warning Focal Point (TWFP) is either the emergency authority (civil defense or other designated agency responsible for public safety), or has the responsibility of notifying the emergency authority of the event characteristics (earthquake and/or tsunami), in accordance with national standard operating procedures. TNC and TWFP designation shall follow formal official procedures.

The IOC Tsunami Unit (TSU) provides global coordination of tsunami warning and mitigation systems, including those in the Pacific and Indian Oceans, Caribbean, and NE Atlantic and Mediterranean Sea. The TSU is based at IOC headquarters in Paris, France, and is composed of the Unit Head, the Secretariats of the ICGs, the ITIC, and technical and professional staff.

The IOC International Tsunami Information Centre (ITIC) is located in Honolulu, Hawaii. The ITIC was established in 1965 by the IOC Resolution IOC/IV.6. ITIC is hosted by the United States of America Department of Commerce, National Oceanic and Atmospheric Administration National Weather Service (US NOAA NWS) Pacific region, which provides its Director and staff. The ITIC works to strengthen national and regional capacities and assists countries in establishing tsunami warning and mitigation system.

The Pacific Tsunami Warning Centre (PTWC), the West Coast/Alaska Tsunami Warning Centre (WC/ATWC), and the Japan Meteorological Agency Northwest Pacific Tsunami Advisory Centre (JMA NWPTAC) are the operational tsunami warning centres providing international services for the PTWS.

**Pacific Tsunami Warning Centre (PTWC)**

The PTWC started in 1949 following an unwarned tsunami from Alaska in 1946 that killed 159 people in Hawaii. It is administratively part of the NOAA NWS Pacific region. Its mission responsibilities include serving as the:

- International Tsunami Warning Center for the PTWS, and headquarters and coordinator of warning centre activities in the Pacific,
- Tsunami Warning Centre for all US national interests in the Pacific outside of Alaska and the US and Canada West Coast,
- Hawaii Regional Tsunami Warning Centre,
- Interim Tsunami Watch provider for the Indian Ocean (along with JMA),
- Interim Tsunami Warning Centre for the South China Sea (along with JMA NWPTAC),
- Interim Tsunami Watch provider for the Caribbean and adjacent regions.

**West Coast/Alaska Tsunami Warning Center (WC/ATWC)**

The WC/ATWC started in 1967 after the 1964 Alaska earthquake as the warning centre for Alaska. It expanded to include the west coast of North America in 1982, and to all coasts on North America in 2005. It is administratively part of NOAA NWS Alaska region. Its mission responsibilities include serving as the:

- US Tsunami Warning Center for all US states except Hawaii,
- US and International Tsunami Warning Centre for Puerto Rico and Virgin Islands,
- International Tsunami Warning Center for Canada.

**Japan Meteorological Agency (JMA); Northwest Pacific Tsunami Advisory Center (NWPTAC)**

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) oversees the JMA that operates and administers the tsunami warning programme for Japan. The JMA National Center has mission responsibilities as:

- National Tsunami Warning Center (started in 1952),
- International Tsunami Advisory service for the Northwest Pacific (through the NWPTAC, since 2005),
- Interim Tsunami Watch Provider for the Indian Ocean (with PTWC, since 2005),
- Interim Tsunami Advisory Center for the South China Sea as part of the expanded coverage of the NWPTAC (with PTWC, since 2006).

## 1.3 27FEBRUARY 2010 CHILE TSUNAMI – AN OPPORTUNITY TO ASSESS PERFORMANCE

A series of severe earthquakes hit Central Chile on Saturday, 27 February 2010. The major one off Concepcion at 06:34 UTC (03:34 a.m. in local time) had a magnitude of 8.8 Mw. The Pacific Tsunami Warning Center (PTWC) in Hawaii issued a regional warning for Chile and Peru, at 06:46

UTC. The tsunami warning system for the Pacific Ocean (PTWS) went into action, and first reports indicate that timely and adequate information was produced and disseminated.

This is the first real ocean wide test of a system that was put in place about 45 years ago by UNESCO's Member States through its Intergovernmental Oceanographic Commission (IOC), when a 9.5 magnitude earthquake occurred on 22 May 1960 off Chile.

The recent event provides the PTWS with an opportunity to evaluate the performance of the system and will enable PTWS and its Member States to identify those components which worked properly and, most importantly, any components which did not work in an appropriate manner and are in need of further attention. A post-event assessment questionnaire was designed to evaluate the performance of the PTWS and to provide a benchmark of the present status of the system. Support and cooperation of Member States to complete the questionnaire was requested.

The questionnaire addressed 4 main areas of an end-to-end warning system, including upstream and downstream components. These are:

- The PTWC/WC/ATWC service,
- National Actions,
- National Response,
- Monitoring and Modelling.

The assessment was meant to be positive and constructive, and not to be in any way critical or judgmental.

## 2. EVENT CHARACTERISTICS

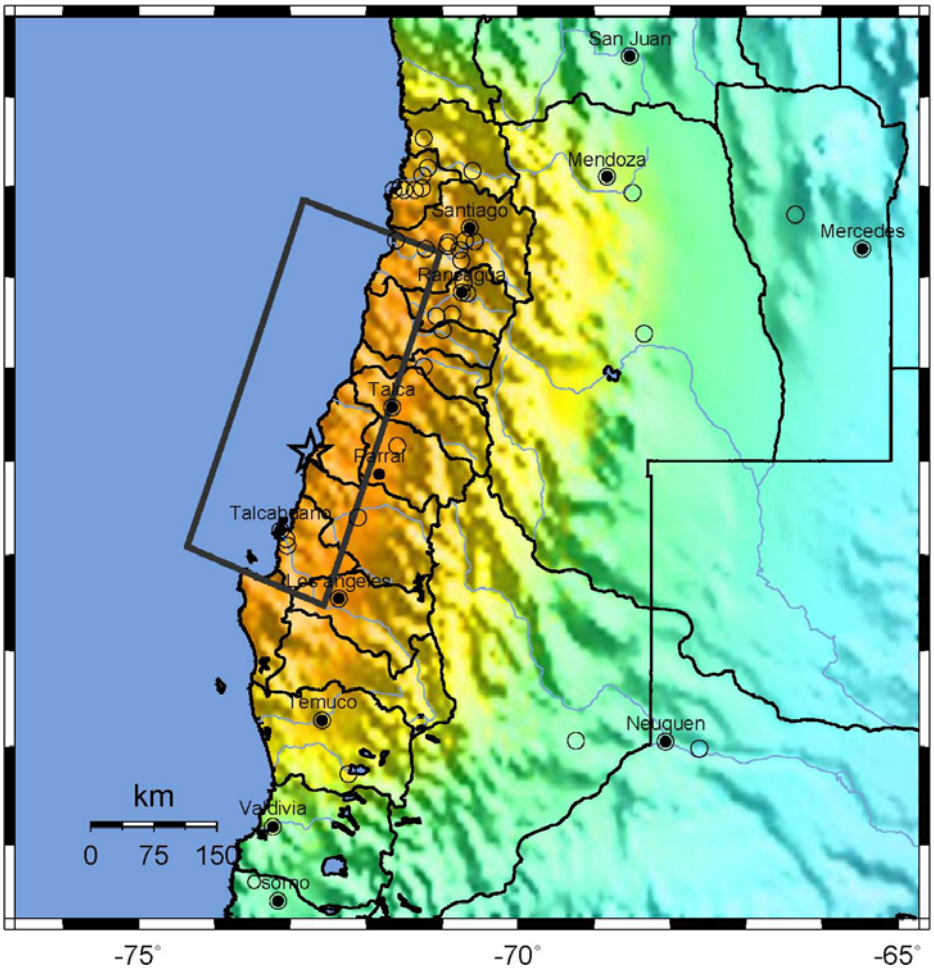
According to the Chilean authorities (as of January 2011), a total of 156 persons died and 25 people are missing as a consequence of the tsunami, including 25 children under 10 years old. Many campers are included in the fatalities.

### 2.1 EARTHQUAKE FACTS

At 06:34:14 UTC on 27 February 2010 (local time was 03:34:14 AM) an earthquake of Mw 8.8 occurred 105 km NNE of Conception and 335 km SW of Santiago, Chile (Figure 2.1). The earthquake parameters were as follows (from USGS).

Location: 35.909° S, 72.732° W
Depth: 35 km
Magnitude (Mw): 8.8

USGS ShakeMap : OFFSHORE MAULE, CHILE Sat Feb 27, 2010 06:34:14 GMT
M 8.8 S35.91 W72.73 Depth: 35.0km ID:2010tfan




**Map Version 7 Processed Fri Mar 5, 2010 03:00:13 AM MST -- NOT REVIEWED BY HUMAN**

| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
|---|---|---|---|---|---|---|---|---|---|
| POTENTIAL DAMAGE | none | none | none | Very light | Light | Moderate | Moderate/Heavy | Heavy | Very Heavy |
| PEAK ACC.(%g) | *<.17* | *.17-1.4* | *1.4-3.9* | *3.9-9.2* | *9.2-18* | 18-34 | 34-65 | 65-124 | >124 |
| PEAK VEL.(cm/s) | <0.1 | 0.1-1.1 | 1.1-3.4 | 3.4-8.1 | *8.1-16* | *16-31* | *31-60* | *60-116* | *>116* |
| INSTRUMENTAL INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X+ |

Figure 2.1 Location and seismic intensity map of 27 the February 2010 earthquake, 105 km NNE of Conception and 335 km SW of Santiago, Chile. (USGS)

The earthquake was generated at the gently sloping fault that conveys the Nazca plate eastward and downward beneath the South American plate. The two plates are converging at 7 meters per century. The fault rupture, largely offshore, exceeded 100 km in width and extended nearly 500 km parallel to the coast. The rupture began deep beneath the coast and spread westward, northward, and southward. As it spread, the fault slip generated an earthquake shaking. The fault slip also warped the ocean floor, setting off the tsunami along the fault-rupture area. (USGS).

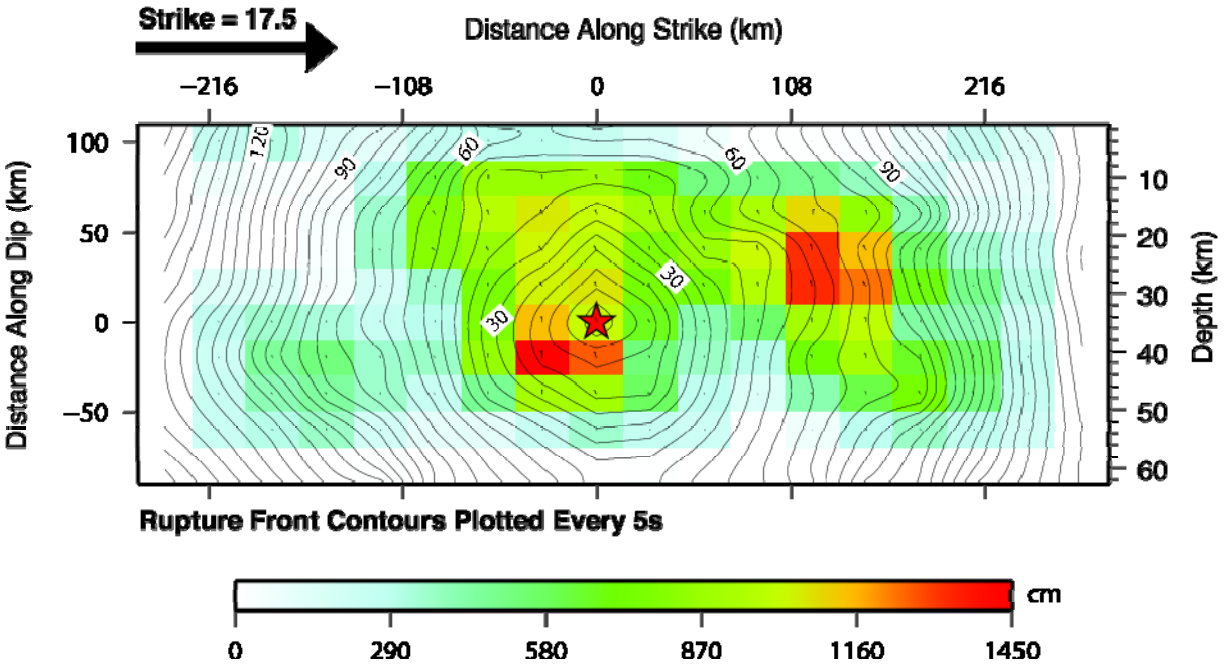



Figure 2.2 Cross-section of slip distribution. The strike direction of the fault plane is indicated by the black arrow and the hypocenter location is denoted by the red star. The slip amplitudes are shown in colour. Contours show the rupture initiation time in seconds. (USGS).

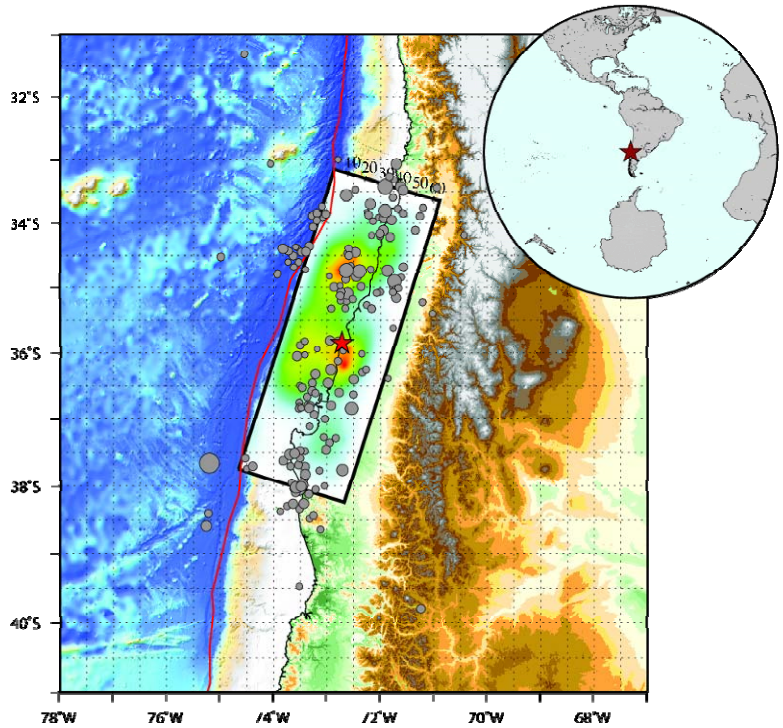



Figure 2.3 Surface projection of the slip distribution superimposed on GEBCO. Red lines indicate major plate boundaries [Bird, 2003]. Gray circles are aftershock locations, sized by magnitude, up to 2010/03/02 15:30 UTC (USGS)

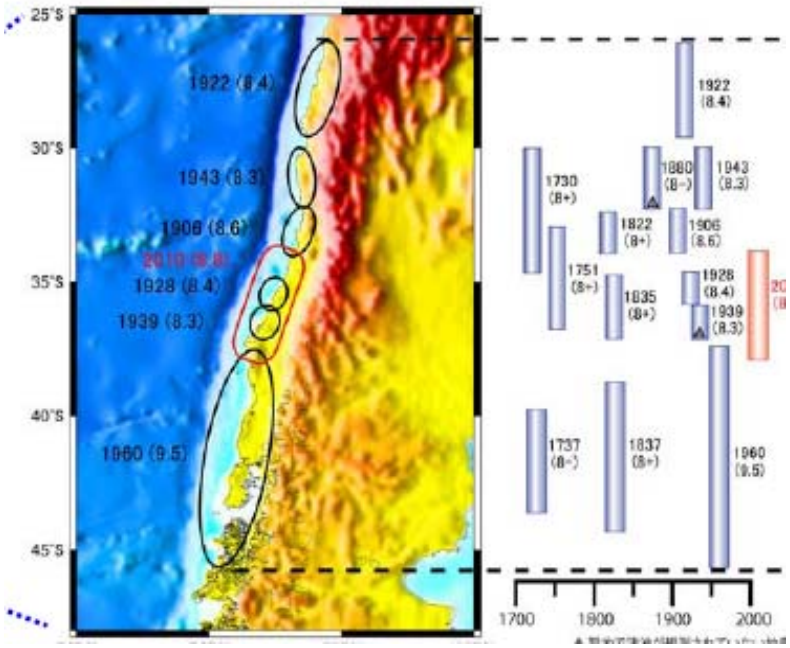



Figure 2.4 Focal areas of the 2010 earthquake (red) and past significant earthquakes (black elipse). The largest elipse shows the focal area of the 1960 Chilean earthquake. The 2010 earthquake took place after about 70 years from the preivious M 8.4 class earthquakes. (Figure is taken from JMA)

## 2.2 TSUNAMI MODELLING AND SEA LEVEL OBSERVATIONS

### 2.2.1 Tsunami modelling

The use of numerical modelling to predict tsunami wave heights is gradually increasing. In case of tsunamis which attack within a few minutes, the TWC can use only the seismic data for issuing a tsunami warning before the tsunami arrival. If we could get actual tsunami wave forms generated, we can be able to provide accurate tsunami information including tsunami arrival times and its height.

In case of the tsunami of February 27, 2010 Chile, the tsunami was first recorded at a DART buoy in approximately 3 hours. Forecast results shown in Figure 2.5 were created with the NOAA forecast method using the MOST model with the tsunami source inferred from DART data. The tsunami waves first arrived at Talcahuano tide gauge station, Chile (about 100 km south from epicenter) about 19 minutes after the earthquake. The second arrival was at the Valparaíso tide gauge station, Chile (about 330 km NE from the epicenter) about 34 minutes after the earthquake.

According to the WC/ATWC, the first tsunami arrival in Hawaii was at 21:29; 14:55 hours after the earthquake and was recorded in Japan at 04:43 on 28 February; 22:09 hours after the earthquake.

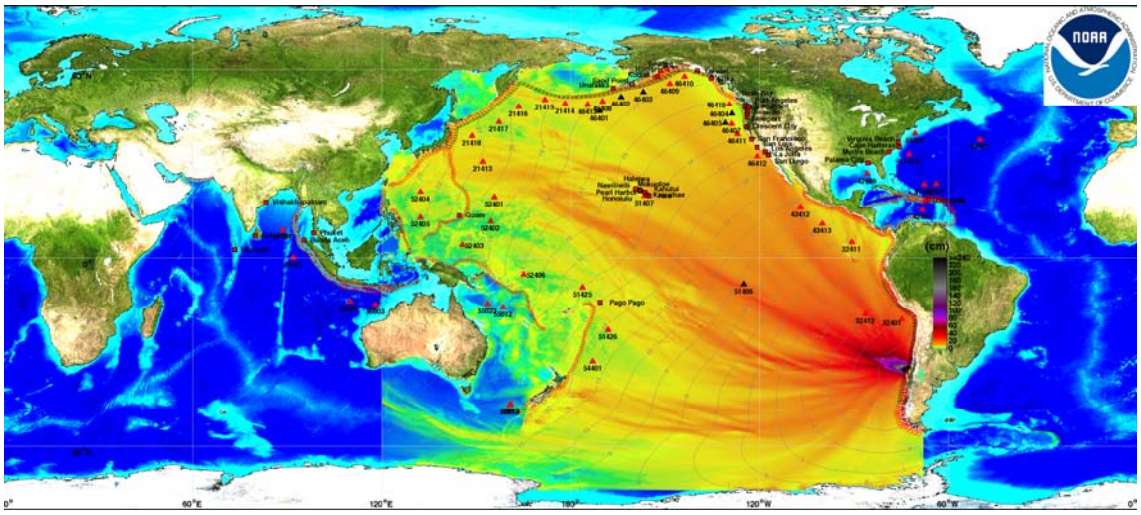


Figure 2.5 Energy propagation pattern of the 27 February 2010 tsunami calculated with MOST forecast model. Filled colors show maximum computed tsunami amplitude in cm during 24 hours of wave propagation. Black contours show computed tsunami arrival time. (NOAA/PMEL/Centre for Tsunami Research)

The PMEL also calculated the Model amplitudes for the 1960 Chile tsunami, shown in Figure 2.6.

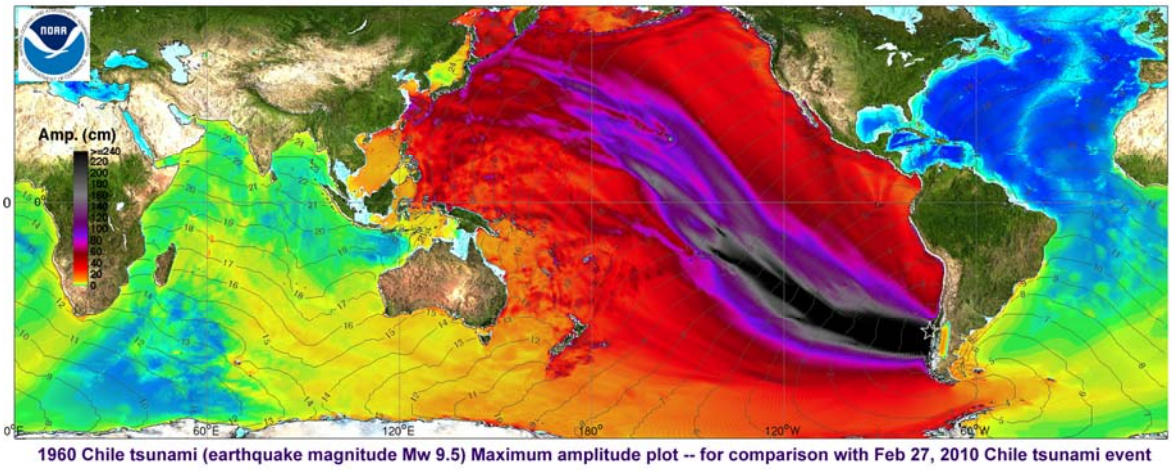



Figure 2.6 Model amplitudes of the historical 1960 Chilean tsunami from the M 9.5 earthquake calculated with the MOST forecast model. Filled colors show maximum computed tsunami amplitude in cm during 24 hours of wave propagation. Black contours show computed tsunami arrival time. The source parameters of the earthquake (Mw 9.5) are taken from Kanamori and Ciper [1974]. (NOAA/PMEL/Centre for Tsunami Research)

### 2.2.2 Tsunami Travel Time Modelling

Another model package that has proved to be useful for predicting tsunami propagation is the Tsunami Travel time (TTT) software developed by Paul Wessel, GeowareTravel and distributed by World Data Centre (NGDC) in Boulder, Colorado, USA in cooperation with the International Tsunami Information Center (ITIC) and UNESCO IOC.TTT maps are used for Figures 5.1, 5.2, 5.3.

### 2.2.3 Sea Level Observation

The Pacific Ocean sea level network collected a significant amount of tsunami sea level readings for the 2010 Chile tsunami. Here, some tsunami records are shown in Figure 2.7 to Figure 2.19. All figures show 1 day data with the same amplitude scale; one grid of each figure corresponds to 1 meter. All figures are absolute sea level data; tide components are not removed. All data are taken from the WC/ATWC data archive.

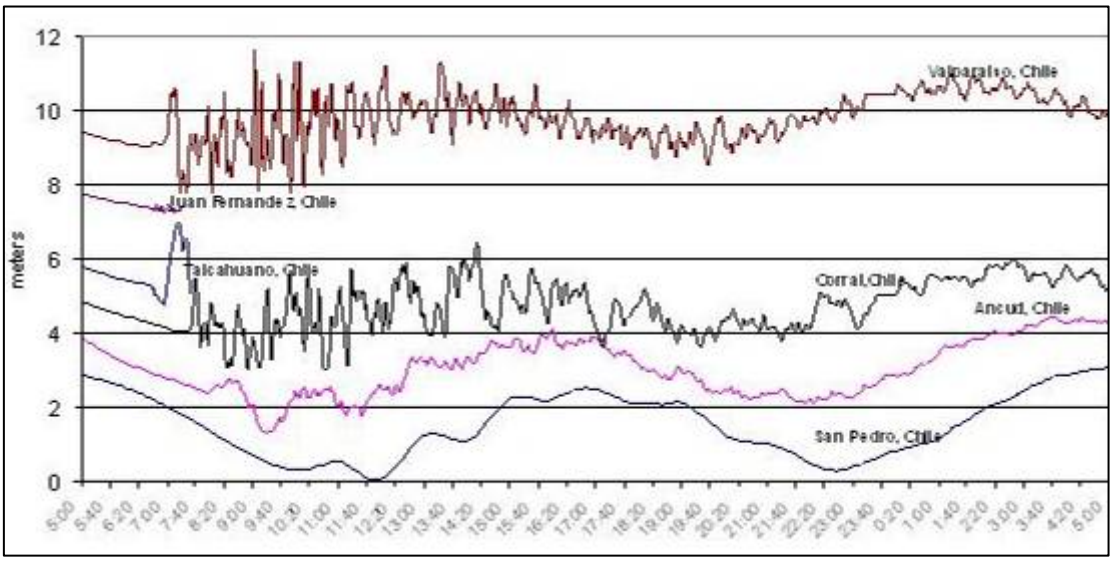



Figure 2.7 Southern Chile sea level stations: San Pedro, Ancud, Corral, Talcahuano, Juan Fernández and Valparaíso

This figure shows the Chilean sea level stations from South (bottom) to North (top). Significant tsunamis waves were recorded at these Chilean sea level stations. The data samplings are every 2 minutes. The first tsunami wave, fortunately, arrived at the time of low tide in the early morning. The high tide time is about 6 hours later from the first tsunami arrival. The highest sea level at Corral was around 14:00 UTC; 8 hours after the earthquake occurence. In the case of Valparaíso, the highest sea level height was recorded around 9:00 UTC; 3 hours after the earthquake.

The data transmission at Talcahuano and Juan Fernández were terminated shortly after the earthquake (see Box on Sea level readings for near field events, next page).

**Sea level network readings for near field events**

Photo 1 shows the tsunami damaged sea level station at Talcahuano, Chile. Top 2 elements are GOES antenna (flat) and protected air temperature sensor (cylinder). GOES antenna is used to send sea level data through satellite. A UHF antenna which use is to send sea level data to the local maritime authority is placed immediately below the temperature sensor. Two flat panels below are solar panels to charge batteries to the power system in case the commercial power system fails. Some seaweed is attached to a solar panel and the antenna pole and the pole is slightly inclined. As it is reported, the tsunami run-up height in the region was around 6 meters. A broken low wall down the picture is reported as causing the pole inclination and the sea level station broken down.

*Photo 1. Damaged sea level station the day after the 27 February 2010 tsunami, Talcahuano, Chile*
*Photo by Rodrigo Núñez Gundlach*

As the data transmission interval for this station was every 60 minutes, 29 minutes after the hour, the sea level readings from this station were first available 54 minutes after the earthquake, at 07:29 UTC and afterwards at 08:29 UTC. Then this level station stopped working sometime between 08:29 UTC and 09:29 UTC.

As demonstrated by the case of the sea level station in Talcahuano, Chile, sea level stations close to the epicenter may be partially or totally destroyed by the earthquake or by the impact of a tsunami. Given the critical role sea level readings have in tsunami warning systems, monitoring sea level networks should be dense close to active subduction areas.

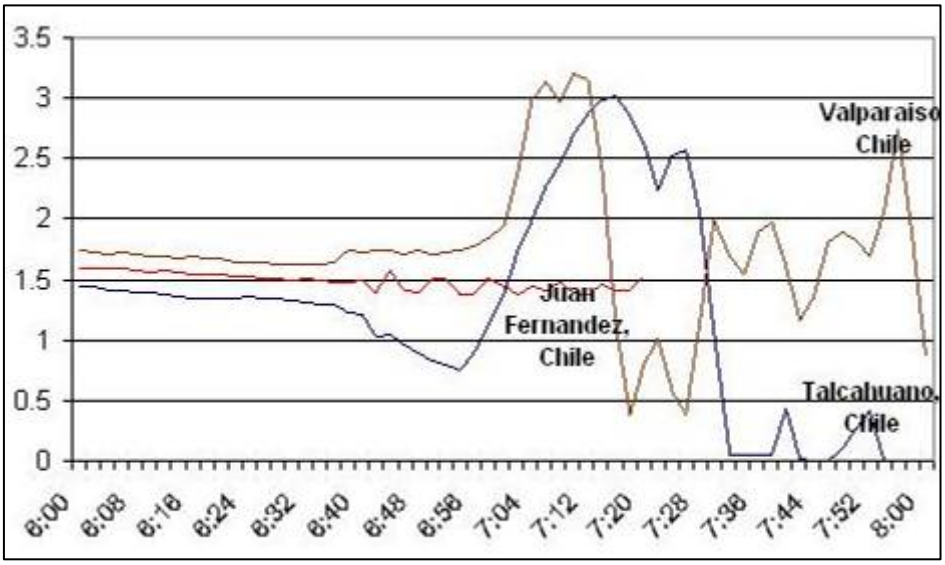



Figure 2.8 Expanded records for Chile sea level stations: Juan Fernández, Talcahuano and Valparaíso

Three expanded records; vertical and horizontal axises as in Figure 2.8, show the records at Talcahuano, Valparaíso and Juan Fernández for 2 hours (06:00 – 08:00 UTC) and vertical scale is

also expanded; one grid is a half meter. Each record shows some changes are initiated just after the earthquake at 06:34 UTC. The cause of these fluctuations may be different from station to station. Sea level records at Valparaíso show co-seismic rises of about 10 cm that continue for about a half hour without oscillation,and then a sudden increase starts. It is not clear at the moment but this may reflect the subsidence of sea level station. On the other hand, the record at Talcahuano shows a gradual sea level decrease initiated immediately after the earthquake occurrence, and a sudden increase starting after about a half hour. Juan Fernández station is located in Robinson Crusoe Island which lies some 700 km from Chilean mainland. The sea level record also shows a small periodic oscillation; about 10 cm (peak to trough), has started just after the earthquake. As the station is some distance from the earthquake source area, the oscillation is not the tsunami arrival but the seiche generated by the seismic wave of the earthquake. Although the tsunami height could not observed by the sea level station due to the malfunction of the system, the run-up height of the Island was over 8 meters, and 16 lives were lost in the island.

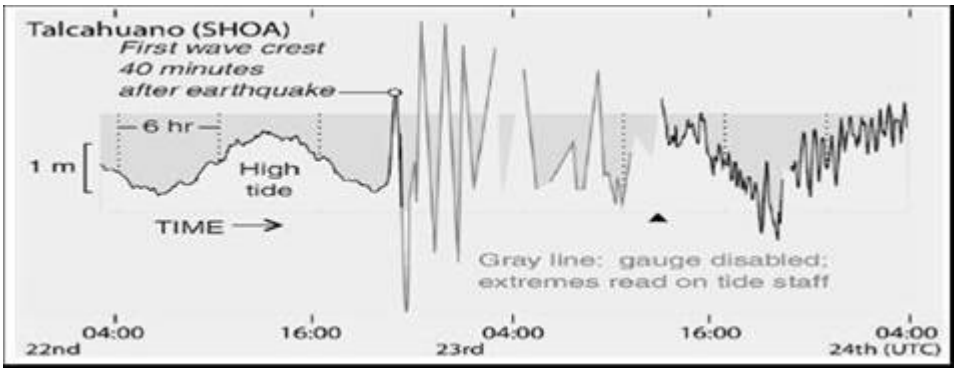



Figure 2.9 shows the 1960 tsunami record at Talcahuano as a reference

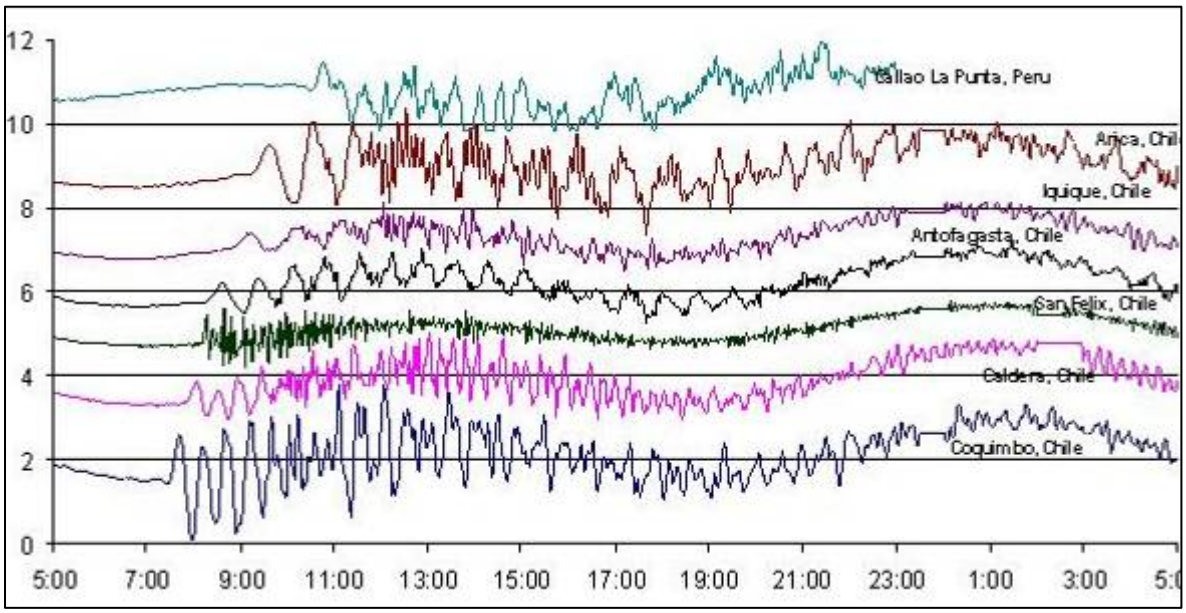



Figure 2.10 Northern Chile and Peru sea level stations:Coquimbo, Caldera, San Felix, Antofagasta, Iquique and Arica (Chile) and Callao La Punta (Peru).

Figure 2.10 shows tsunami heights recorded by sea level stations from Central Chile (bottom) to Peru (top). The initial motion of all stations in this figure starts with a clear push wave. The maximum tsunami amplitude was about 1.3 meter at Coquimbo, Chile. Other stations were around 0.3 to 0.7 meter. Tsunami records continue for a long time without a rapid decay. The highest sea level was observed at the time of the high tide at each station.

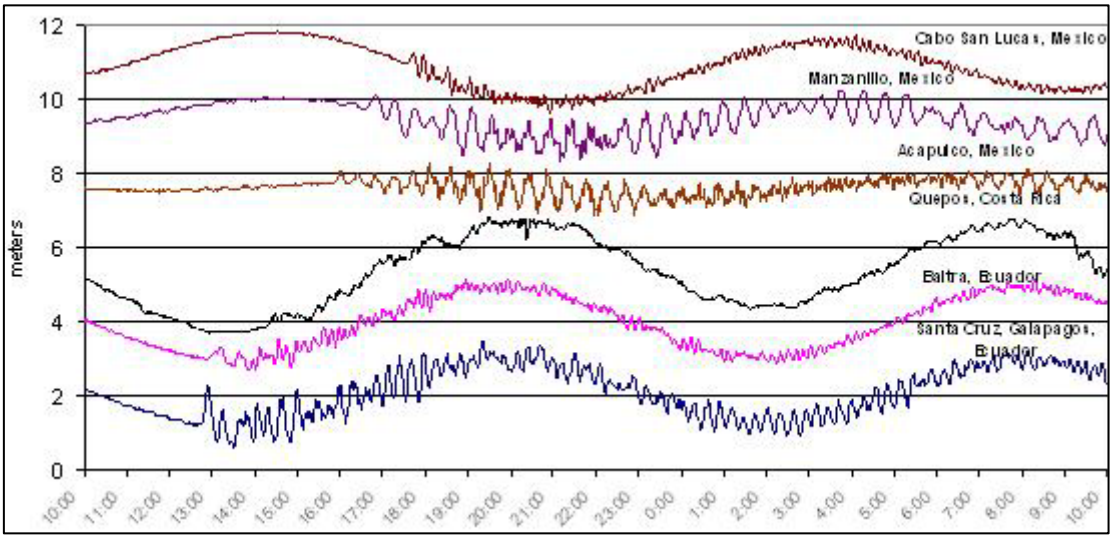



Figure 2.11 Central America sea level stations: Santa Cruz, Galápagos and Baltra (Ecuador), Quepos (Costa Rica), Acapulco, Manzanillo, Cabo San Lucas (México).

Figure 2.11 shows sea level data from tide gauges located in Central America. Epicentral distances are about 4,300 km (bottom) to 7,600 km (top). The maximum amplitude at Santa Cruz, Galápagos, Ecuador was about 1.1 m. Other stations in the figure were 0.2 – 0.4 m.

The common features of these stations are:

- A clear push wave onset of the first arrival wave,
- Tsunami amplitudes continue with same height without decaying,
- The predominant periods are constant at each station (harbour).

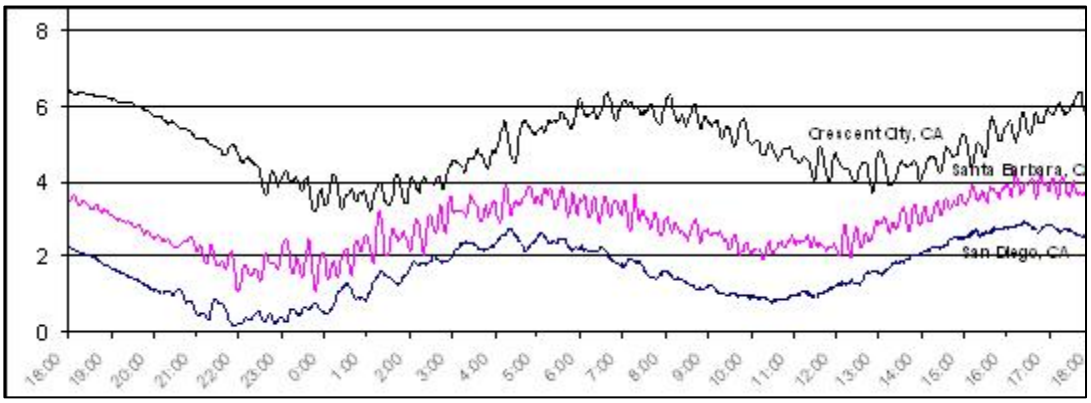



Figure 2.12 Sea level stations along California coast (USA):San Diego, Santa Barbara and Crescent City

Figure 2.12 shows sea level data from stations located in California, USA. Epicentral distances are about 9,000 km to 10,000 km. The maximum amplitudes at these three stations were 0.4 – 0.6 m. Both records at Santa Barbara and San Diego show short period oscillations and a long duration

with same amplitude; about 40 cm. This implies that strong currents continued for a long time in each harbour.

The common features of these stations are:

- Onset of the first arrival wave is not clear at each station,
- Tsunami amplitude continues with same height without decaying,
- The predominant periods are constant at each station (harbour).

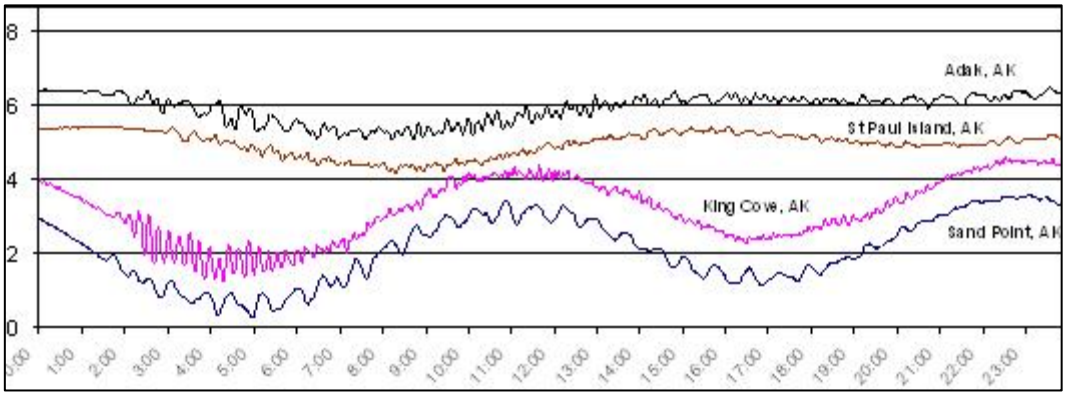



Figure 2.13 Sea level stations along Alaska, USA Sand Point, King Cove, St Paul Island and Adak

Figure 2.13 shows the sea level data for locations in Alaska, USA. Epicentral distances are about 13,000 km to 14,000 km. The maximum amplitudes at these three stations were 0.2 – 0.6 m. The predominant periods of tsunami are quite different station by station.

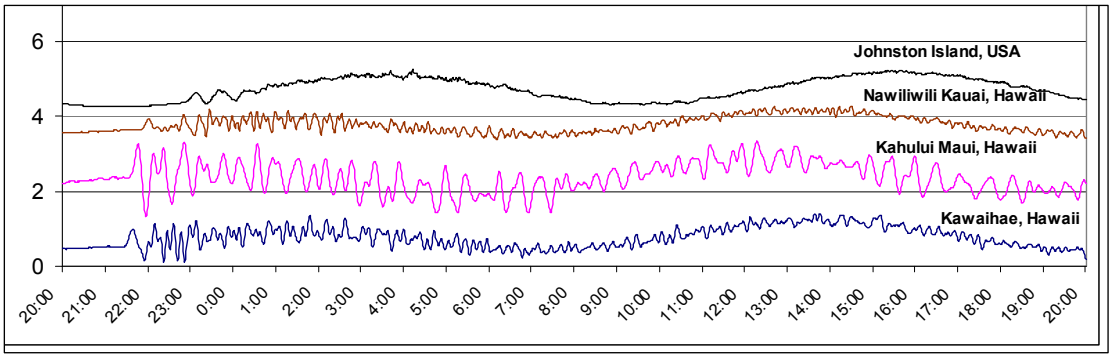



Figure 2.14 Sea level stations in Hawaii and Johnston Island: Kawaihae, Kahului, Maui, Nawiliwili, Kauai and Johnston Island (USA)

Figure 2.14 shows the sea level data from locations in Hawaii (3 stations) and Johnston Island, USA. Epicentral distances are around 11,000 km. The maximum amplitudes at these three stations were 0.4 – 1 m. All records start with clear push waves and have a similar wave form with long time oscillation at the Hawaiian stations. However, Johnston Island is a small coral reef island about 1,400 km west of Hawaii, and the tsunami waveform is quite simple. The maximum amplitude was about 0.2 m in the part of the first few oscillations and attenuated rapidly.

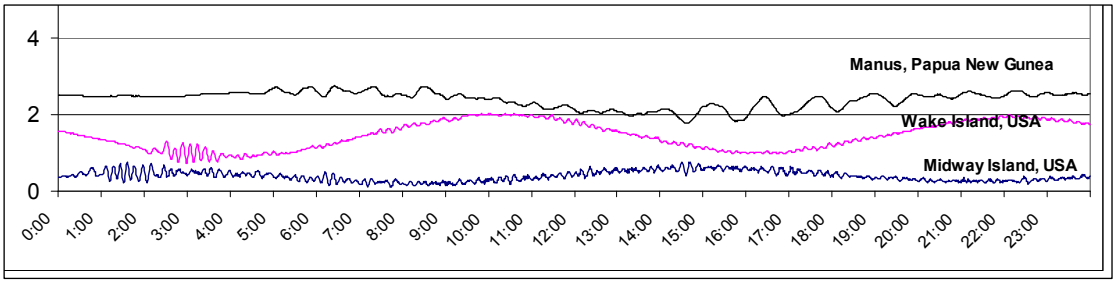



Figure 2.15 Sea level stations in the Western Pacific Ocean Midway Island and Wake Island (USA) and Manus (Papua New Guinea).

Both Midway Island and Wake Island (Figure 2.15) are small coral reef islands in the North-West Pacific Ocean. Epicentral distances are about 13,000 km to 14,000 km. The maximum amplitude waves arrived within a few hours of tsunami arrival and attenuated rapidly. Manus sea level station is installed in Manus Island in northern Papua New Guinea. Maximum amplitude of 0.7 m appears a half day after the tsunami generation.

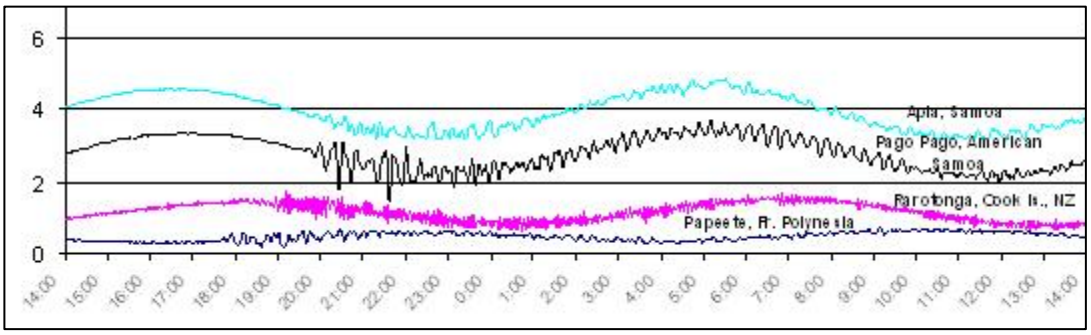



Figure 2.16 Sea level stations in the Southern Pacific Ocean: Papeete (Fr. Polynesia), Rarotonga (New Zealand), Pago Pago (American Samoa) and Apia (Samoa).

Papeete is the capital of French Polynesia in Tahiti Island. Rarotonga station is located in Cook Island. Apia station is located in northern coast of Upolu Island of Samoa. Epicentral distances are about 7,700 km to 9,900 km. Maximum amplitudes are 0.2 – 0.4 m.

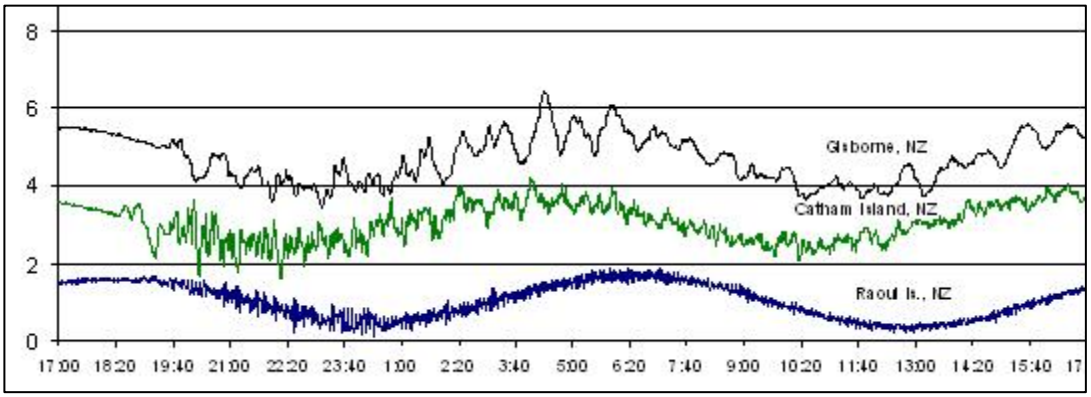



Figure 2.17 Sea level stations in New Zealand: Raoul Island, Chatham Island and Gisborne (New Zealand)

Raoul Island is located in the northernmost of the main Kermadec islands. Chatham Island is located over 800 km east of New Zealand. Gisborne is located east coast of New Zealand. Epicentral distances are about 8,300 km to 9,400 km. Maximum amplitudes are 0.5 – 1 m. Highest sea level at Gisborne is observed a half day after the tsunami generation. The features of the tsunami wave form are quite different station by station.

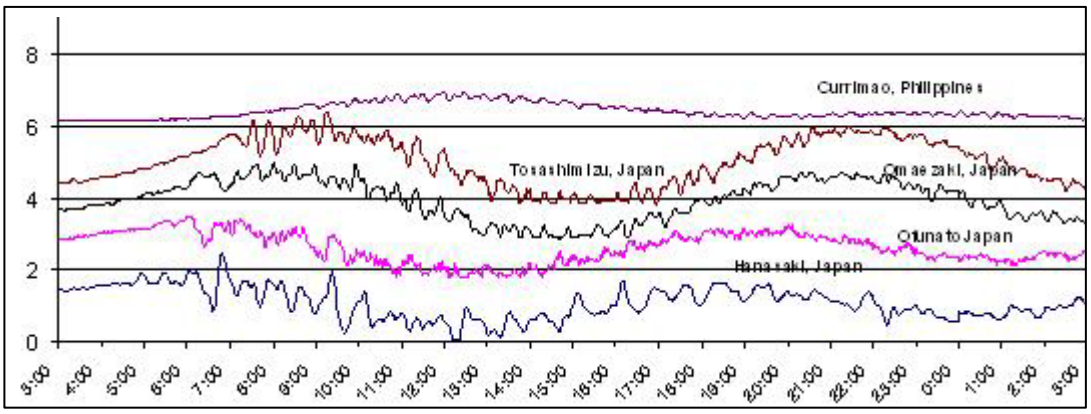



Figure 2.18 Sea level stations in Japan and Philippines: Hanasaki, Ofunato, Omaezaki and Tosashimizu (Japan) and Currimao (Philippines).

Currimao, Philippines station is located in the coast of South China Sea. All 4 stations in Japan (Figure 2.18) are located along the Pacific Ocean coast. Epicentral distances are about 16,700 km to 17,700 km. The maximum amplitudes at 4 stations in Japan were 0.4 – 0.9 m and 0.2 m at Currimao, Philippines. By comparision, the 1960 Chilean tsunami was recorded at the Hanasaki station with amplitude (peak to peak) of over 3 meters (Figure 2.19).

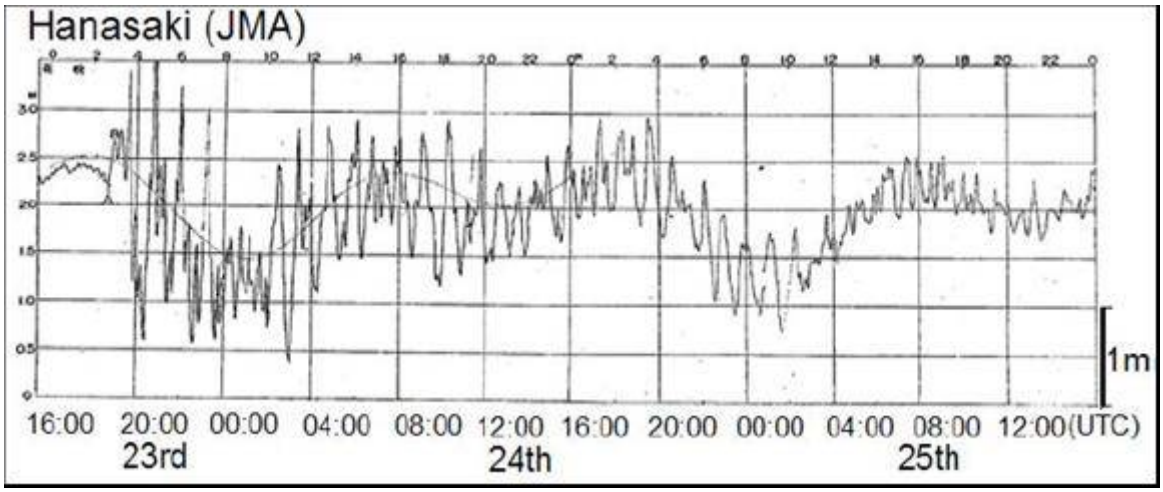



Figure 2.19 Shows the tsunami record of 1960 Chile tsunami; maximum peak-to-peak amplitude was over 3 meters.

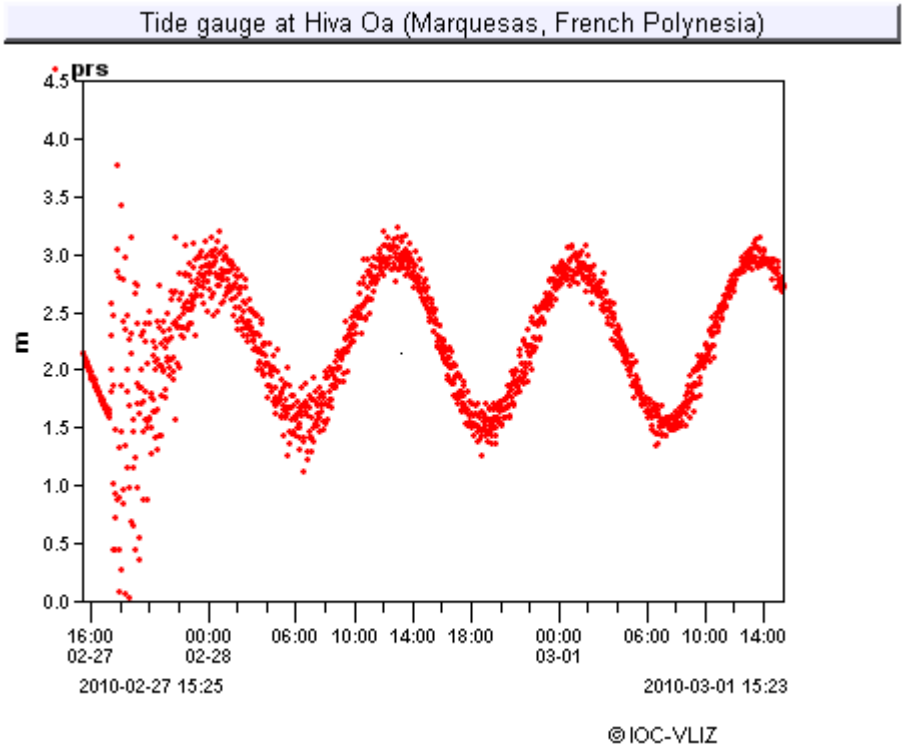



Figure 2.20. Shows the tsunami record of 2010 Chile tsunami at Hiva Oa (Marquesas islands, French Polynesia)

## 2.3 PTWC, WC/ATWC AND JMA BULLETINS

Following the earthquake, PTWC and WC/ATWC issued several bulletins. The North-West Pacific Tsunami Advisory Center of JMA did not issue international bulletins because the earthquake was out of its area of responsibility. The time line below, however, includes for reference the action taken by JMA as a national tsunami warning centre.

**27 Feb 2010 Chile Time Line**
(Note: Blue part is new information.)

| | Elapse | | Action |
|---|---|---|---|
| 27Feb. 06:34Z 2010 | | NEIC | OT: 06:34:14UTC (Local time 03:34AM)<br>35.846S, 72.719W, Depth: 35km Mw: 8.8<br>Offshore Maule, Chile<br>115km NNE of Conception, Chile<br>325km SW of Santiago, Chile |
| 06:46 | 12 | PTWC No. 1 | Warning for Chile, Peru and Watch for Ecuador<br>36.1S 72.6W, depth:55km M:8.5 |
| 06:49 | 15 | WCATWC No. 1 | Tsunami Information 36.1S 72.6W, depth:55km M:8.5 |
| 07:45 | 1:11 | PTWC No. 2 | Warning for Chile, Peru. Watch for Ecuador, Colombia, Antarctica, Panama, Costa Rica 36.1S 72.6W, depth:55km M:8.6 (*M is revised*) |
| 07:55 | 1:18 | WCATWC No. 2 | Tsunami Information 36.1S 72.6W, depth:55km M:8.6 (*M is revised*) |
| 08:44 | 2:10 | PTWC No. 3 | Warning for Chile, Peru. Watch for Ecuador, Colombia, Antarctica, Panama, Costa Rica 36.1S 72.6W, depth:55km M:8.8 *(M is revised)* |
| 08:57 | 2:23 | WCATWC No. 3 | Tsunami Information 36.1S 72.6W, depth:55km M:8.8 (*M is revised*) |
| 09:47 | 3:13 | PTWC No. 4 | Warning for Chile, Peru, Ecuador and Watch for Colombia, Antarctica, Panama, Costa Rica, Nicaragua, Pitcairn, Honduras, El Salvador, Guatemala, Fr. Polynesia |
| 09:58 | 3:24 | WCATWC No. 4 | Tsunami Information 36.1S 72.6W, depth:55km M:8.8 |
| 10:45 | 4:11 | PTWC No. 5 | **Warning is issued for all Pacific area** |
| 10:55 | 4:21 | WCATWC No. 5 | **Tsunami Advisory** for California and Alaska (from Kodiak to Attu) |
| 11:47 | 5:13 | PTWC No. 6 | **Warning for all Pacific area** |
| 11:53 | 5:19 | WCATWC No. 6 | **Tsunami Advisory** for California and Alaska (from Kodiak to Attu) |
| 12:49 | 6:15 | PTWC No. 7 | **Warning for all Pacific area** |
| 12:55 | 6:21 | WCATWC No. 7 | **Tsunami Advisory** for California and Alaska (from Kodiak to Attu) |
| 13:46 | 7:12 | PTWC No. 8 | **Warning for all Pacific area** |
| 14:03 | 7:29 | WCATWC No. 8 | **Tsunami Advisory for entire AOR from California/Mexico border to Attu, Alaska** |
| 14:46 | 8:12 | PTWC No. 9 | **Warning for all Pacific area** |
| 15:04 | 8:30 | WCATWC No. 9 | **Tsunami Advisory for entire AOR** |
| 15:45 | 9:11 | PTWC No. 10 | **Warning for all Pacific area** |
| 16:03 | 9:29 | WCATWC No. 10 | **Tsunami Advisory for entire AOR** |
| 16:50 | 10:16 | PTWC No. 11 | **Warning for all Pacific area** |
| 17:04 | 10:30 | WCATWC No.11 | **Tsunami Advisory for entire AOR** |
| 17:52 | 11:18 | PTWC No. 12 | **Warning for all Pacific area** |
| 17:58 | 11:24 | WCATWC No. 12 | **Tsunami Advisory for entire AOR** |
| 18:43 | 12:09 | PTWC No. 13 | **Warning for all Pacific area** |
| 19:06 | 12:32 | WCATWC No. 13 | **Tsunami Advisory for entire AOR** |
| 19:34 | 13:00 | PTWC No. 14 | **Warning for all Pacific area** |
| 20:03 | 13:29 | WCATWC No. 14 | **Tsunami Advisory for entire AOR** |
| 20:28 | 13:54 | PTWC No. 15 | **Warning for all Pacific area** |
| 21:05 | 14:31 | WCATWC No. 15 | **Tsunami Advisory for entire AOR** |
| 21:32 | 14:58 | PTWC No. 16 | **Warning for all Pacific area** |
| 21:47 | 15:13 | WCATWC No. 16 | **Tsunami Advisory for entire AOR** |
| 22:41 | 16:07 | PTWC No. 17 | **Warning for all Pacific area** |
| 22:46 | 16:12 | WCATWC No. 17 | **Tsunami Advisory for entire AOR** |
| 23:54 | 17:20 | WCATWC No. 18 | **Tsunami Advisory for entire AOR** |
| 00:12 28 Feb | 17:38 | PTWC No.18 | **Cancelled Tsunami Warning for every where except Russia and Japan** |

| | Elapse | | Action |
|---|---|---|---|
| 00:33 | 17:59 | JMA | Major Tsunami Warning for 3 forecast zones in Northern Japan, Tsunami warning for other all Pacific coastal area, a part of Japan sea coast and setonaikai coast, and Tsunami Advisory for some non Pacific coastal area. |
| 00:54 | 18:20 | WCATWC No.19 | Tsunami Advisory for California, BC and Alaska and Advisory is canceled for Oregon and Washington. |
| 01:35 | 19:01 | PTWC No. 19 | **Tsunami warning for Russia and Japan** |
| 01:57 | 19:23 | WCATWC No. 20 | Tsunami Advisory for California and areas in Alaska from Sitka to Attu. Tsunami Advisory is canceled for areas from BC/Washington border to Sitka, Alaska. |
| 02:35 | 20:01 | PTWC No. 20 | **Tsunami warning for Russia and Japan** |
| 03:05 | 20:31 | WCATWC No. 21 | Tsunami Advisory for California and area in Alaska from Seward to Attu. Tsunami Advisory is canceled for areas of Alaska from Sitka to Seward. |
| 03:44 | 21:10 | PTWC No. 21 | **Tsunami warning for Russia and Japan** |
| 04:03 | 21:29 | WCATWC No. 22 | Tsunami Advisory for areas in Alaska from Kodiak to Attu. Tsunami Advisory is canceled for areas of Alaska from Seward to Kodiak and California. |
| 04:47 | 22:13 | Hanasaki/ Japan | Tsunami arrival (push) 0.3m, Max: 1.0m at 09:23 |
| 04:49 | 22:15 | PTWC No. 22 | **Tsunami warning for Russia and Japan** |
| 05:01 | 22:27 | WCATWC No. 23 | Tsunami Advisory for areas in Alaska from Sand Point to Attu. Tsunami Advisory is canceled for areas of Alaska from Kodiak to Sand Point. |
| 05:56 | 23:22 | PTWC No. 23 | **Tsunami warning for Russia and Japan** |
| 06:02 | 23:28 | WCATWC No. 24 | Tsunami Advisory for areas in Alaska from Sand Point to Attu. |
| 07:00 | 24:26 | PTWC No. 24 | **Tsunami warning for Russia and Japan** |
| 07:13 | 24:39 | WCATWC No. 25 | **Tsunami Advisory is canceled for all areas in Alaska** |
| 07:57 | 25:23 | PTWC No. 25 | **Tsunami warning for Japan and Cancelled for Russia** |
| 08:59 | 26:25 | PTWC No. 26 | **Tsunami warning for Japan** |
| 09:40 | 27:06 | PTWC No. 27 | **Tsunami Cancellation and this will be the final bulletin.** |
| 10:01 | 27:27 | JMA | **Major Tsunami Warning for 3 forecast zones were down graded to Tsunami Warning and Other Tsunami Warning and Advisory are remained.** |
| 12:13 | 29:39 | JMA | **Some Tsunami warnings are downgraded to Advisories and some Advisories are cancelled.** |
| 14:36 | 32:02 | JMA | **Many Tsunami Warning areas are downgraded to Tsunami advisory and some Warnings and Advisories are cancelled.** |
| 16:07 | 33:33 | JMA | **Many Tsunami Warning areas are downgraded to Tsunami advisory.** |
| 18:06 | 34:32 | JMA | **All Tsunami Warnings are downgraded to Tsunami Advisory and some Advisories are cancelled.** |
| 23:40 | 40:06 | JMA | **Some Advisories are cancelled.** |
| 01:15 1 Mar | 41:41 | JMA | **All Advisories are cancelled.** |

## 3. SURVEY QUESTIONNAIRE

The ICG/PTWS designed a questionnaire to obtain information from Member States covering 4 main areas of interest:

- The PTWC and WC/ATWC Service
  The purpose of this section was to confirm how and when the NTWCs had received the first and subsequent bulletins from PTWC and WC/ATWC, and if they had also received bulletins from other sources.
- National Actions
  The purpose of this section is to find out what actions were taken by National Warning Centres, including an independent analysis of the event, notification of relevant organizations, issuing and cancellation of warnings.

- National Response
  The purpose of this section is to find out what the national and local response was to the event after the tsunami warning had been issued by the National Warning Centre.
- Monitoring and Modelling
  This section was intended to ascertain which Member States used numerical model scenarios and real time sea level monitoring procedures in their decision making.

The questionnaire is included in Annex II together with the covering letter sent out to Member States.

Currently the ICG/PTWS comprises 32 Member States.

## 4. COUNTRY REPORTS

The following sections provide details of the response of individual countries, based on information provided in the questionnaires. Note that questionnaires were not returned by Canada, Cook Islands, Costa Rica, Democratic People's Republic of Korea, Fiji, Guatemala, Indonesia, Malaysia, Mexico, Papua New Guinea, Republic of the Philippines, Republic of Korea, Samoa, Vietnam.

The country reports are given in the form of a response timeline followed by a commentary based on information provided by the participating countries. Figure 4.1 shows the timeline legend.

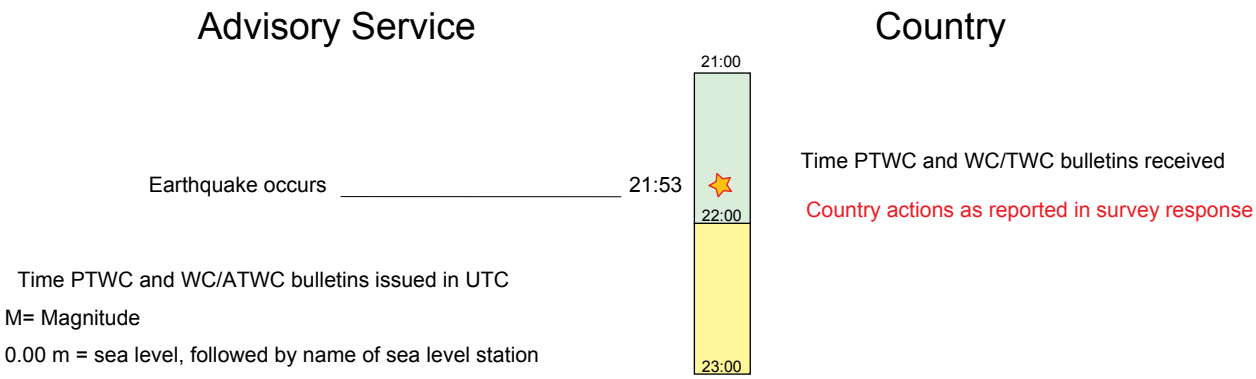
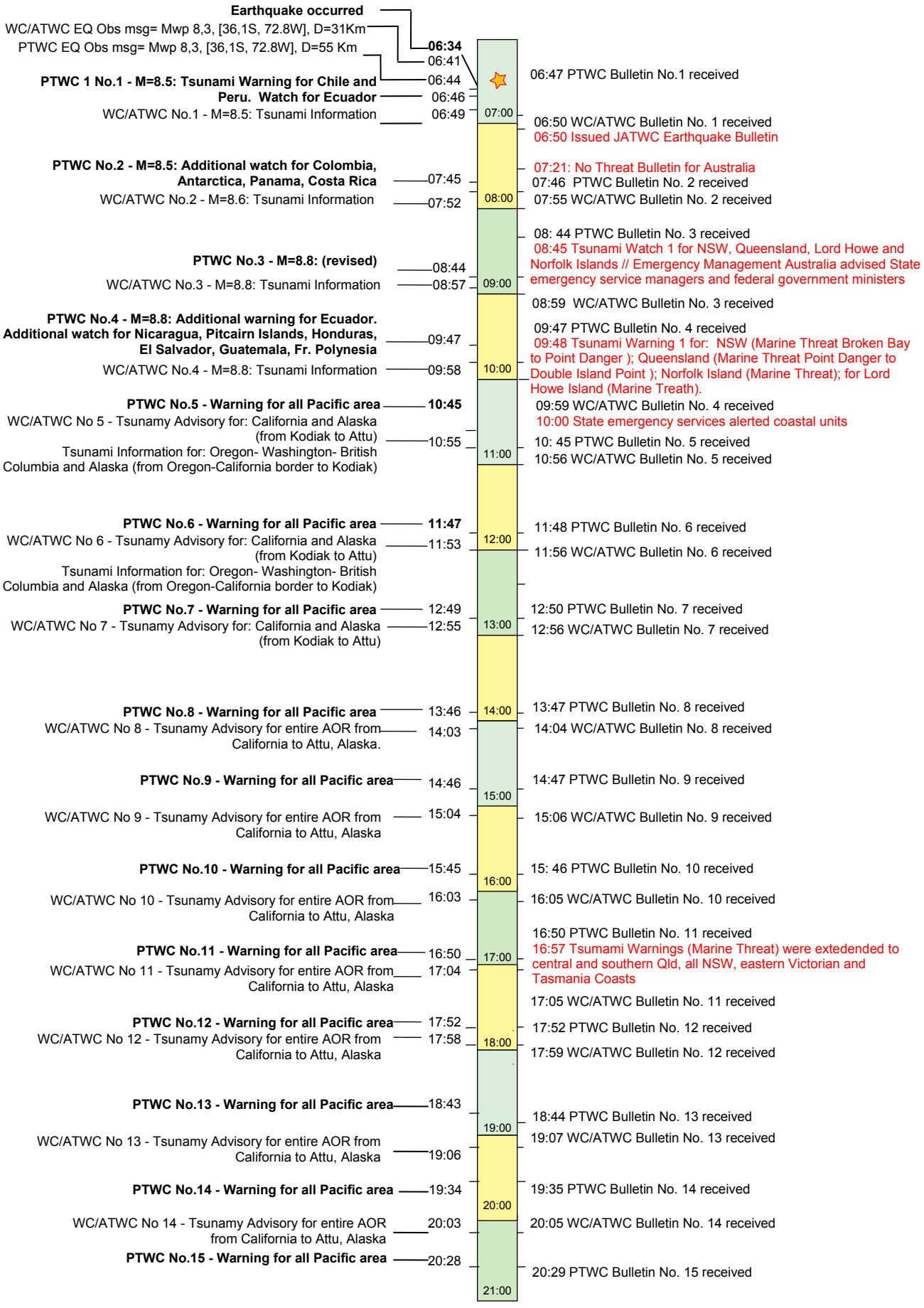



Figure 4.1 Advisory service and country response timeline legend

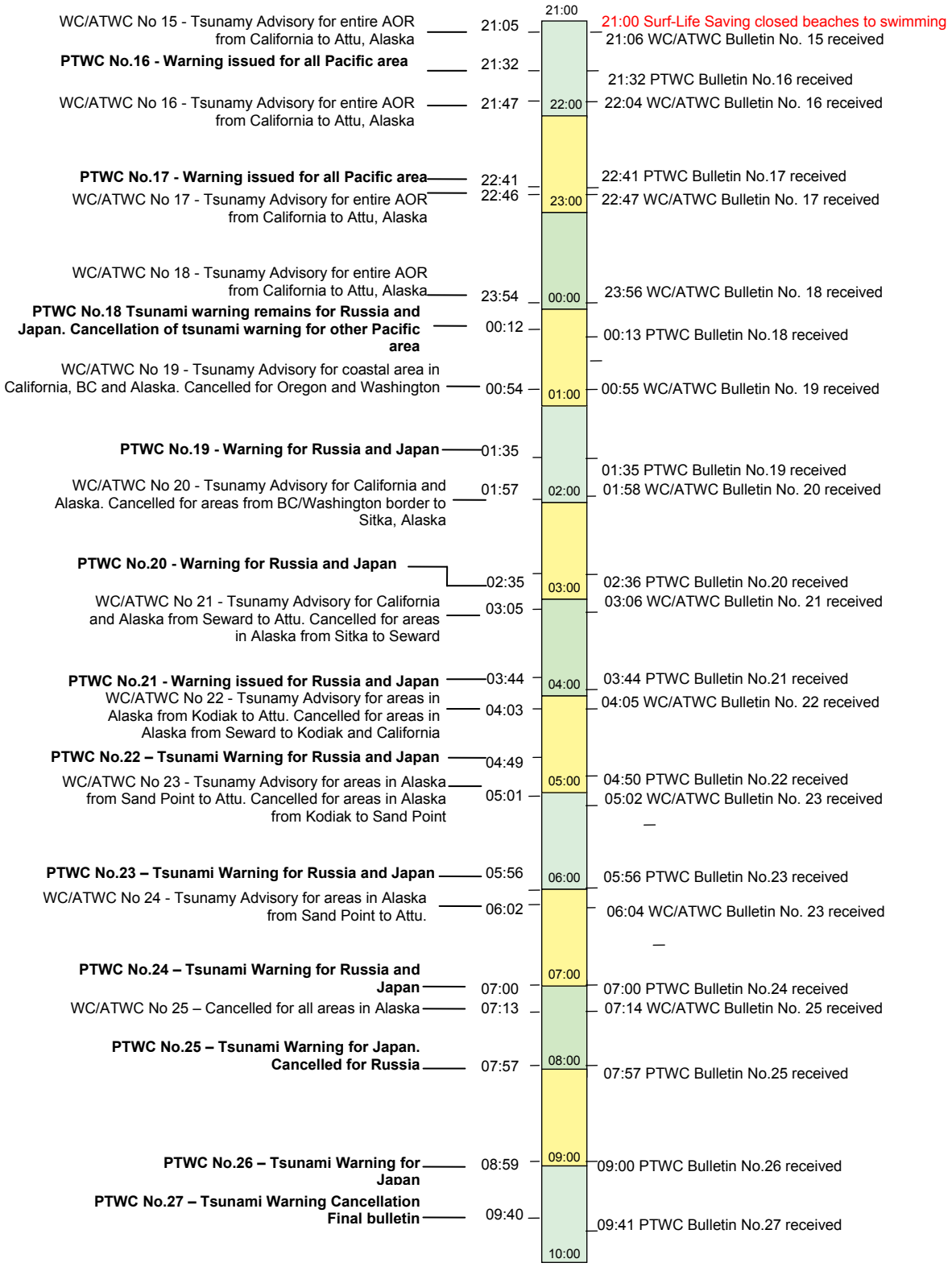
The left side of the timeline lists the times at which bulletins were issued by the Advisory Service (WC/ATWC and PTWC) and is the same for each timeline. Also shown on the left side is sea level information (sea level, gauge location and time of observation) issued in the WC/ATWC and PTWC bulletins. The information on the right side is provided by individual countries and lists the times at which the various bulletins were received from the Advisory Service and the times at which country actions were taken, highlighted in red.

Note that all times in this report are in Coordinated Universal Time (UTC).

# 4.1 AUSTRALIA – BUREAU OF METEOROLOGY



## AUSTRALIA – BUREAU OF METEOROLOGY




## Country comments

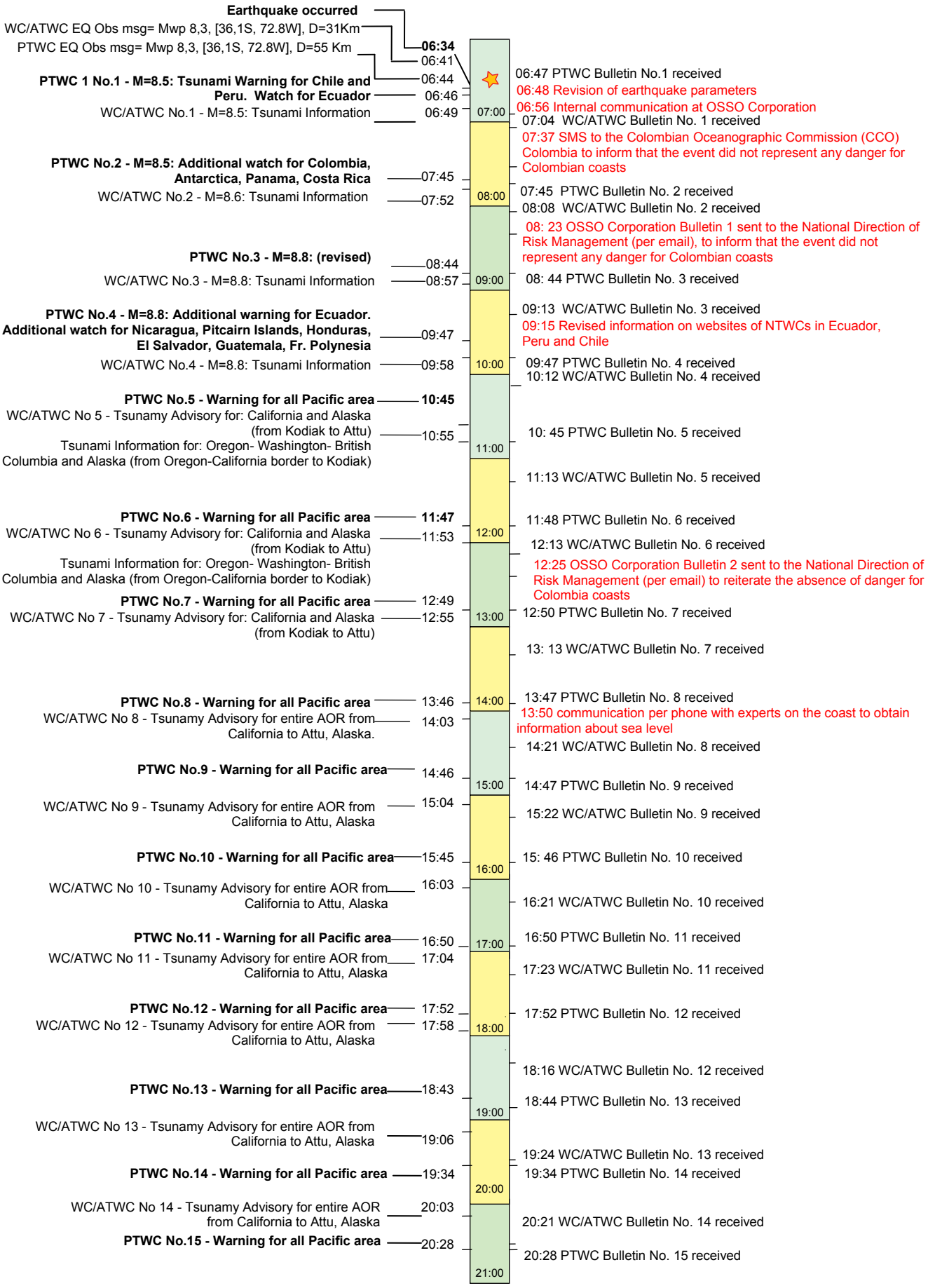
**Other sources of information:** INCOIS

"Sea-level observations at southern NSW and Norfolk Island achieved the Marine Threat warning threshold. Media response to warnings was mixed but improved upon the last warning event (15 July 2009, southern New Zealand tsunami). The lower level of threat implied in Marine Warnings was generally well understood. Media reports focused on the number of members of the public

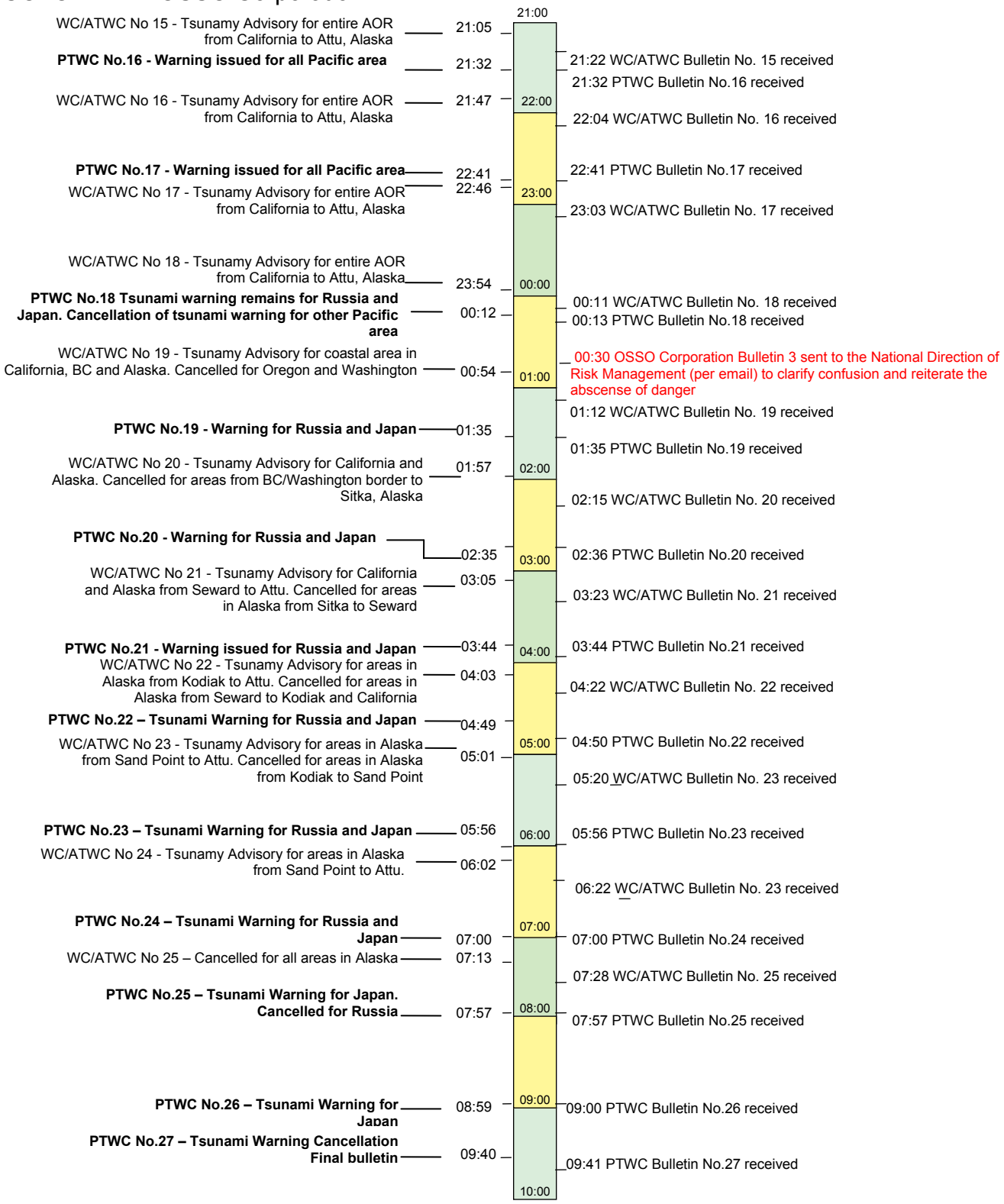
who ignored warnings or actively went to beaches to watch the tsunami. Arrival time on Australian coasts of significant waves was several hours after predicted first arrival, causing some doubt about warning accuracy".

## 4.2 COLOMBIA – OSSO CORPORATION

*Communication with PTWC and WC/ATWC only by email*



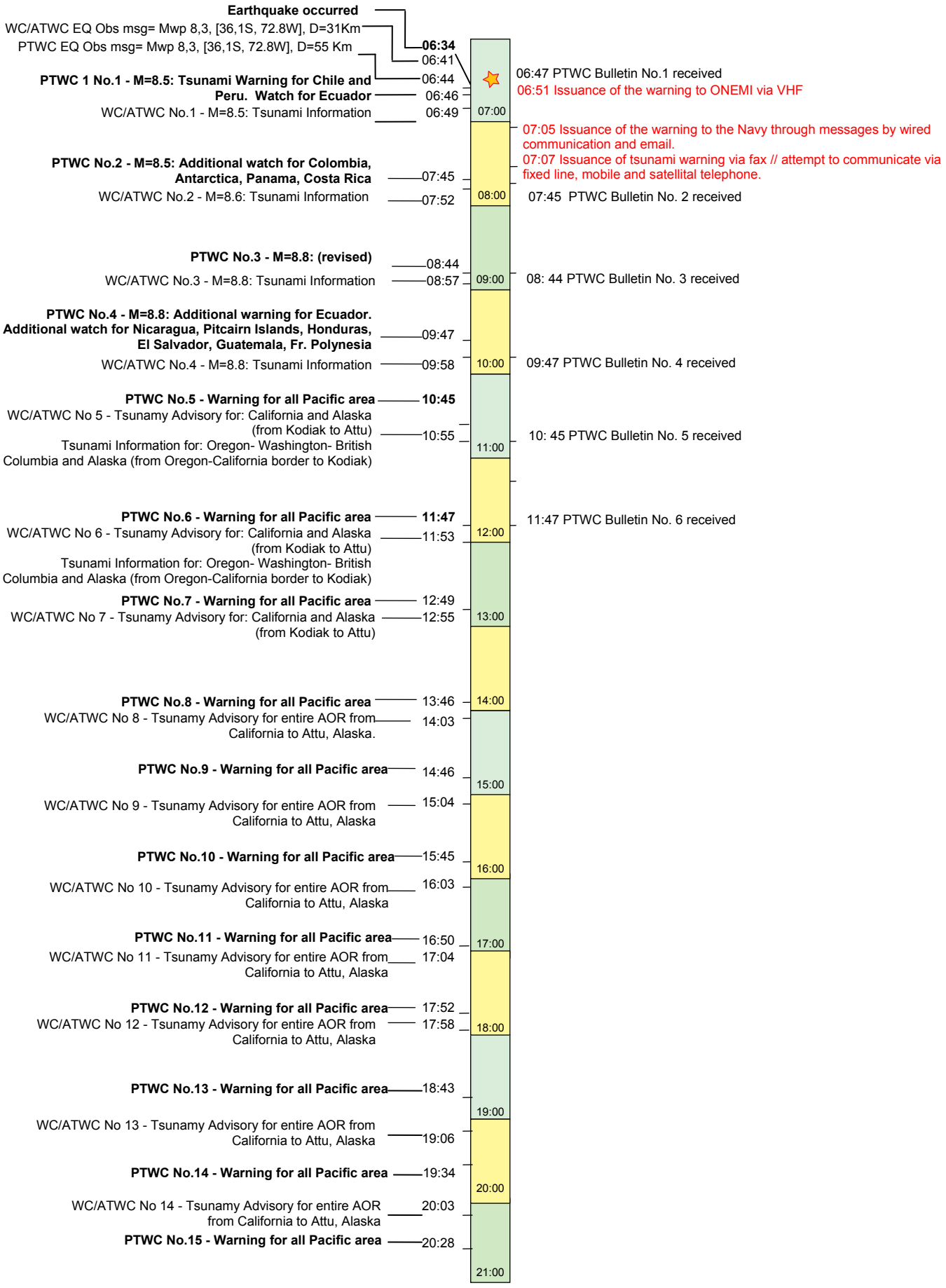
## COLOMBIA – OSSO Corporation



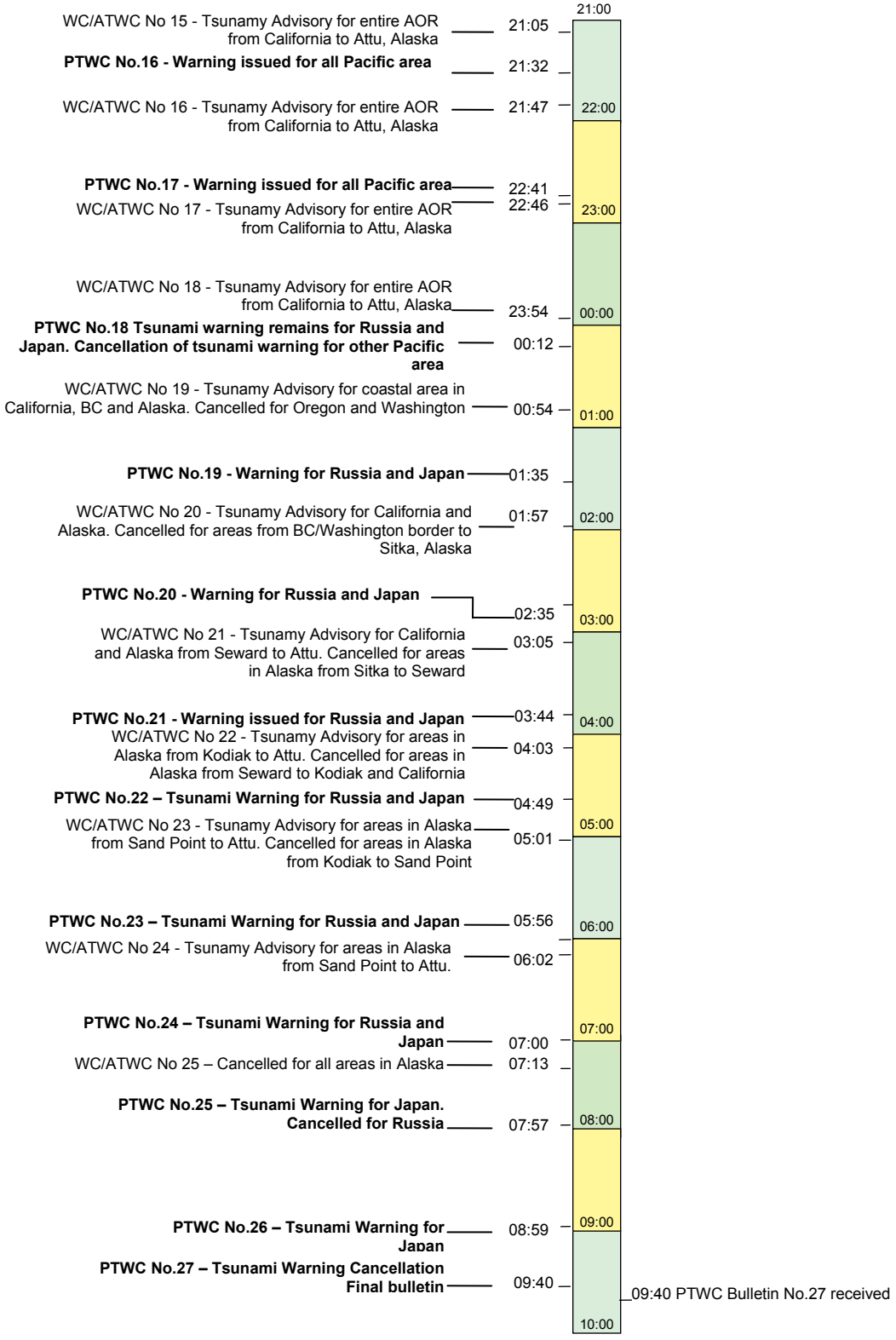

**Country comments**

**Other sources of information:** GDACS

## 4.3 CHILE- HYDROGRAPHIC AND OCEANOGRAPHIC SERVICE OF THE NAVY



CHILE – HYDROGRAPHIC AND OCEANOGRAPHIC SERVICE OF THE NAVY

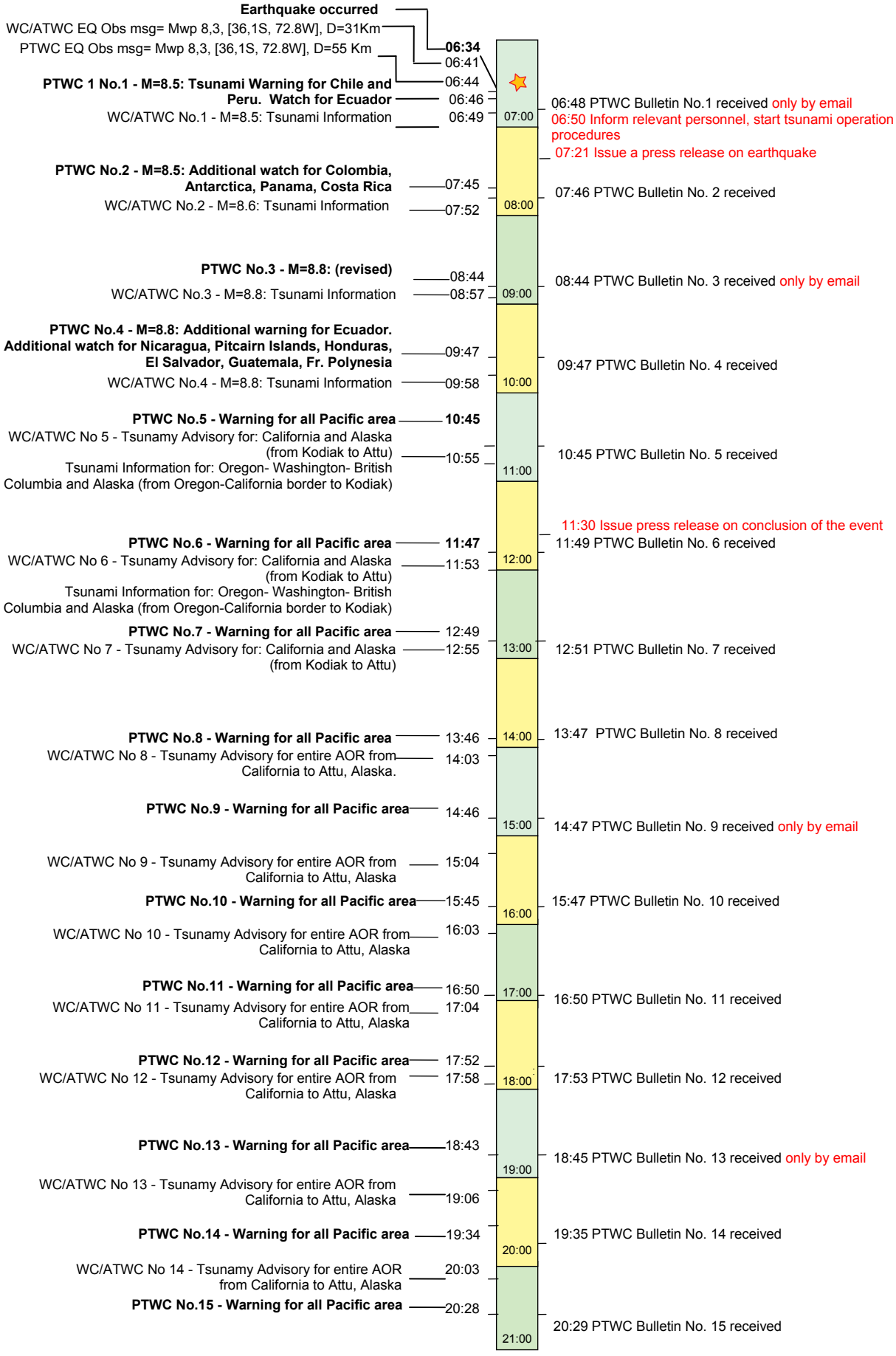



## Country comments

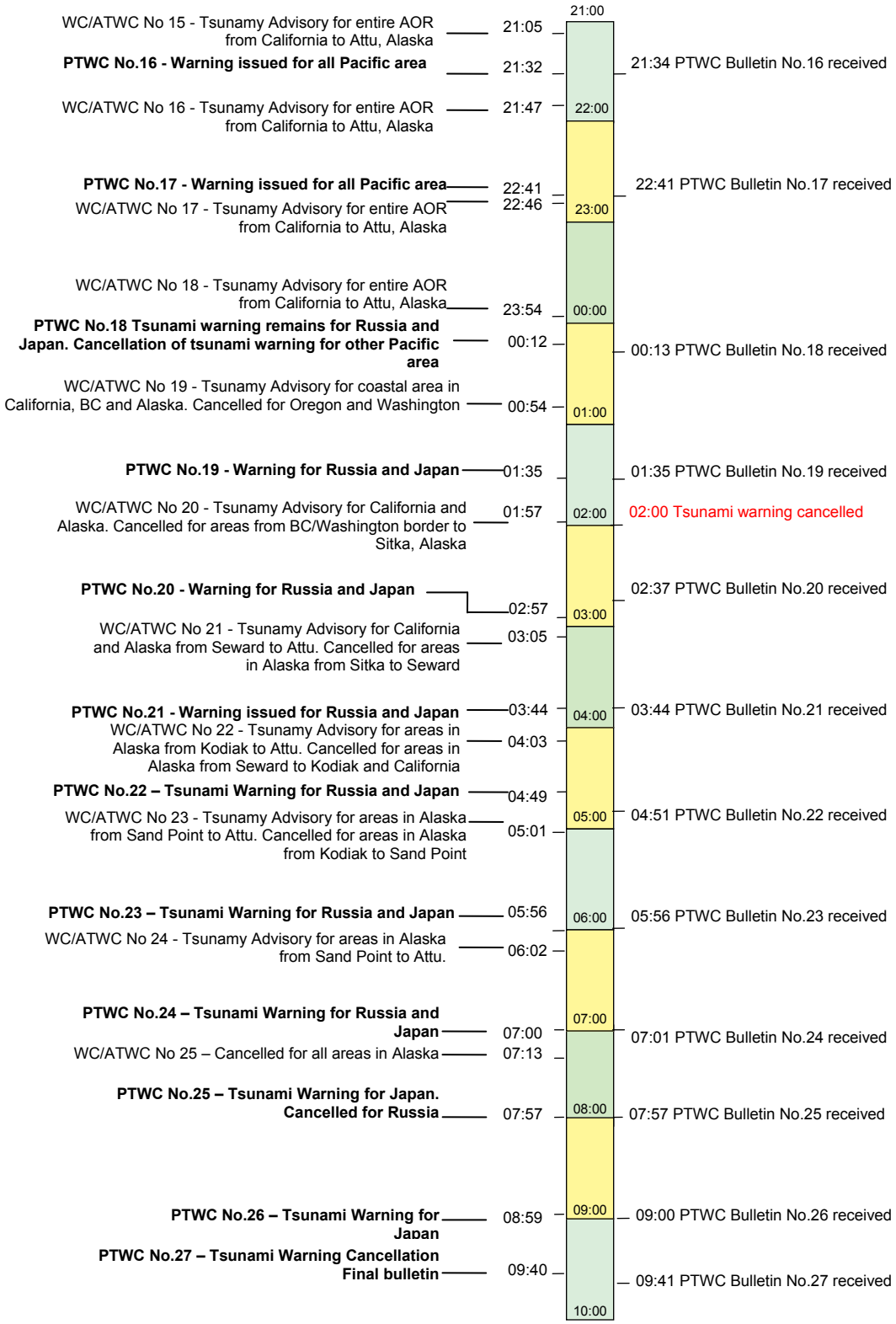
**Other sources of information**: USGS/NEIC (USA); CSEM (France).
SHOA issued tsunami warning to ONEMI with tsunami arrival time.
ONEMI did not issue warning to the population.
The warning was cancelled because SHOA did not identify significative sea level variations at the stations monitored (Valparaiso, San Antonio, Talcahuano, Corral, Juan Fernández, Coquimbo, Isla de Pascua, San Felix).

## 4.4 CHINA – HONG KONG OBSERVATORY

*Communication with PTWC by GTS, email and fax; and with WC/ATWC by GTS.*



## CHINA HONG-KONG OBSERVATORY



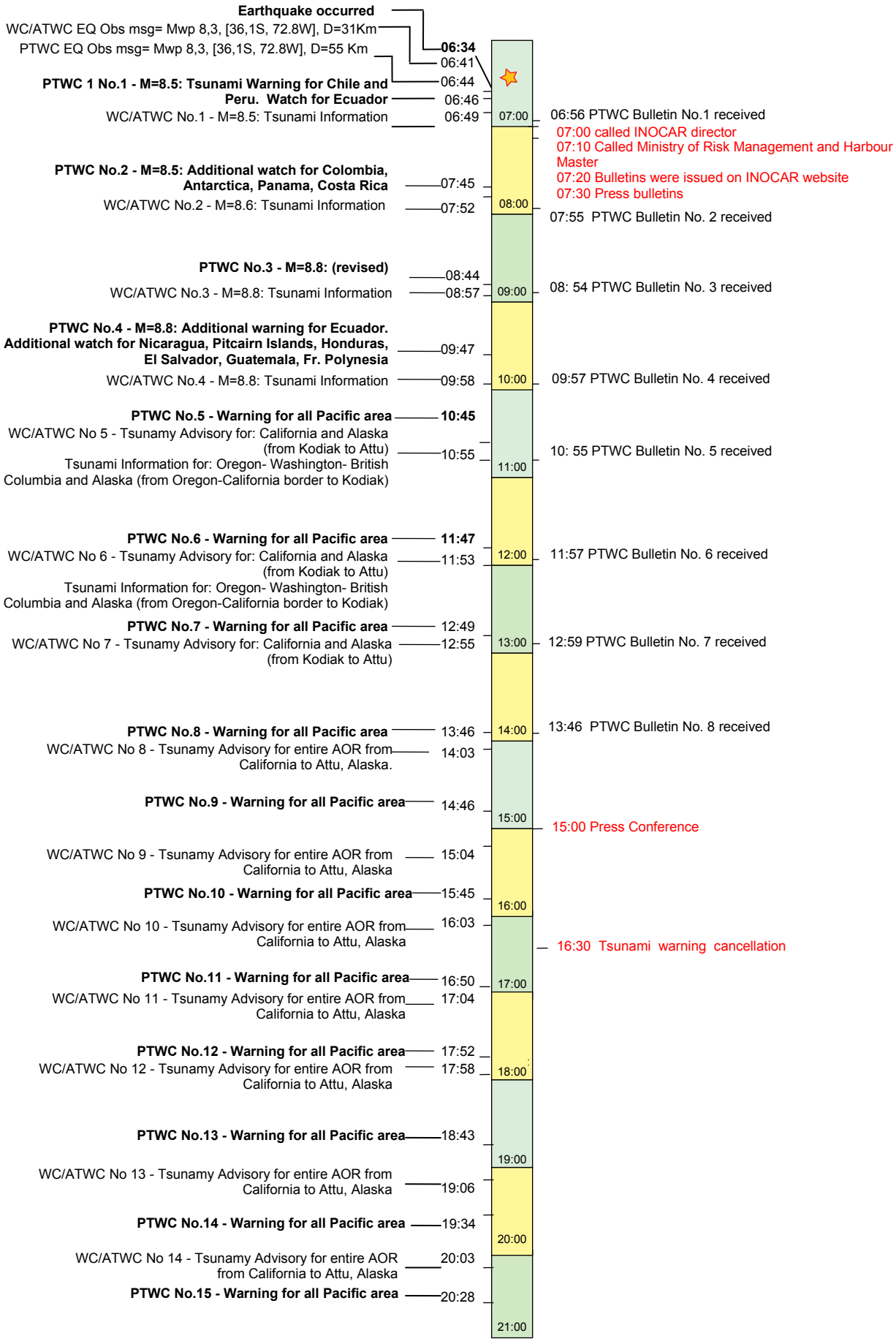

**Country comments:**

**Other sources of information:** CISN Display.

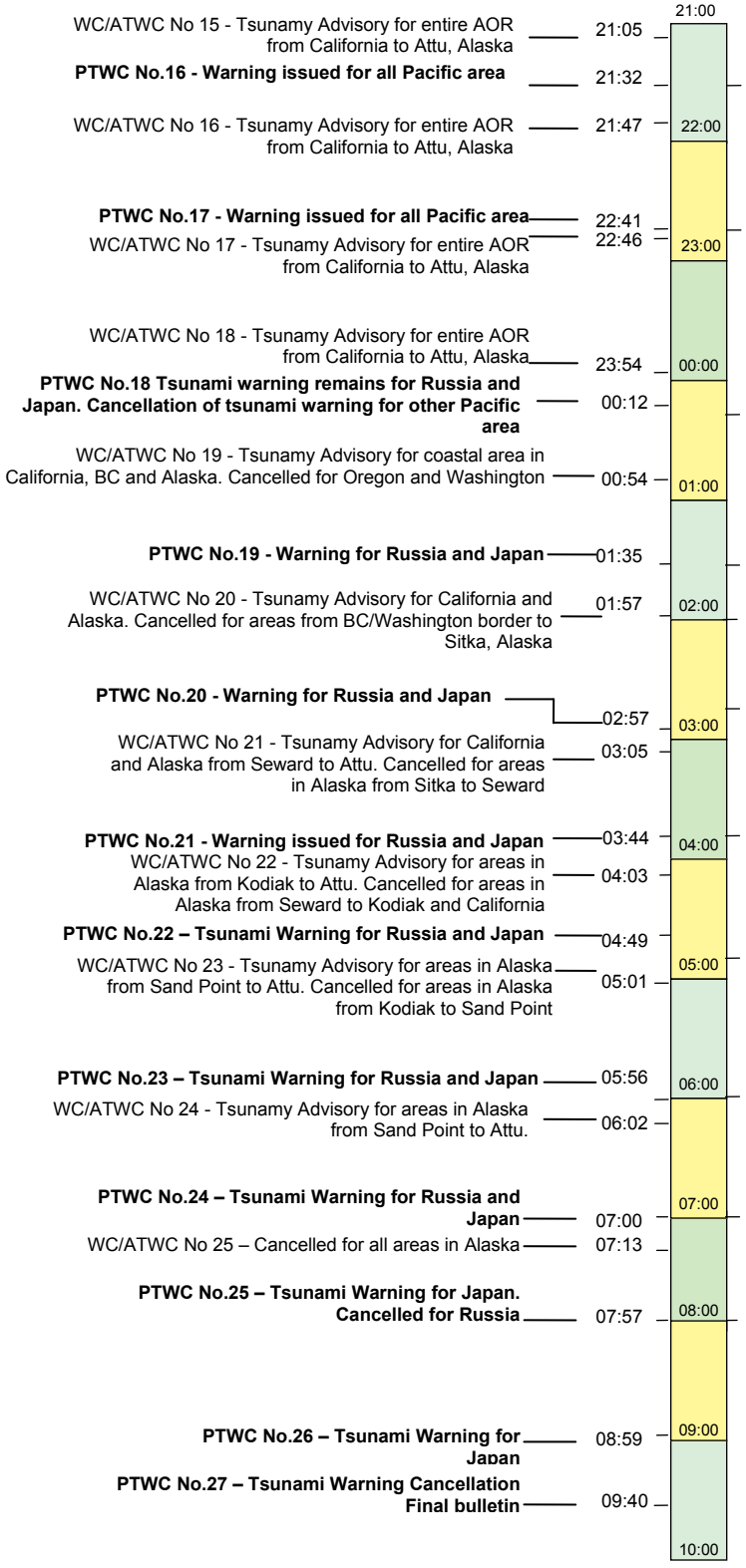
“GTS is usually the primary channel for receiving tsunami messages. In this event, many PTWC bulletins were available via email but not on the GTS. This would have significant impact on the reliability of the tsunami communication system”.

## 4.5 ECUADOR –OCEANOGRAPHIC INSTITUTE OF THE NAVY

*Communication with PTWC by email and fax.*



# ECUADOR – OCEANOGRAPHIC INSTITUTE OF THE NAVY

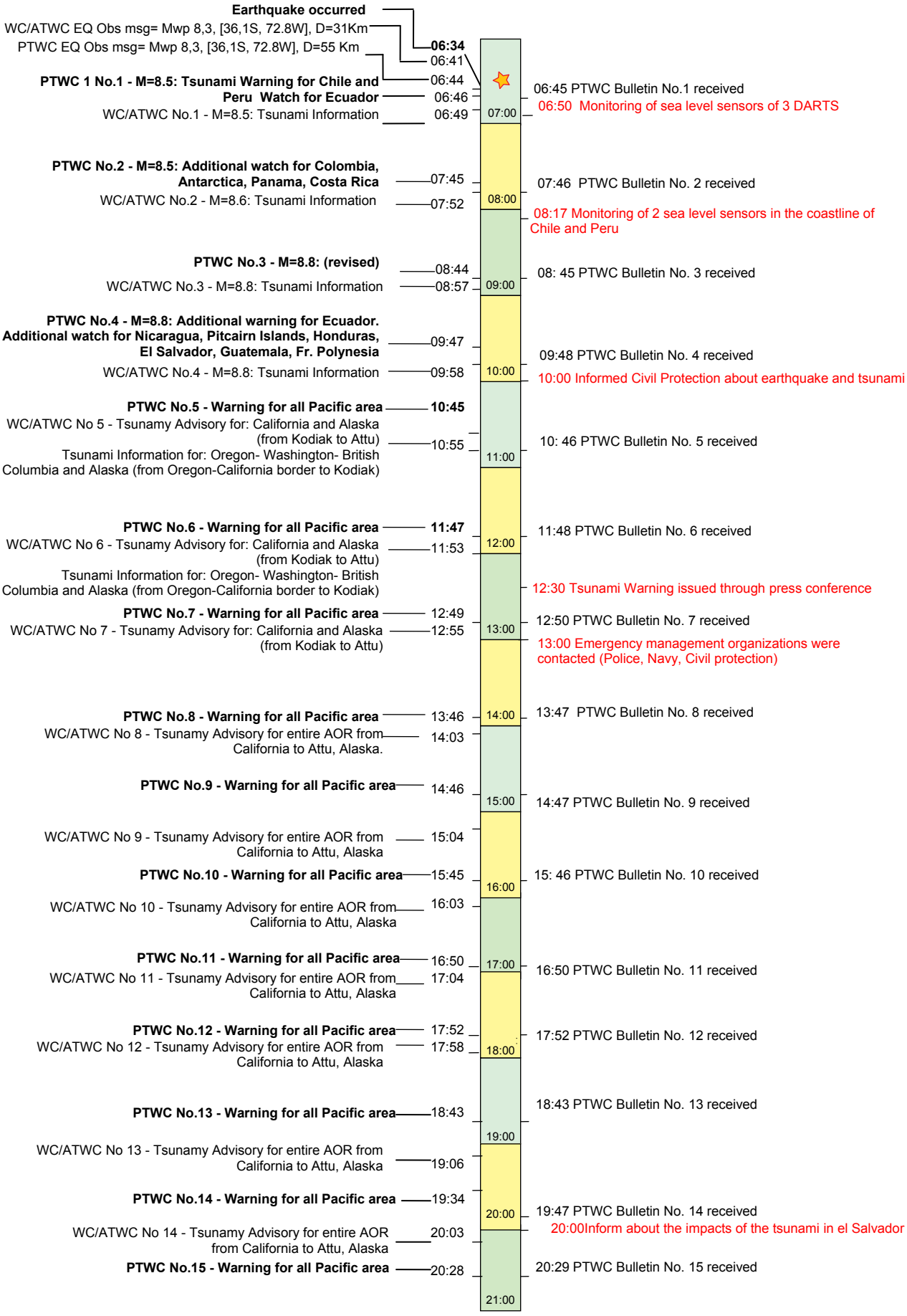



**Country comments:**

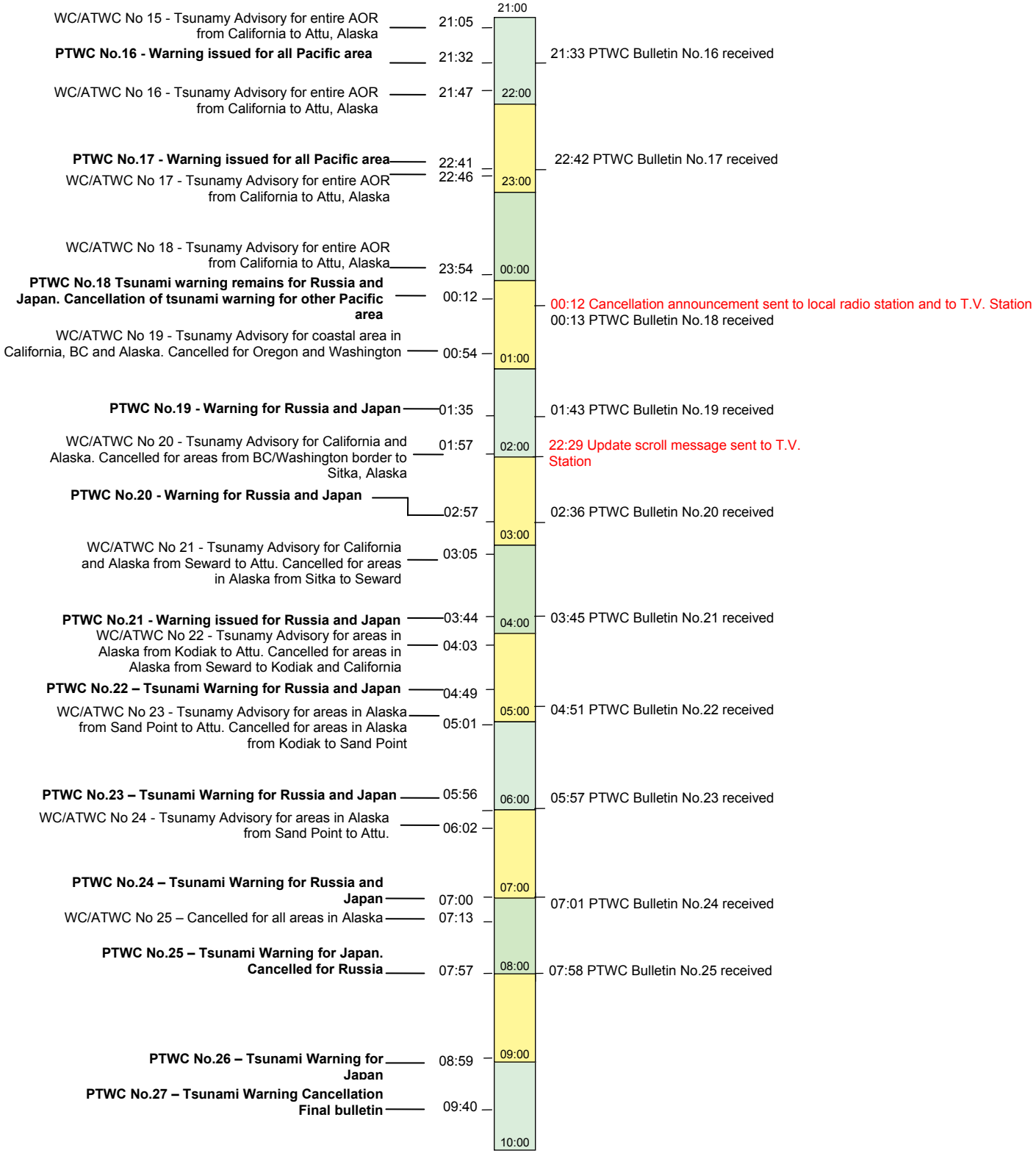
**Other sources of information:** USGS-NEIC.

## 4.6 EL SALVADOR – NATIONAL SERVICE FOR TERRITORIAL STUDIES

*Communication with PTWC by email and fax*



# EL SALVADOR- NATIONAL SERVICE FOR TERRITORIAL STUDIES

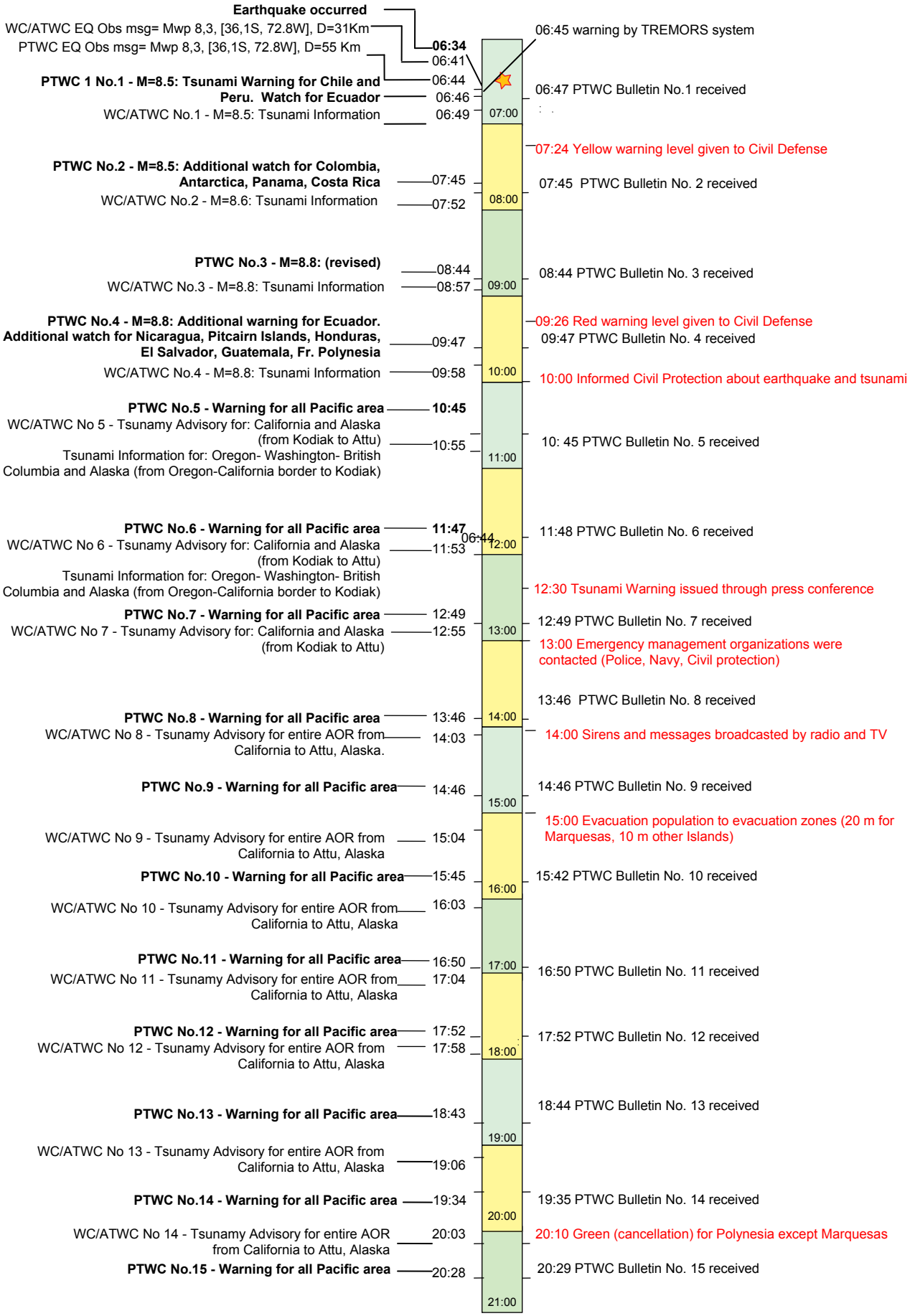



## Country comments

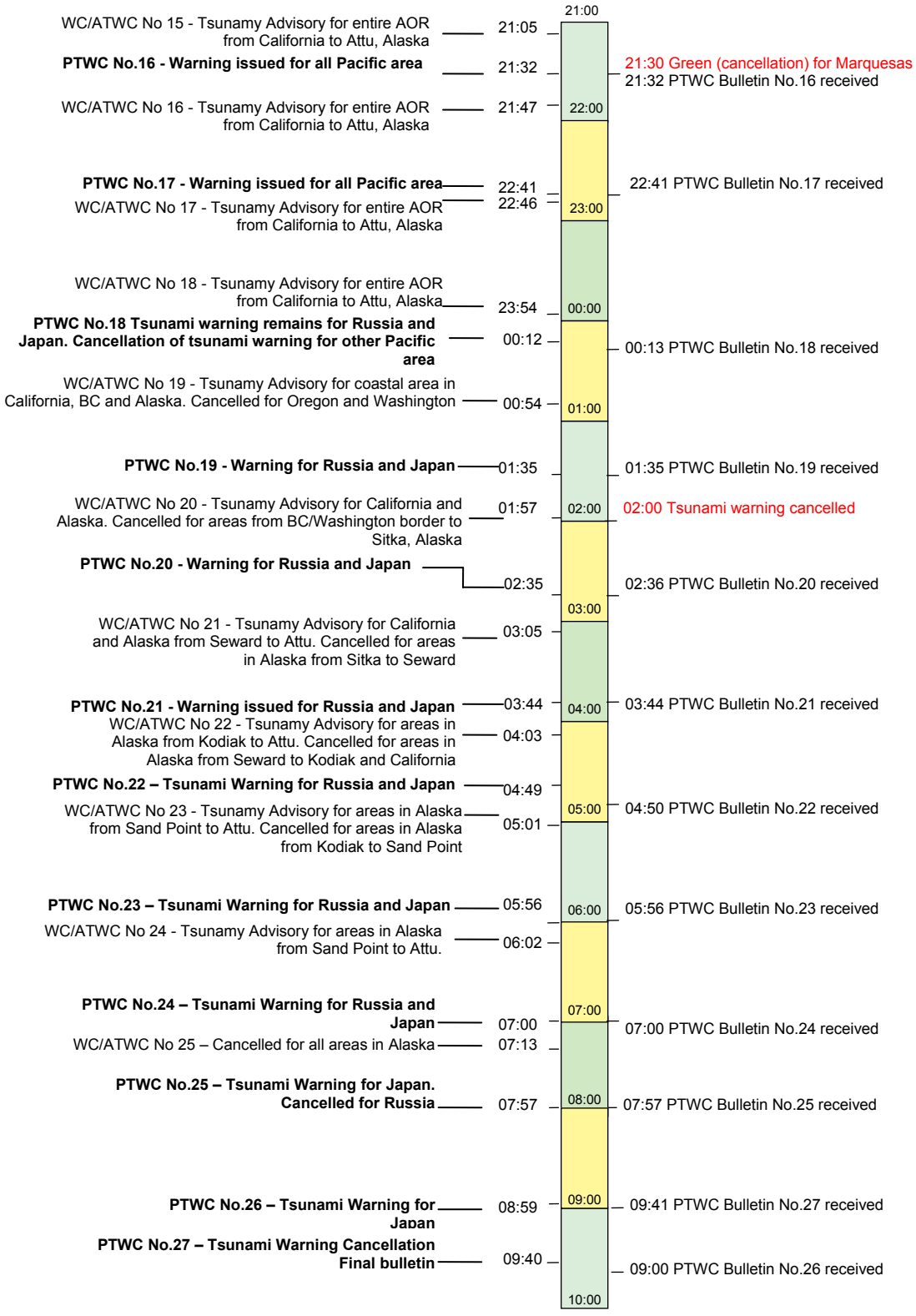
**Other sources of information**: USGS, RANET, IRIS, CISN.

## 4.7 FRANCE – FRENCH POLYNESIA – TAHITI – CEA/DASE/LABORATOIRE DE GEOPHYSIQUE

*Communication with PTWC by email, fax and GTS*



# FRANCE – FRENCH POLYNESIA- TAHITI -CEA/DASE/LABORATOIRE DE GEOPYSIQUE

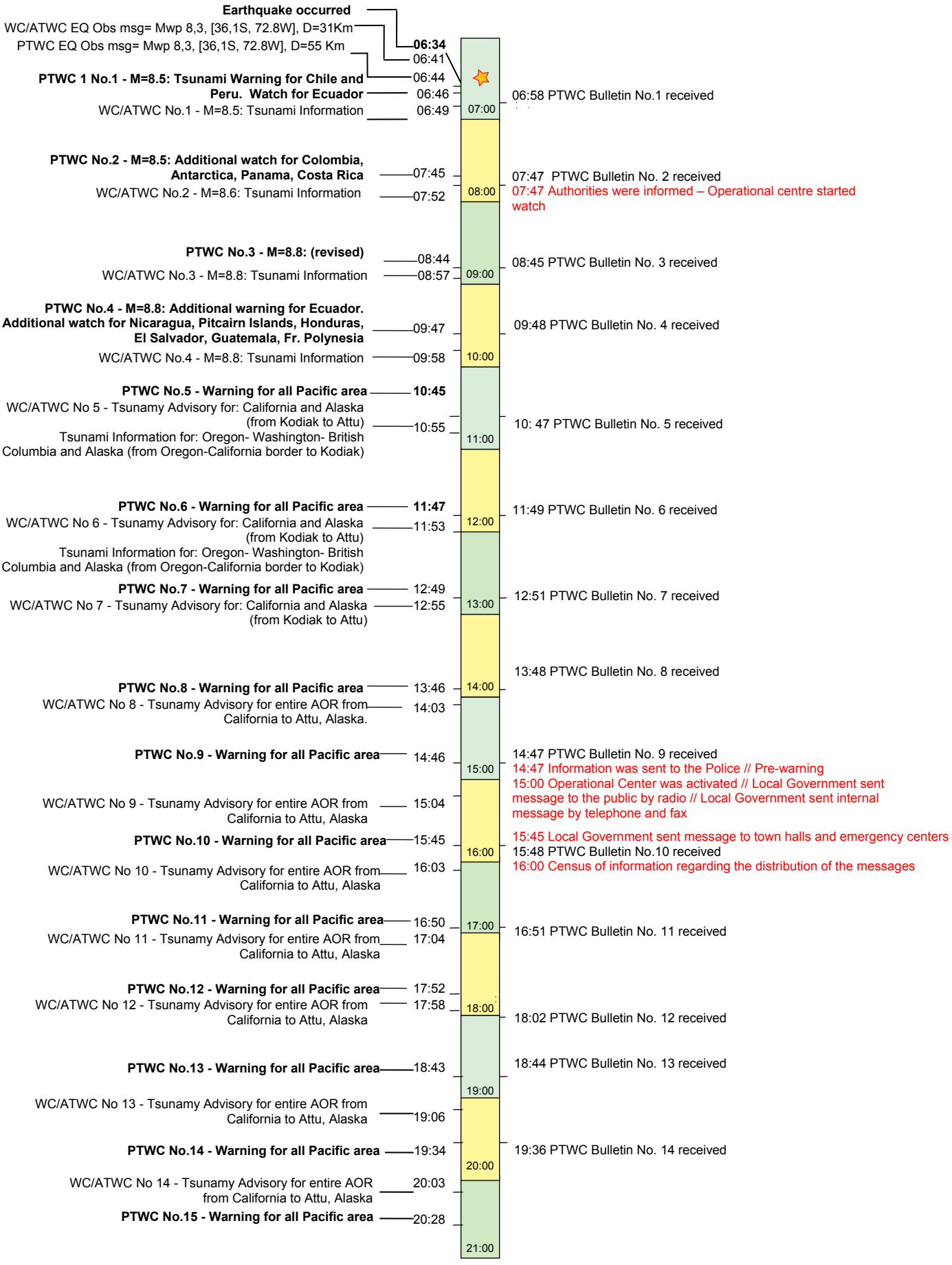



## Country comments

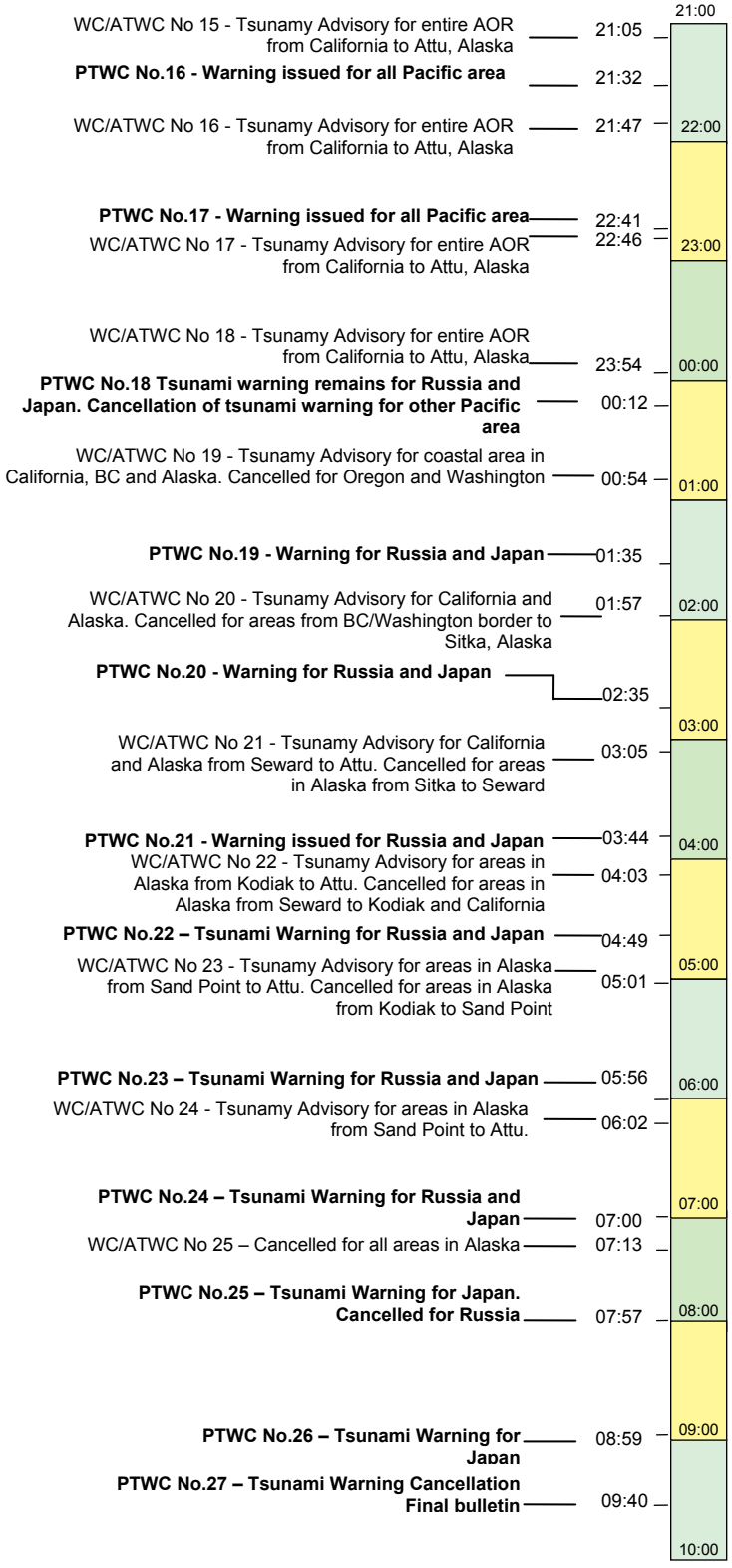
**Other sources of information**: USGS, EMSC and CPPT TREMORS System.

*Annex III includes some pictures provided by the CEA/DASE/Laboratoire of Geophysique showing differences in sea level caused by the tsunami in The Marquesas islands.

# 4.8 FRANCE – NEW CALEDONIA – DIRECTION OF CIVIL SECURITY



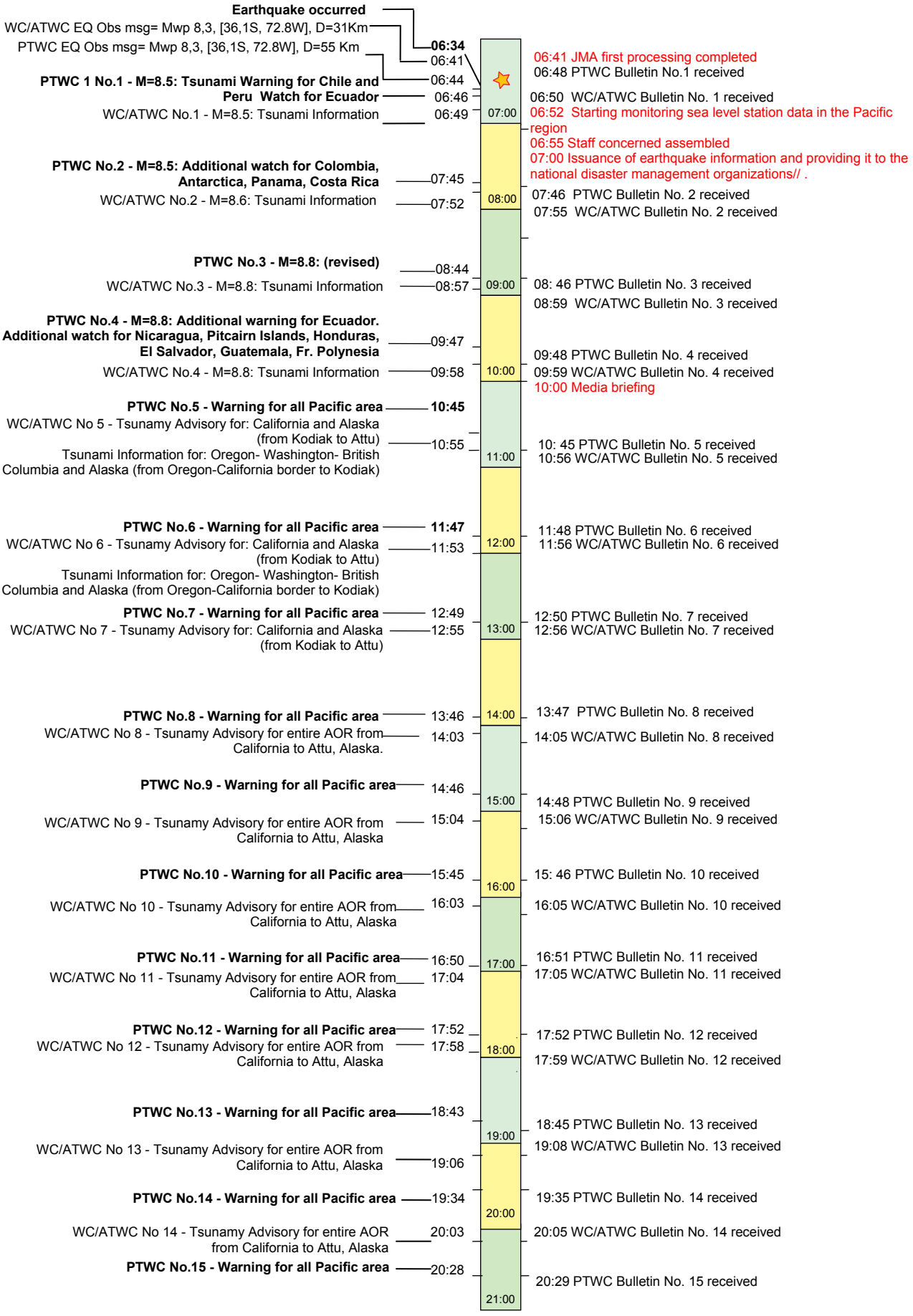
## FRANCE-NEW CALEDONIA- DIRECTION OF CIVIL SECURITY



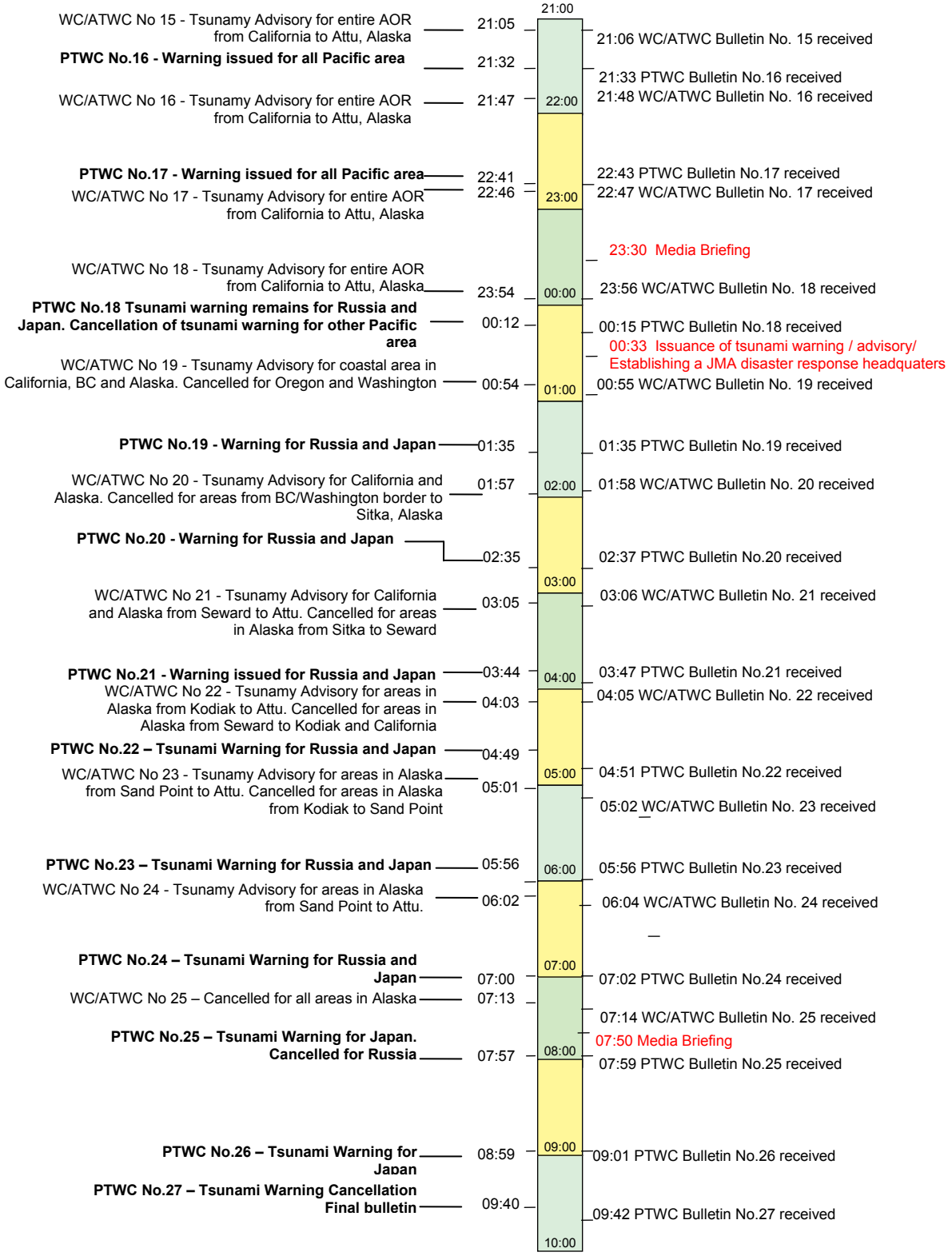

**Country comments**

**Other sources of information**: PTWC internet site, television.

# 4.9 JAPAN – JAPAN METEOROLOGICAL AGENCY



# JAPAN – JAPAN METEOROLOGICAL AGENCY

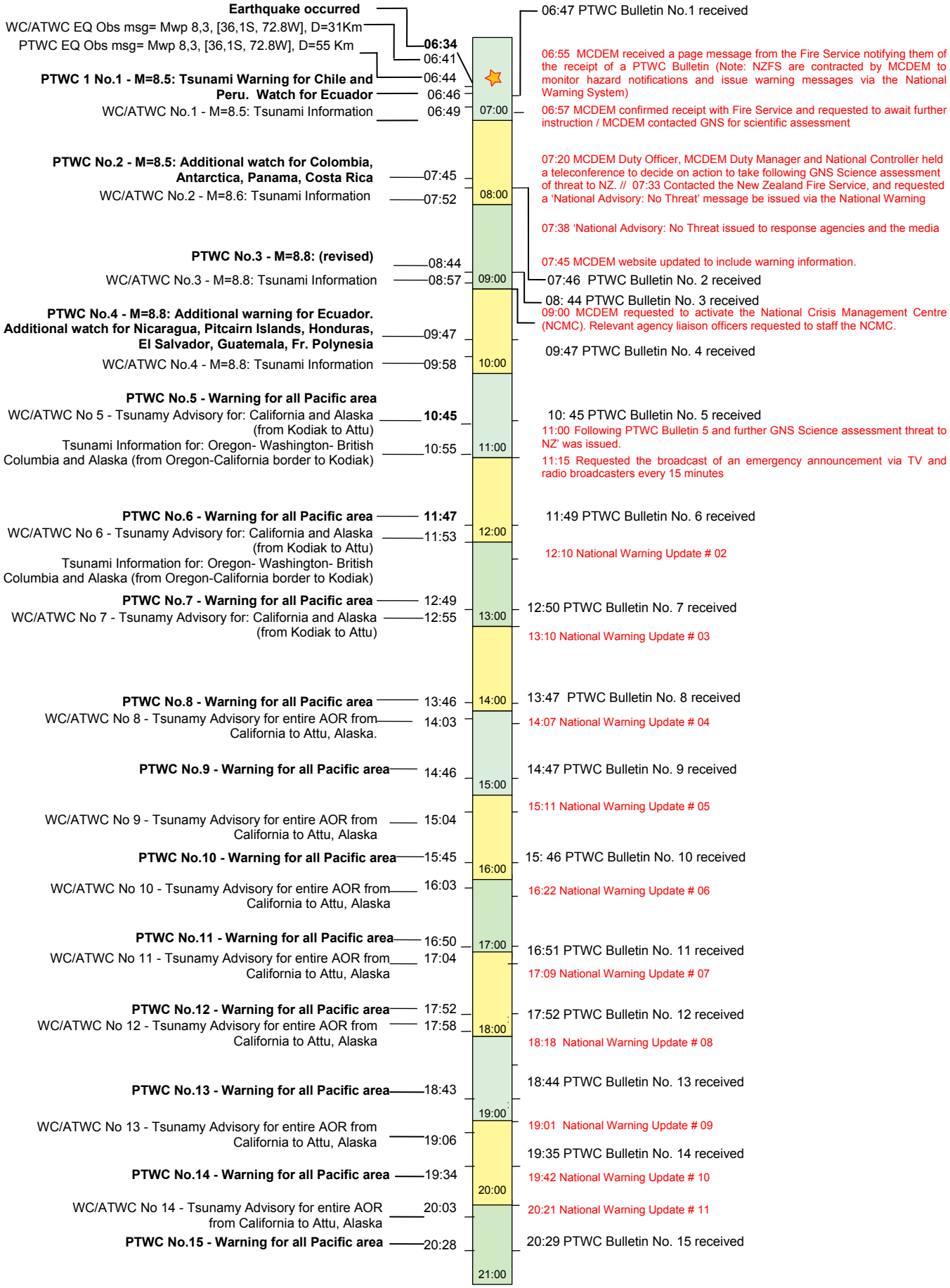



## Country comments

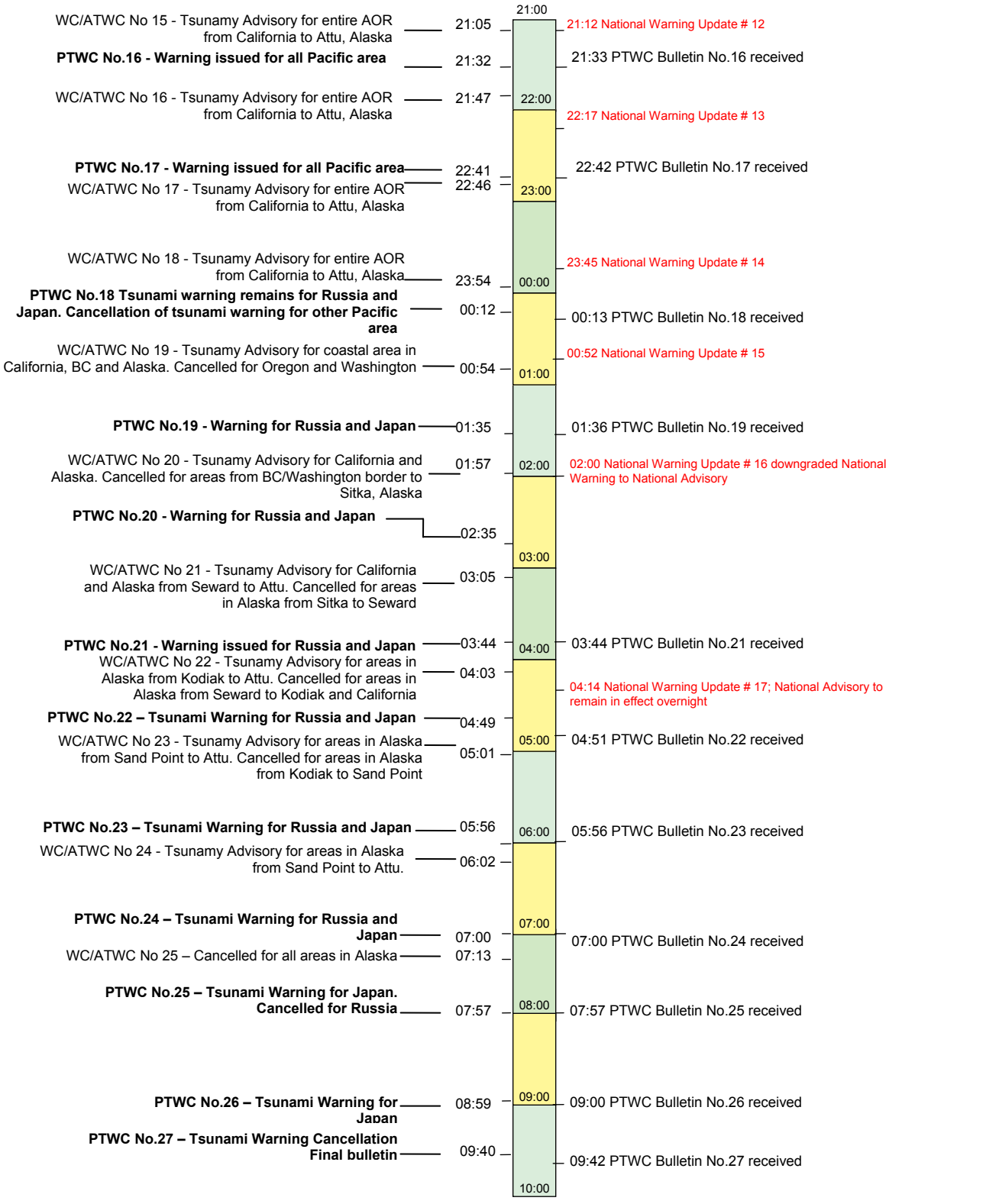
**Other sources of information**: USGS through its website.

- Media briefing also at 12:45, 01:00.
- Dispatching JMA Mobile Obervation Team to the disaster areas for field survey.

# 4.10 NEW ZEALAND – MINISTRY OF CIVIL DEFENCE & EMERGENCY MANAGEMENT



## NEW ZEALAND MINISTRY OF CIVIL DEFENCE & EMERGENCY MANAGEMENT




19:35 (28 Feb/10) → National Advisory Update #18 - 08:37am on 01/03 (National Advisory Cancellation)

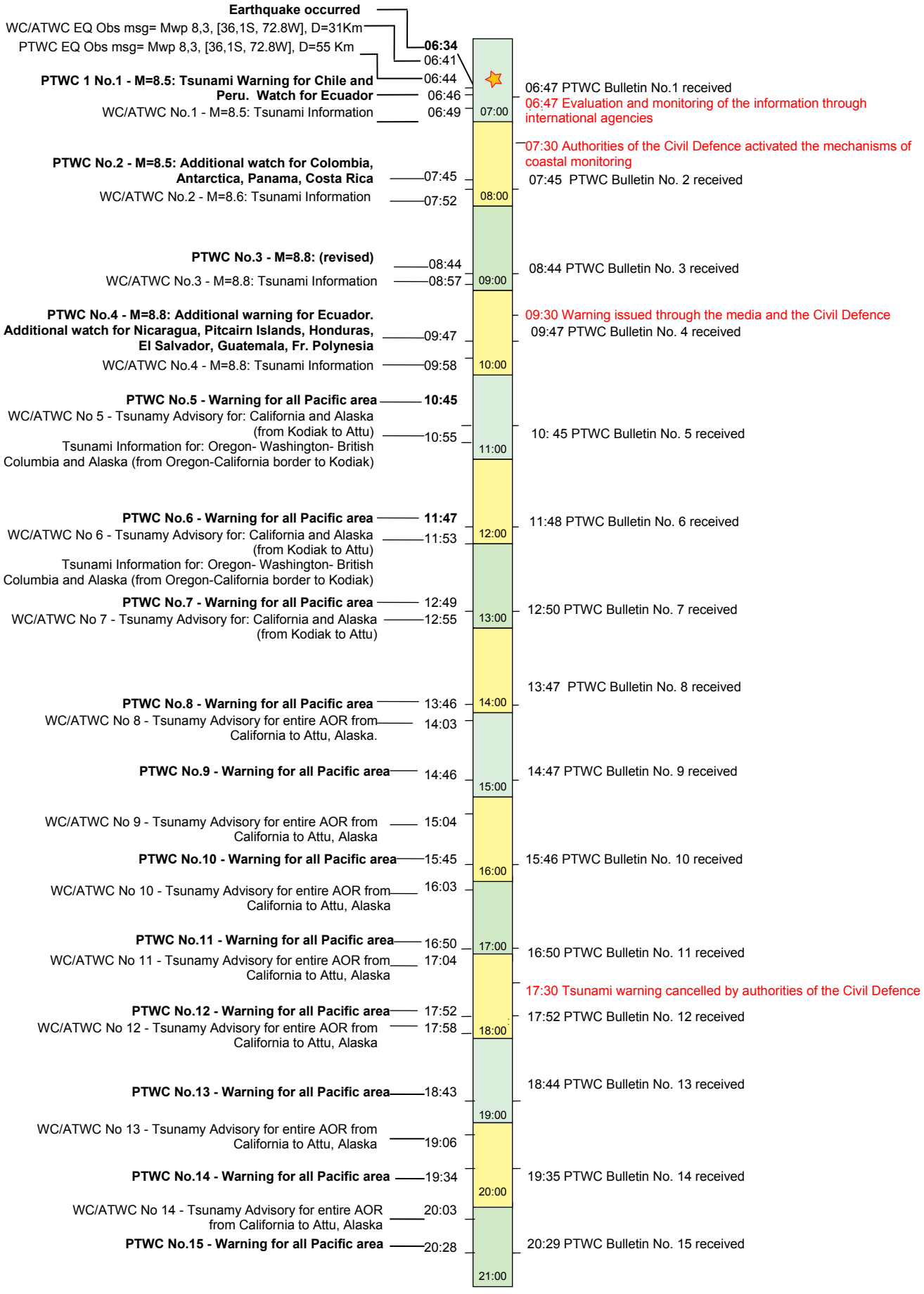
19:40 (28 Feb/10) → Cancellation of Request for Broadcast

## Country comments

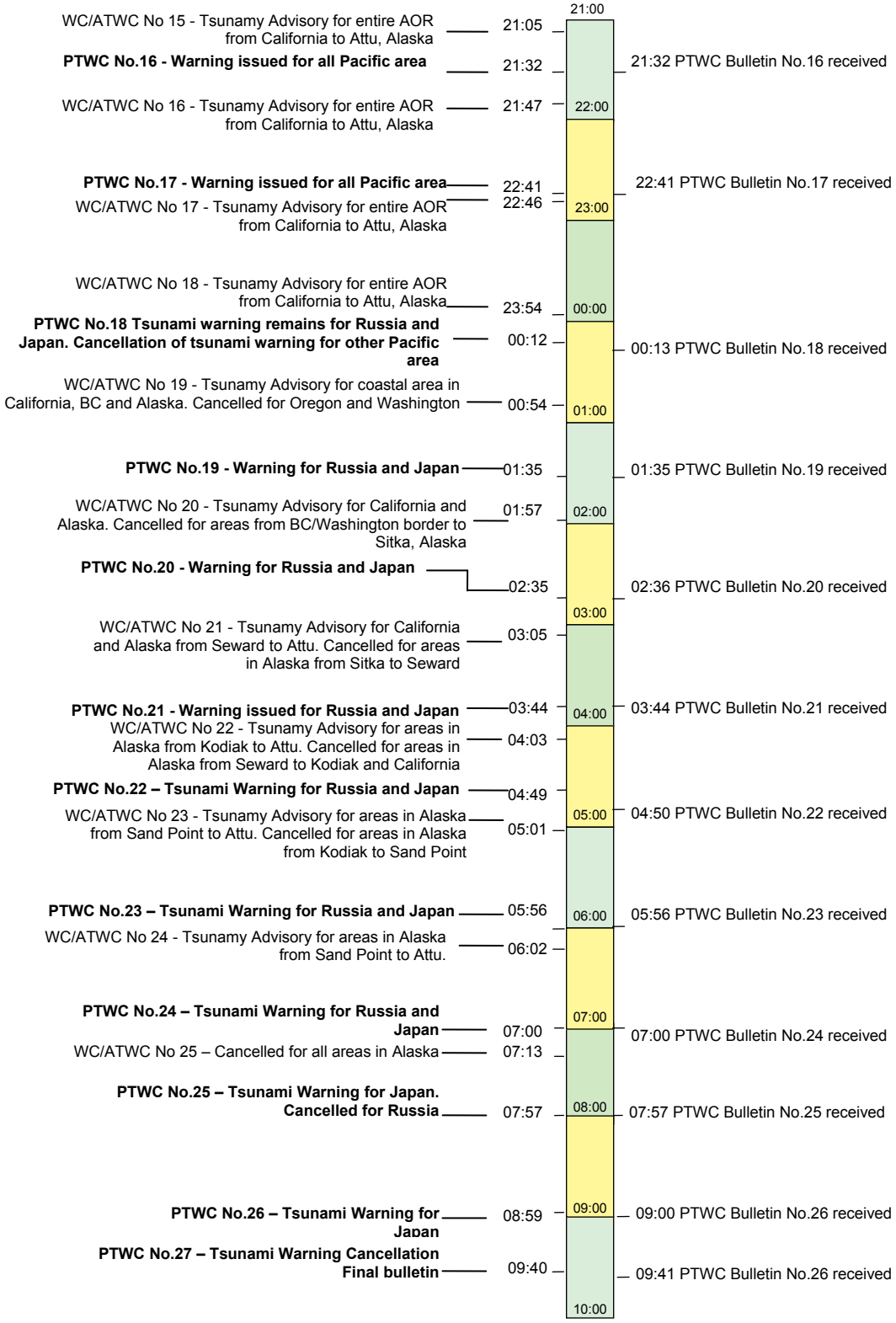
**Other sources of information:** USGS

"Updates to the MCDEM website were also accompanied by a tweet through the MCDEM Twitter account. MCDEM's Twitter account went live two weeks prior to the event and had approximately 160 followers on the day prior to the tsunami. Within 24 hours the number of followers had increased to 1500, and has progressively risen to 1700 since this time".

# 4.11 NICARAGUA – INSTITUTE OF TERRITORIAL STUDIES



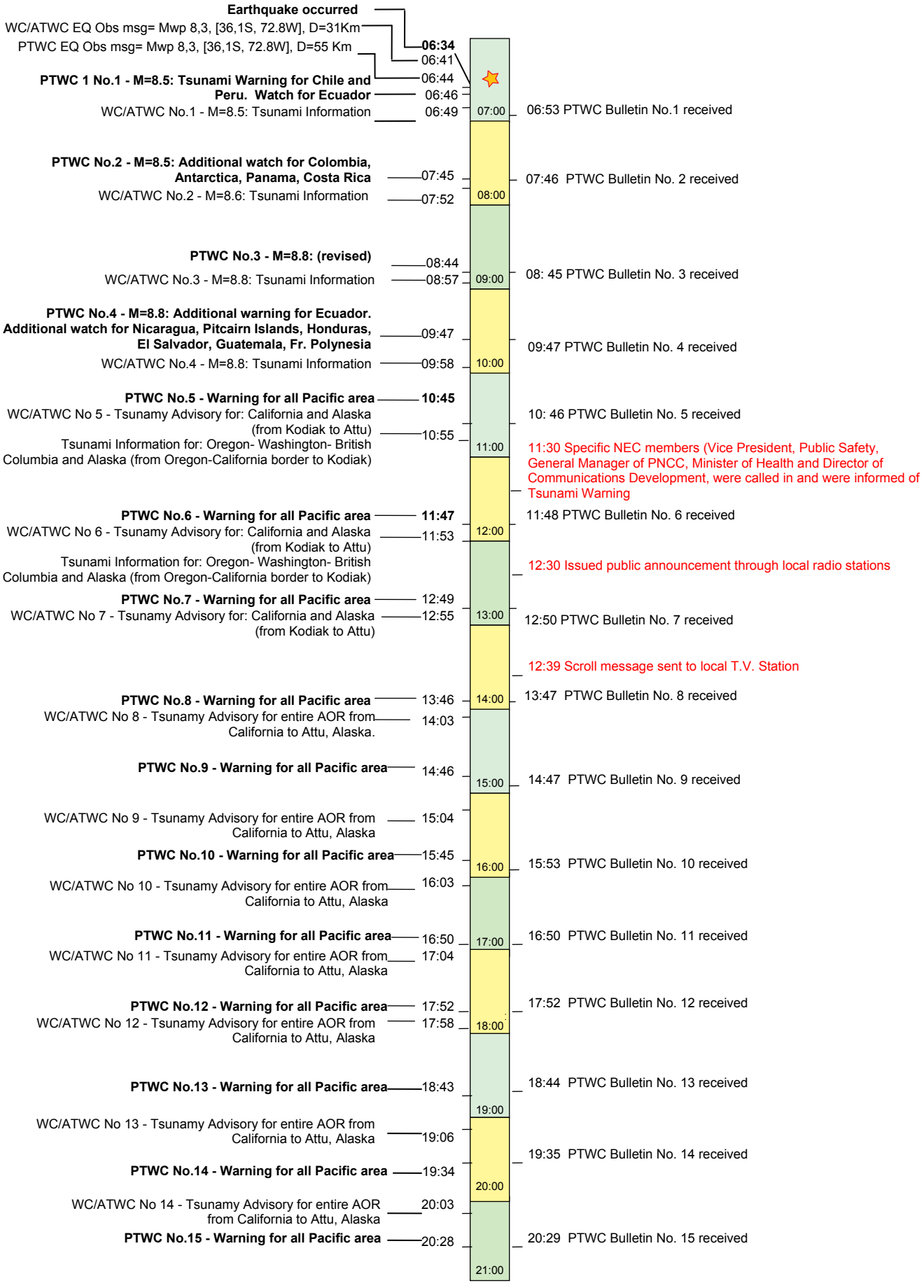
# NICARAGUA- INSTITUTE OF TERRITORIAL STUDIES



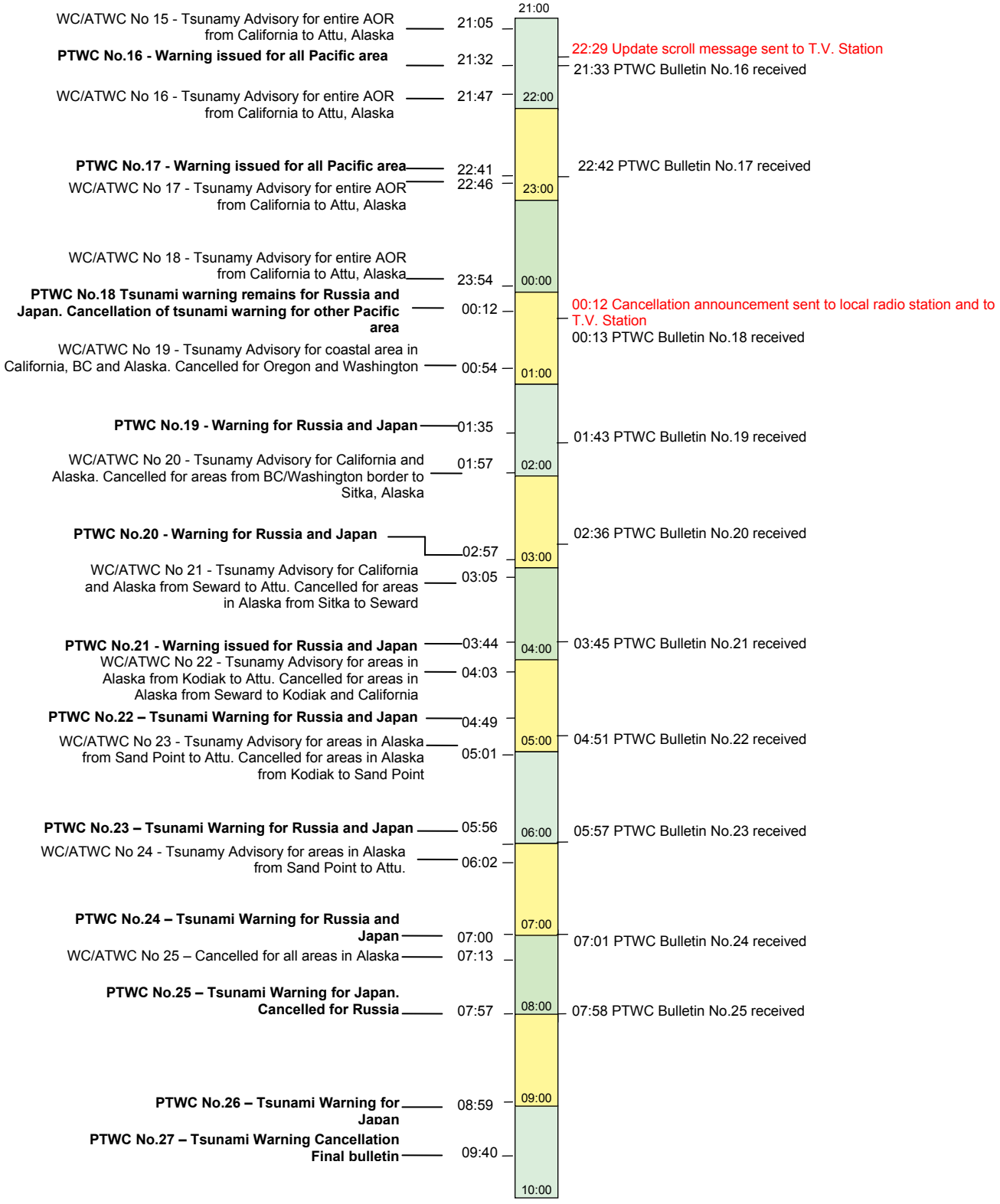

**Country comments**

**Other sources of information**: NEIC- USGS-GEOFON.

# 4.12 PALAU – NATIONAL EMERGENCY MANAGEMENT OFFICE (*Not IOC Member State*)



# PALAU- NATIONAL EMERGENCY MANAGEMENT OFFICE

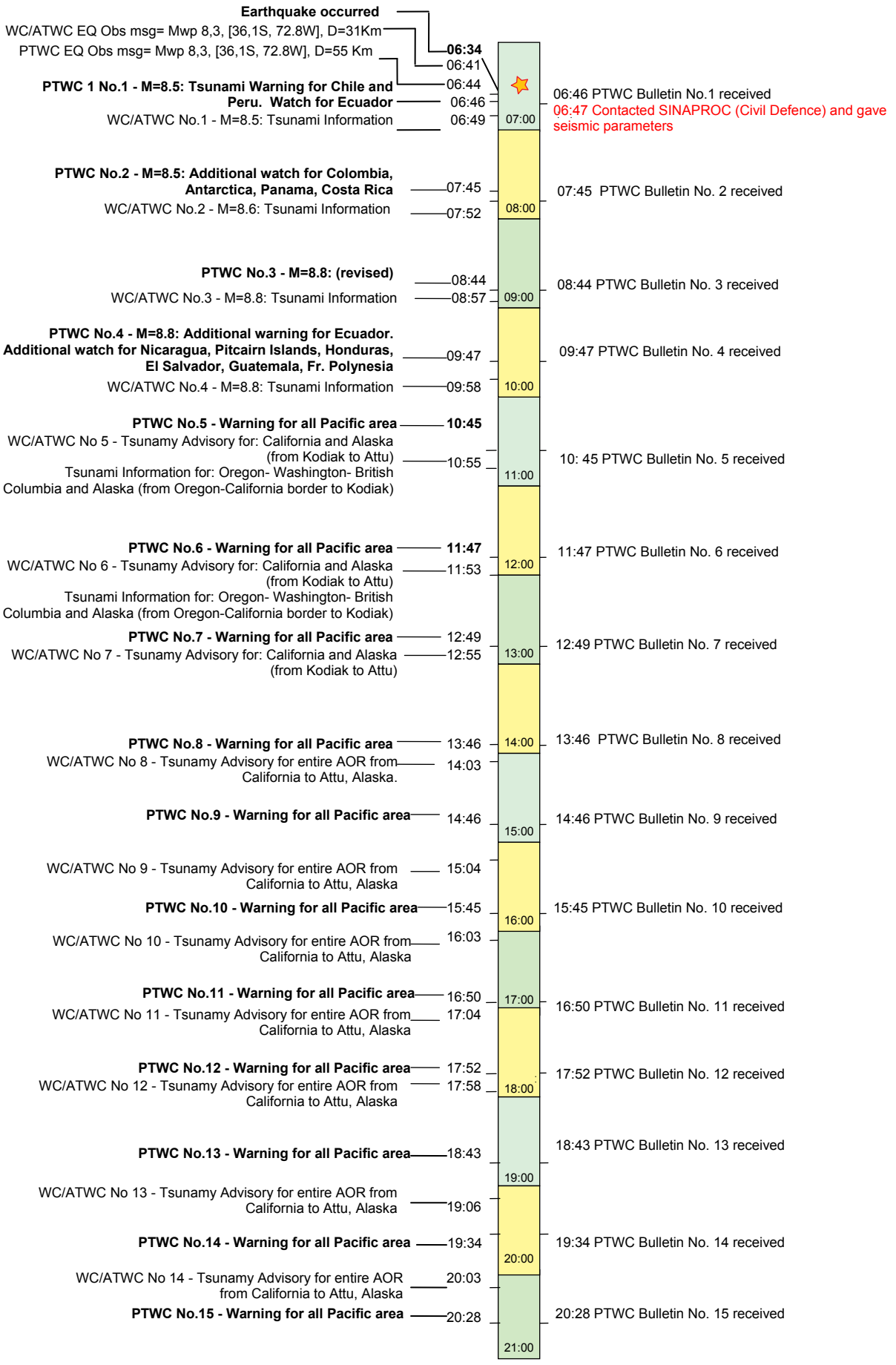



## Country comments

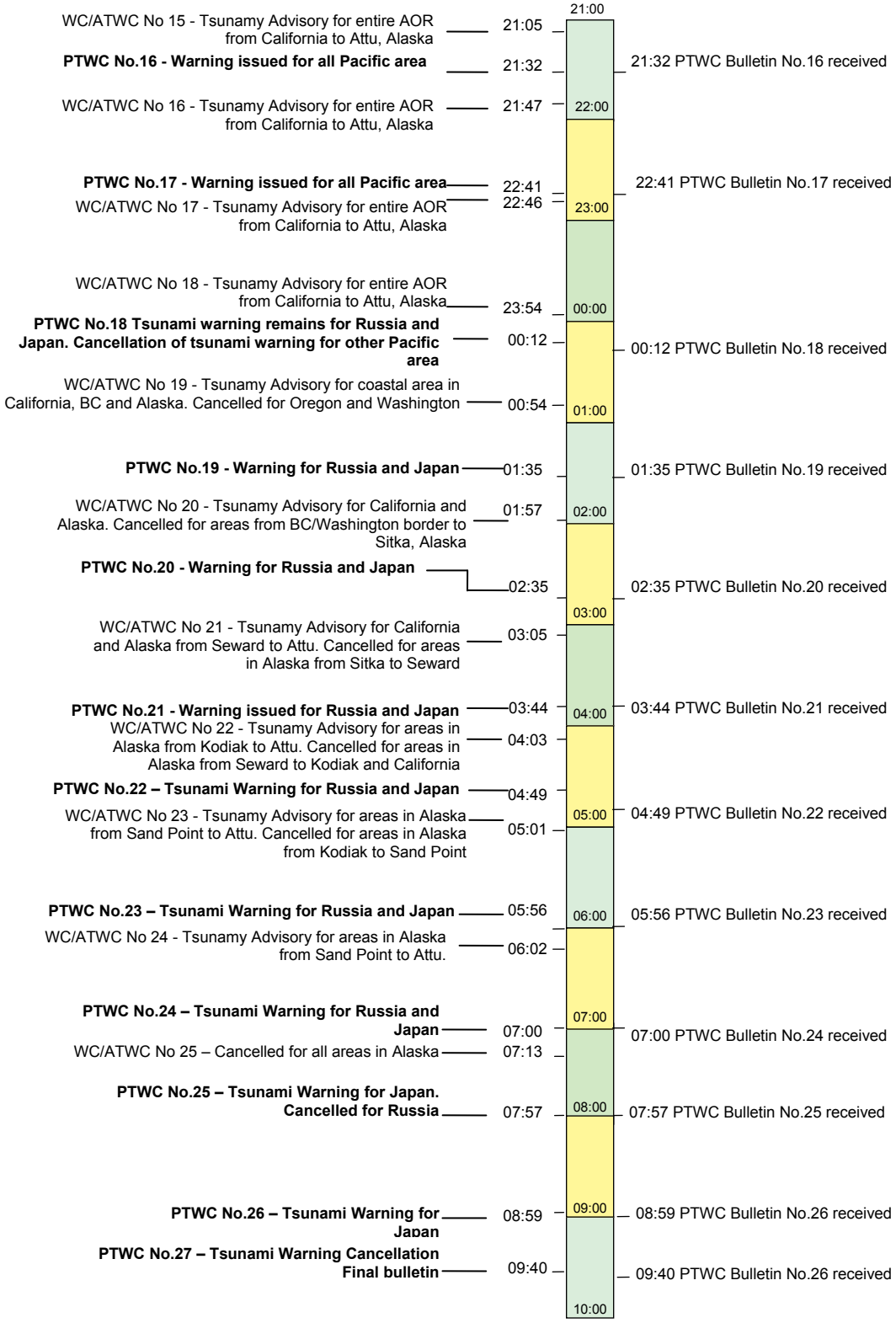
Emergency office received PTWC Bulletin No.1 from NWS by fax.

**Other sources of information**: CNN.

# 4.13 PANAMA – GEOSCIENCES INSTITUTE- UNIVERSITY OF PANAMA



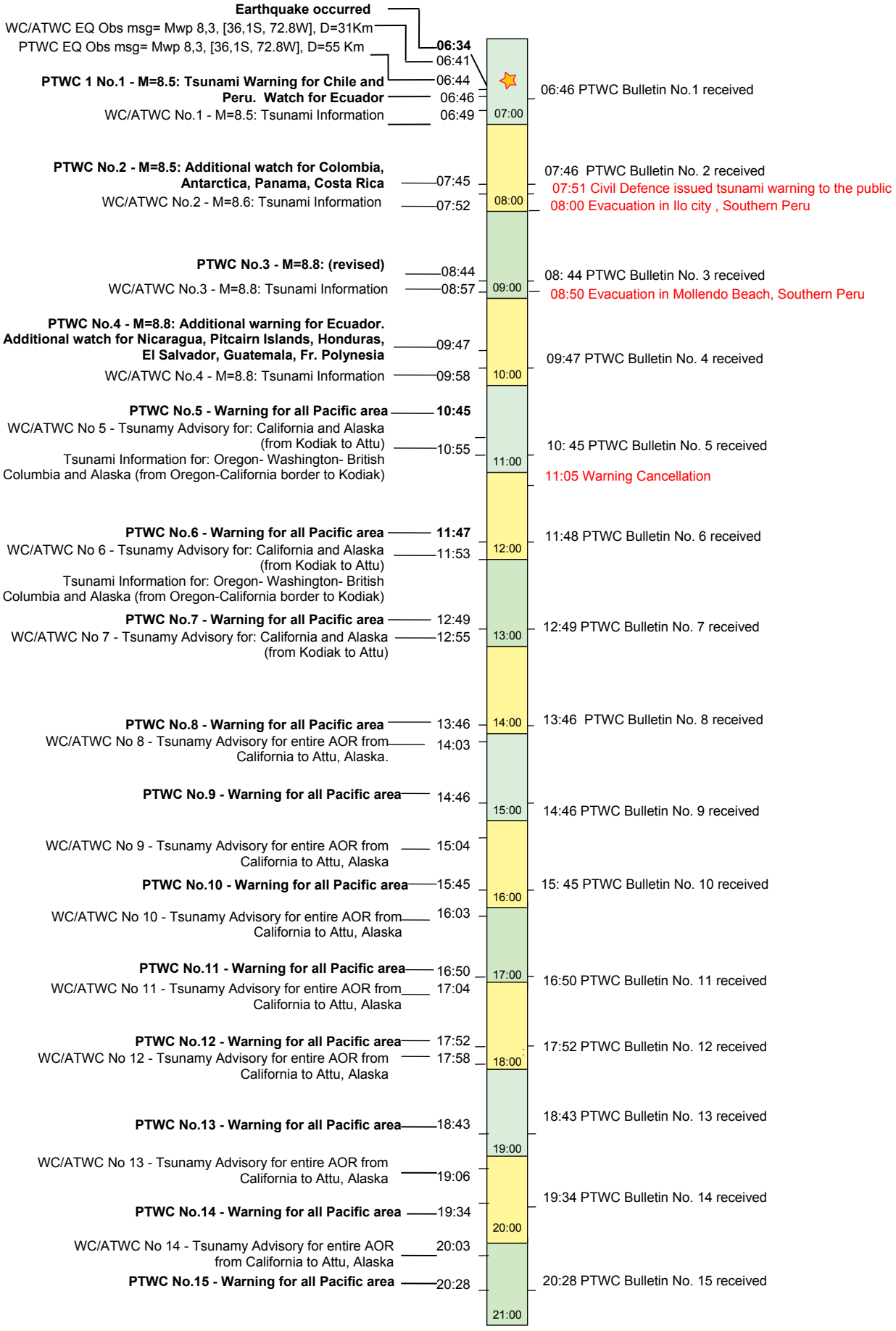
# PANAMA- GEOSCIENCES INSTITUTE- UNIVERSITY OF PANAMA



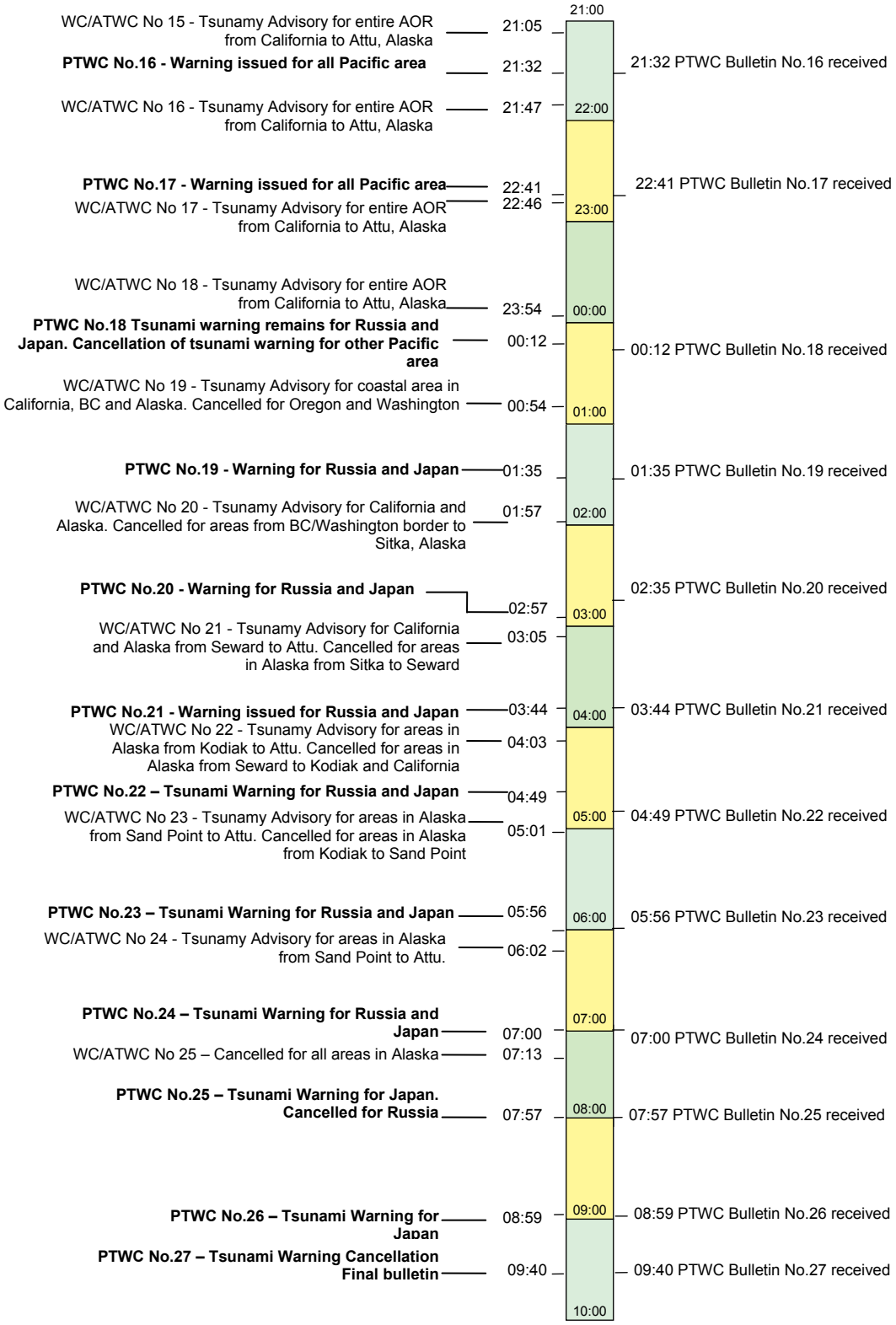

## Country comments

“It is imperative to create an active Tsunami National Warning Center in Panama and to place sea level stations in the Pacific and the Caribbean because we should be able to manage evacuation procedures and other issues regarding tsunami hazards”.

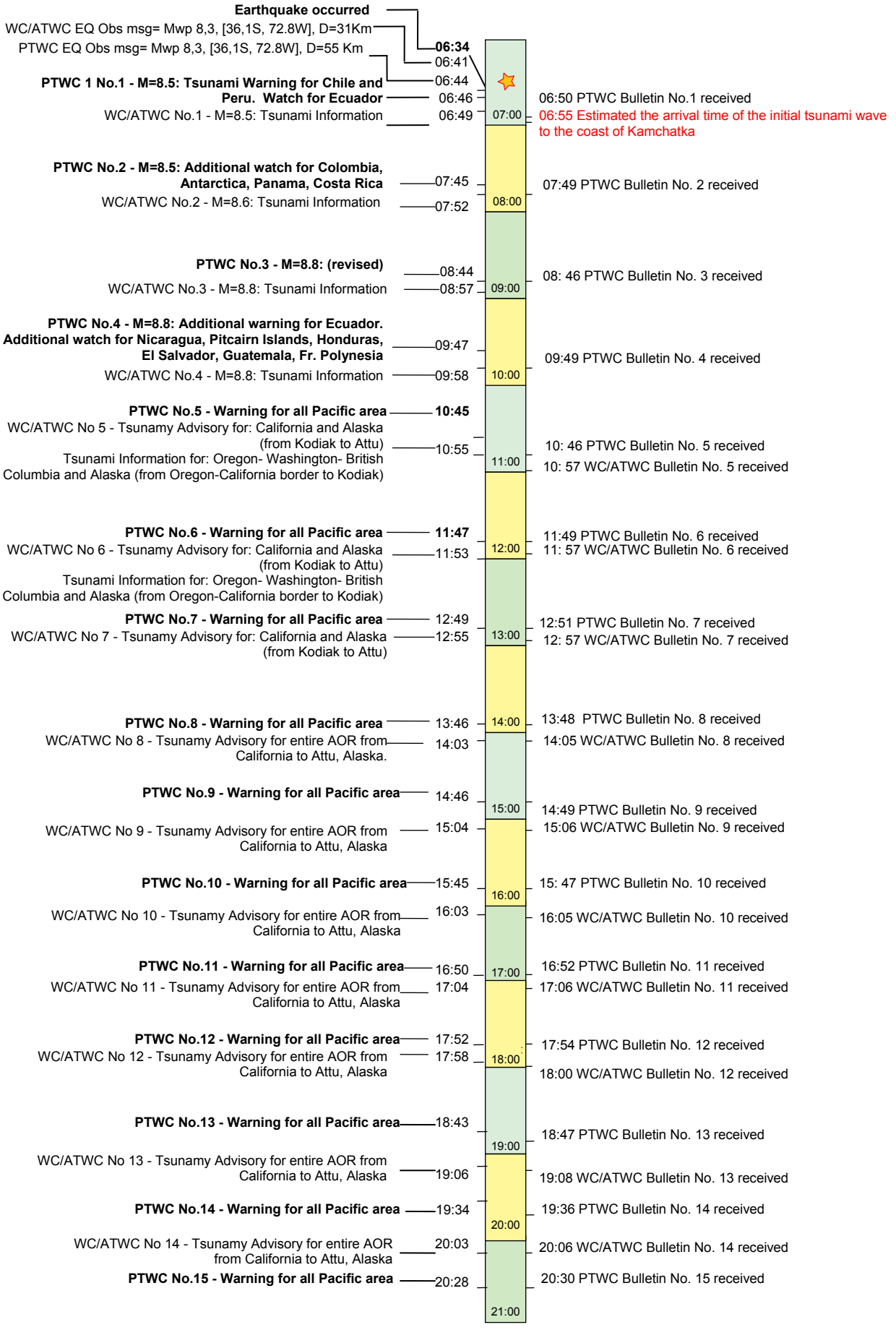
# 4.14 PERU – DIRECTORATE OF HYDROGRAPHY AND NAVIGATION OF THE PERUVIAN NAVY



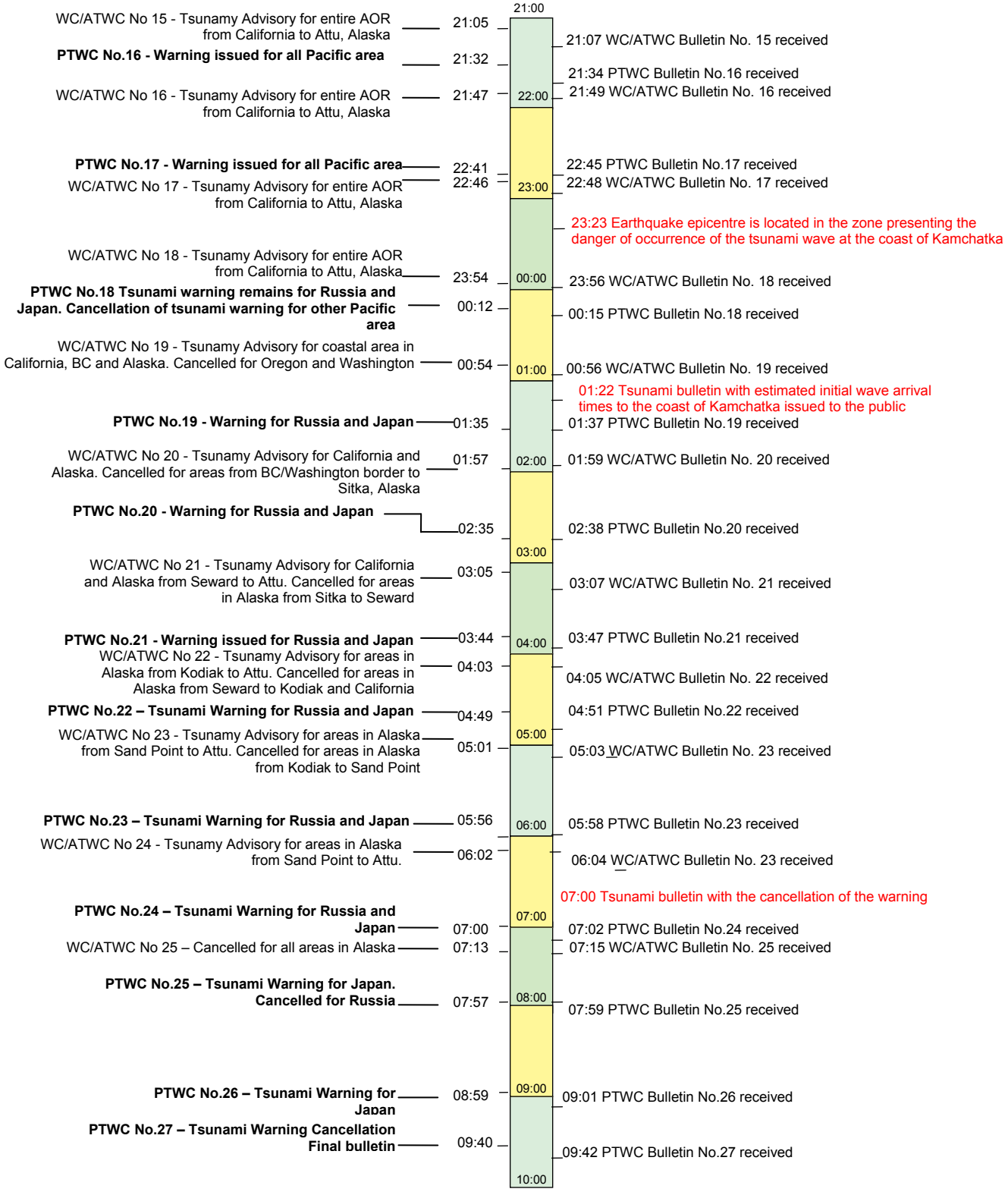
# PERU – DIRECTORATE OF HYDROGRAPHY AND NAVIGATION OF THE PERUVIAN NAVY



## 4.15 RUSSIAN FEDERATION – THE KAMTCHATKA TWC, ROSHYDROMET



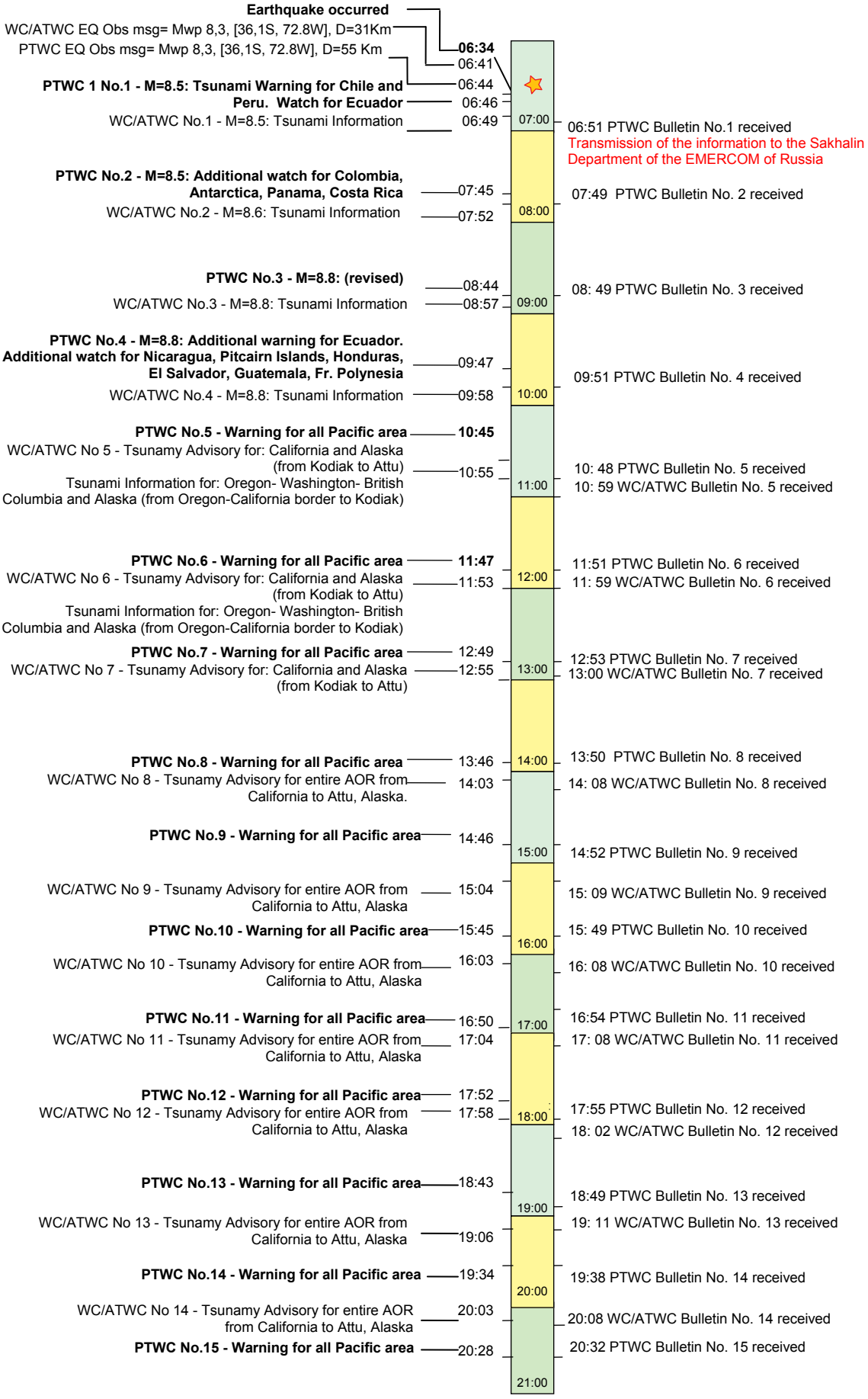
# RUSSIAN FEDERATION – THE KAMCHATKA TWC, ROSHYDROMET



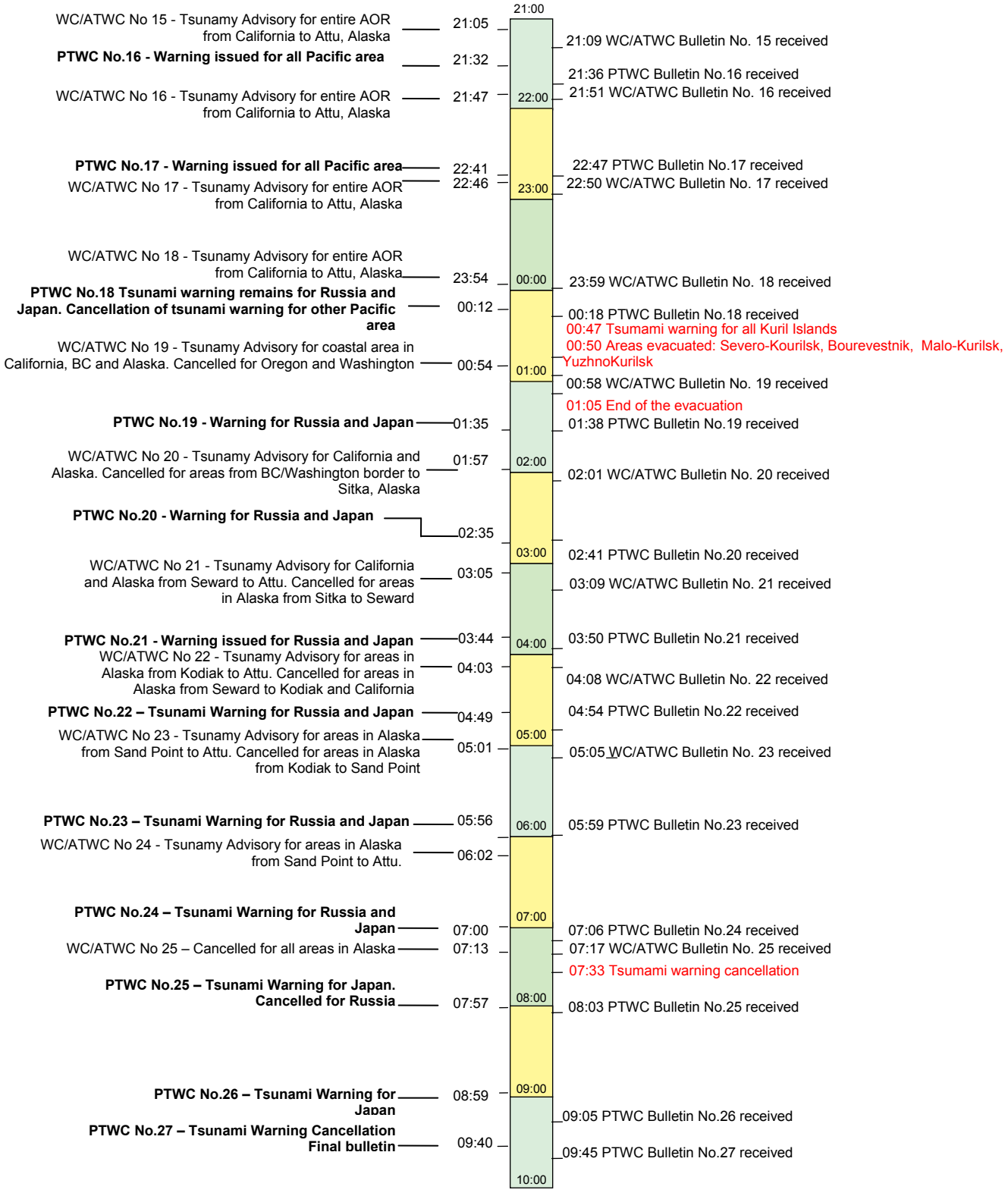

**Country comments**

**Other sources of information**: Seismic station " Petropavlovsk-Kamchatski" – 06:54

# 4.16 RUSSIAN FEDERATION – SUKHALIN TWC, ROSHYDROMET



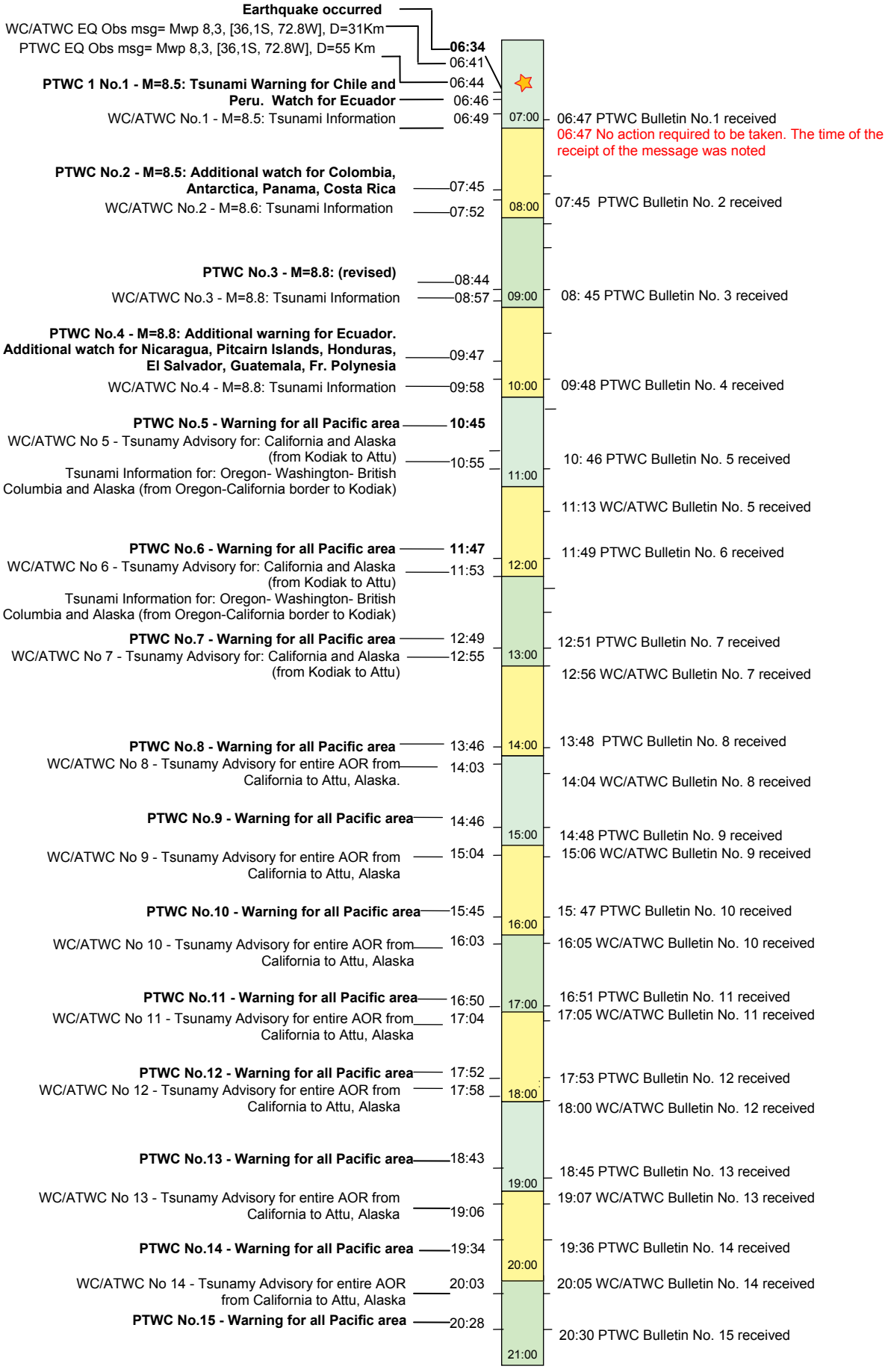
# RUSSIAN FEDERATION- SUKHALIN TWC, ROSHYDROMET



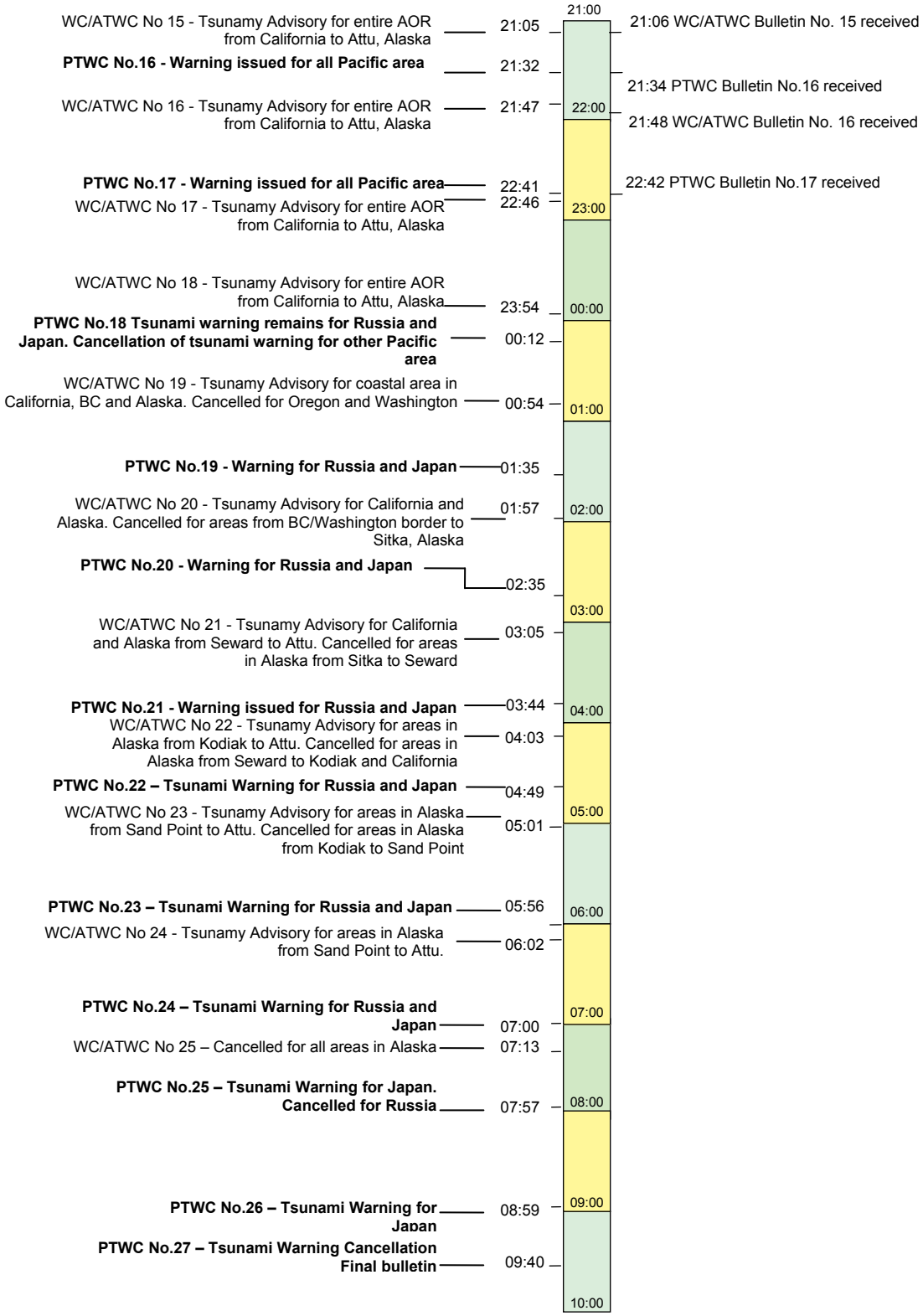

## Country comments

**Other sources of information**: Yuzhno – Sakhalius Seismic Station.

# 4.17 SINGAPORE – METEOROLOGICAL SERVICES DIVISION (MSD), NATIONAL ENVIRONMENT AGENCY



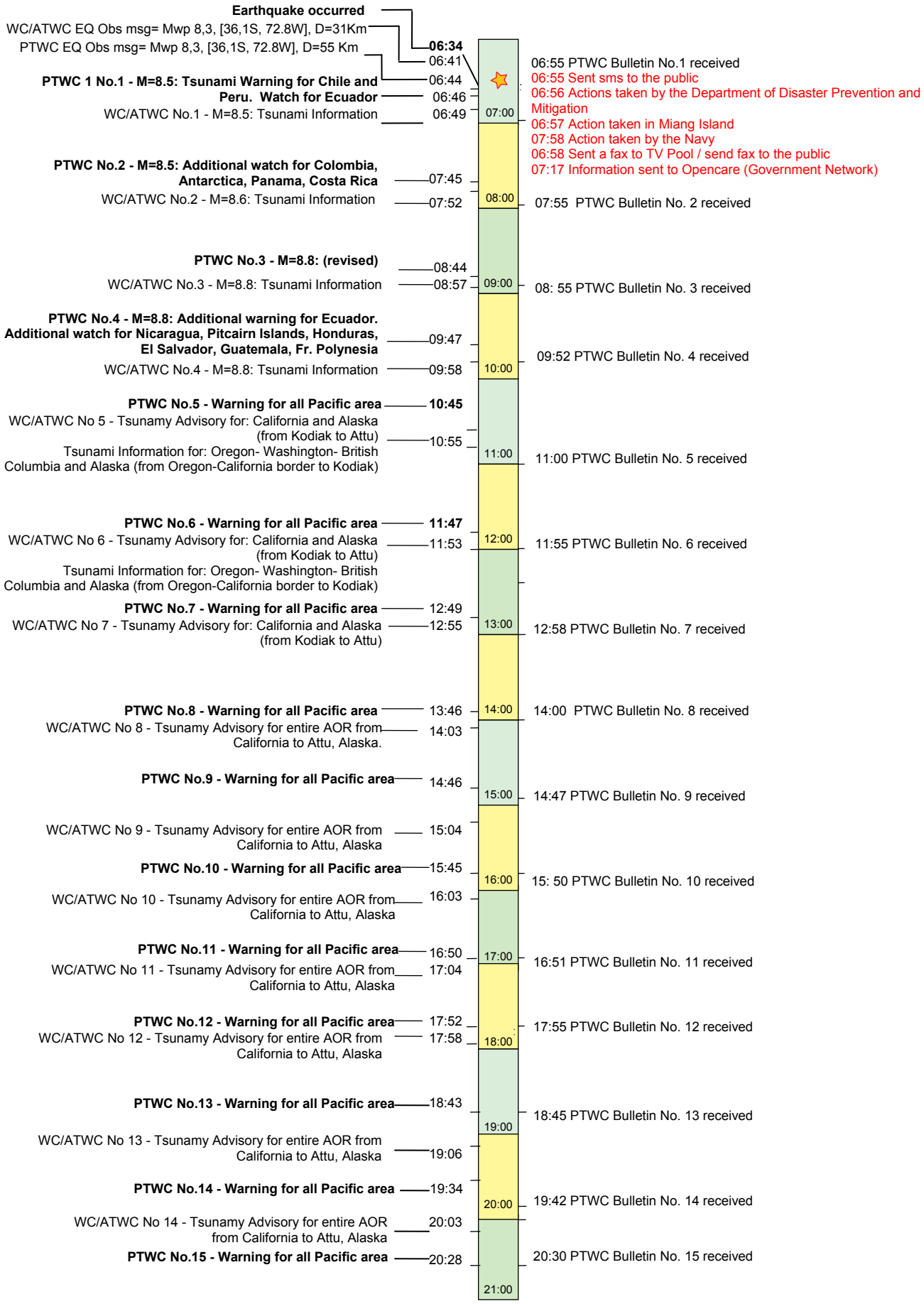
## SINGAPORE – METEOROLOGICAL SERVICES DIVISION (MSD), NATIONAL ENVIRONMENT AGENCY



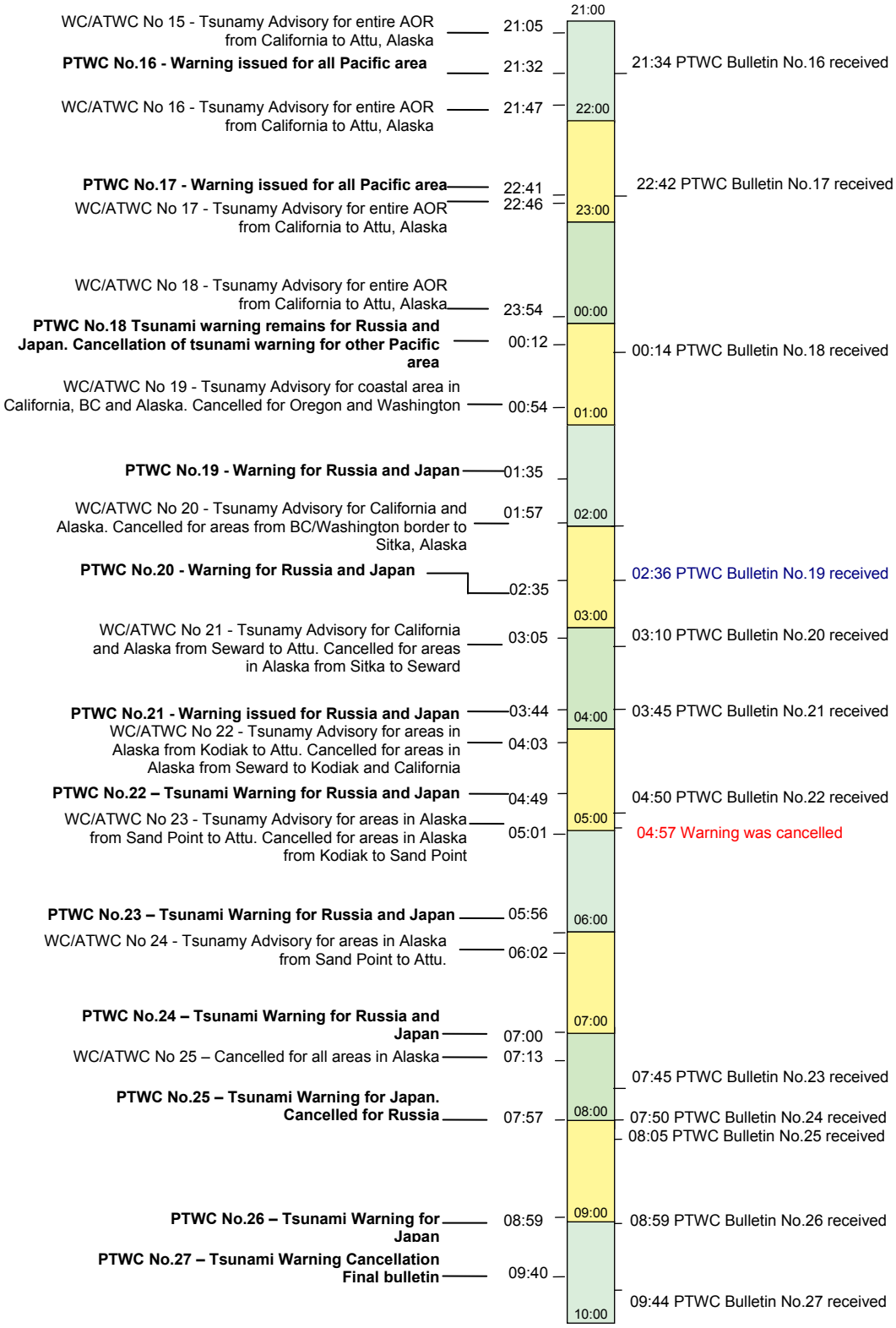

**Country comments**

"This event is not within our watch areas that are specified in our standard operational procedures. Hence no actions are taken by MSD upon receipt of the warning bulletins from PTWC. In the case that the event is within our watch area, our National Warning Centre will generate numerical model scenarios for our assessment purposes".

# 4.18 THAILAND – NATIONAL DISASTER WARNING CENTER



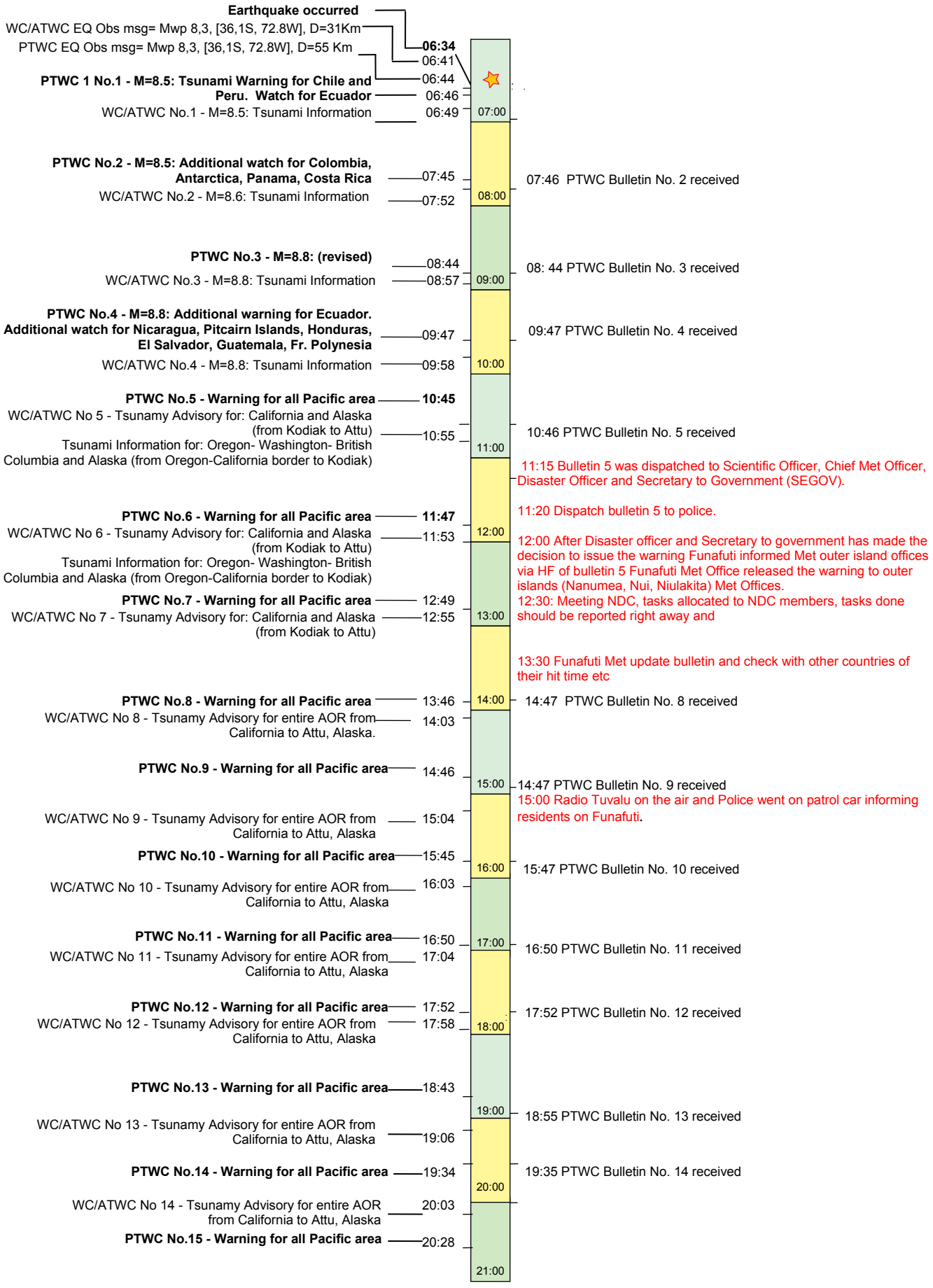
# THAILAND – NATIONAL DISASTER WARNING CENTER



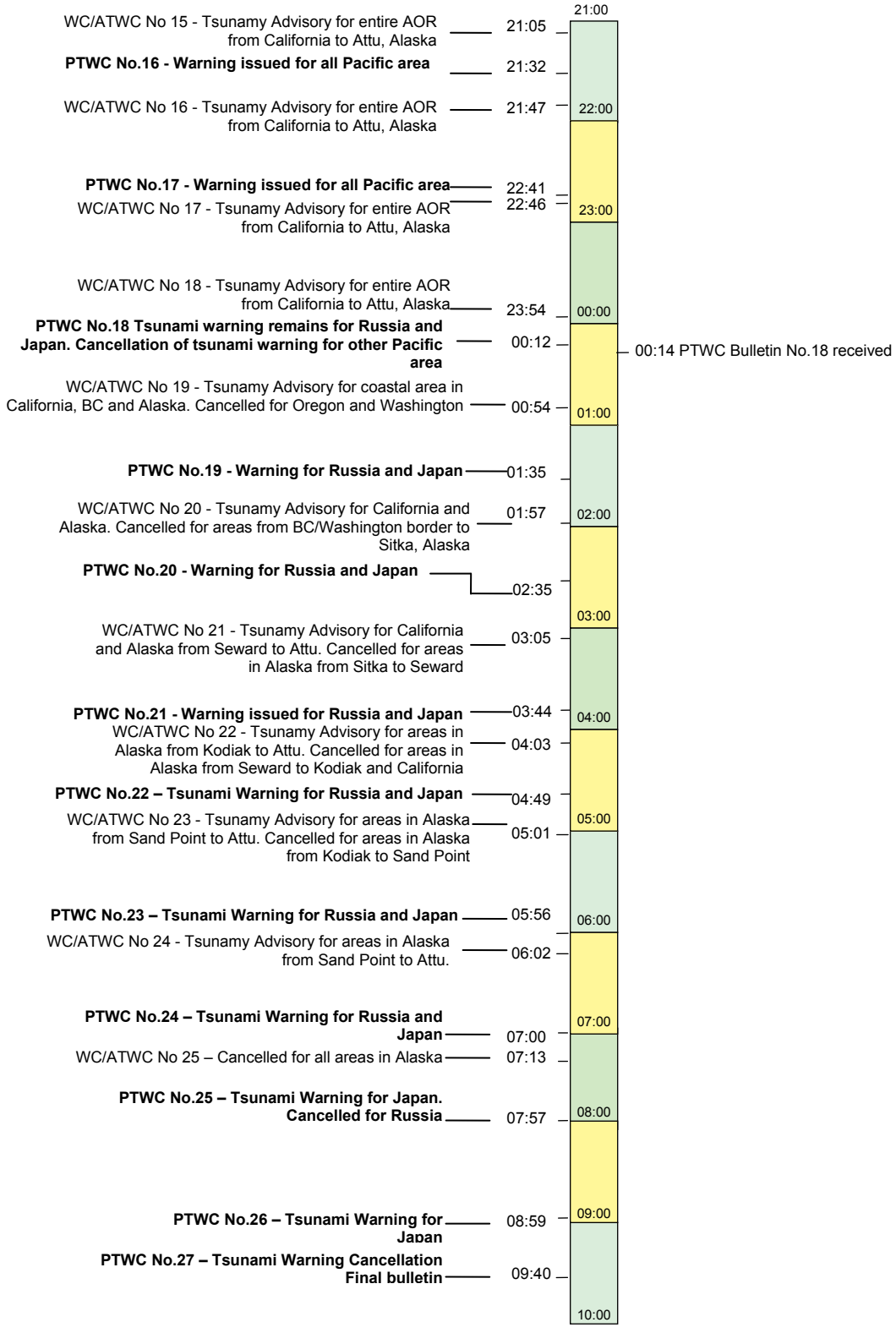

## Country comments

**Other sources of information**: JMA, TMD, USGS, GEOFON.

# 4.19 TUVALU – NATIONAL DISASTER MANAGEMENT OFFICE (*Not IOC Member State*)



# TUVALU – NATIONAL DISASTER MANAGEMENT OFFICE – (*Not IOC Member State*)

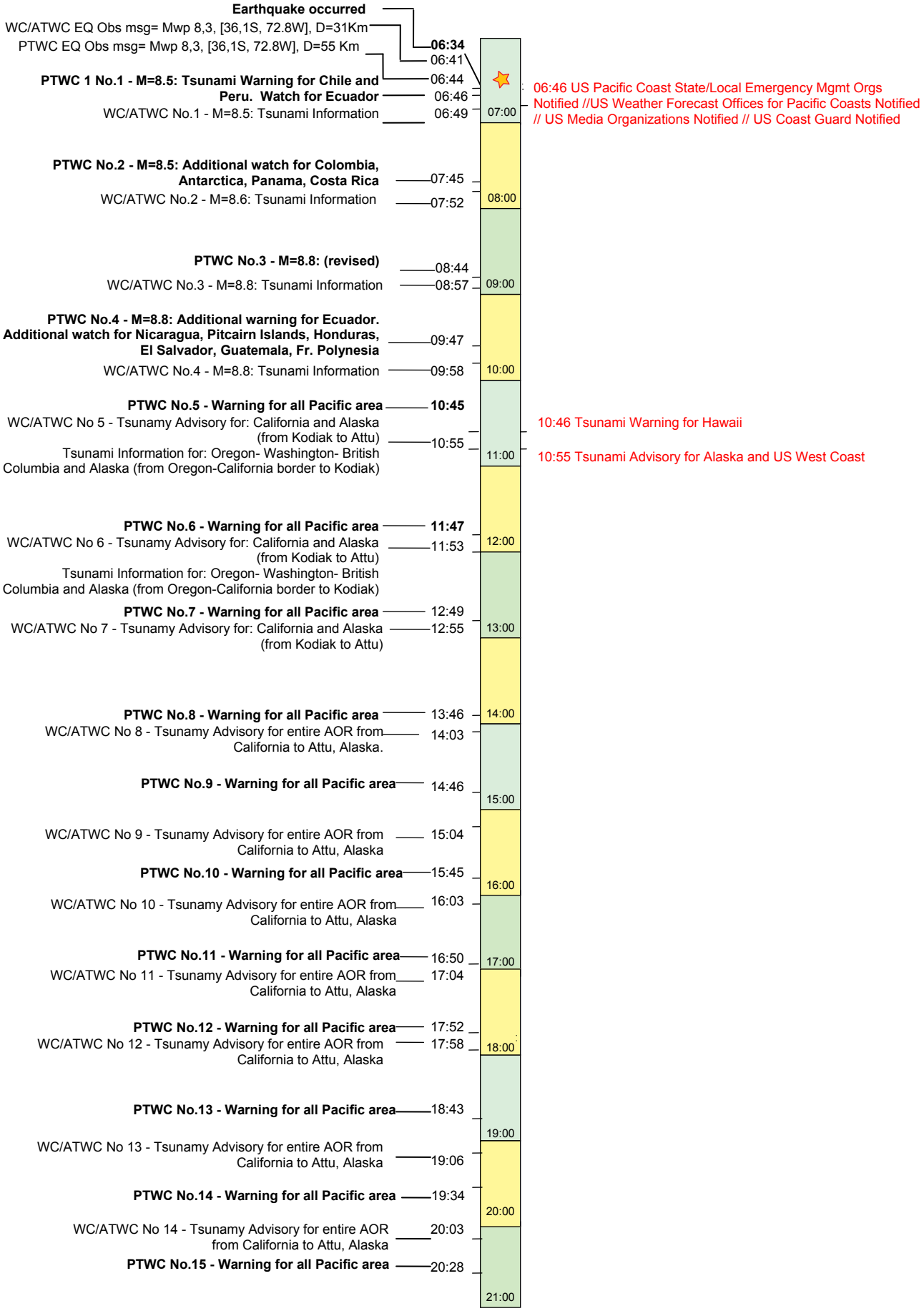



## Country comments

Radio Tuvalu on the air until morning after 9 a.m. when warning was cancelled.

## 4.20 UNITED STATES- NATIONAL WEATHER SERVICE PACIFIC REGION

The United States do not receive Bulletins as the PTWC is the USA National Focal Point



## 5. SURVEY RESULTS

The Member States' responses to the questions asked in the survey questionnaire have been compiled into tables and figures, as follows:

**TABLES**

Table 5.1 Summary of responses by countries to "yes/no" questions. *(Q2, 4, 5, 6, 7, 8, 9, 10, 12, 15, 17, 18, 19, 20, 22)*

Table 5.2 Time of earthquake awareness by countries and means of notification. Time of receipt of first PTWC and WC/ATWC bulletins *(Q1, 2)*

Table 5.3 Time of receipt by countries of all PTWC and WC/ATWC bulletins. *(Q5)*

Table 5.4 Earthquake parameters calculated by countries. *(Q7)*

Table 5.5 Actions taken by countries before the first PTWC/ WC/ATWC bulletin was received. *(Q8)*

Table 5.6 Actions taken by countries after the first PTWC/ WC/ATWC bulletin was received. *(Q9)*

Table 5.7 Time of national warnings issued by countries. Time lapse between earthquake awareness and issuance of first warning. Source information on which the warning was based. *(Q10, 11)*

Table 5.8 Time of warning cancellation for those countries that issued warnings (UTC). Time period between warning issuance and cancellation *(Q14)*

Table 5.9 Actions taken by National Disaster Management Organisations. *(Q16)*

Table 5.10 Evacuations by countries. *(Q17)*

Table 5.11 Sea level stations monitored by countries. *(Q20)*

**FIGURES**

Figure 5.1 Time of earthquake awareness expressed as lapsed time since earthquake.

Figure 5.2 Time of official tsunami warnings issued by countries and modelled tsunami travel times.

Figure 5.3 Time of warning cancellation for countries that issued warnings and modelled tsunami travel times.

| | Country | AUS | CHI | COL | FNC | FRP | ECU | ESAV | HK | JAP | NZ | NIC | PAN | PER | PAL | RF-S | RF-K | SIN | THA | TUV | USA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADVISORY SERVICE | Received first bulletin from PTWC and/or WC/ATWC | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ○ | - |
| | Acknowledged receipt of bulletin | ● | ○ | ○ | ○ | ○ | ● | ● | ● | ○ | ● | ○ | ● | ● | ● | ○ | ● | ○ | ● | ○ | - |
| | Received subsequent PTWC/ WC/ATWC bulletin | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | - |
| | Received info from other sources | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ○ | ● | ● | ● | ● | ● | ○ | ● |
| NATIONAL ACTIONS | Calculated earthquake parameter | ● | ● | ○ | ○ | ● | ○ | ○ | ● | ● | ○ | ● | ● | ○ | ○ | ● | ● | ○ | ● | ○ | ● |
| | Action taken before bulletin | ● | ○ | ○ | ○ | ● | ● | ● | ○ | ● | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ |
| | Action taken after bulletin | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ○ | ● | ● | ● |
| | Issued a tsunami warning | ● | ● | ○ | ● | ● | ● | ● | ○ | ● | ● | ● | ○ | ● | ● | ● | ● | ○ | ● | ● | ● |
| | Wave height forecasted | ○ | ○ | ○ | ○ | ● | ● | ● | n/a | ● | ● | ○ | n/a | ○ | ○ | ● | ○ | n/a | ● | N/A | ● |
| | Communication Problem with warning | ○ | n/a | n/a | ● | ○ | ● | ● | n/a | ○ | ○ | ○ | n/a | ○ | ○ | ○ | ○ | n/a | ○ | N/A | ○ |
| NATIONAL RESPONSE | Any area evacuated | ● | ● | ○ | ● | ● | ● | ○ | ○ | ● | ● | ○ | ○ | ● | ○ | ● | ○ | ○ | ○ | ● | ● |
| | Smooth evacuation | ● | N/A | n/a | ● | ● | ● | n/a | n/a | ● | N/A | n/a | n/a | N/A | N/A | ● | n/a | n/a | n/a | ○ | ● |
| | Self evacuation | ○ | N/A | n/a | ● | ○ | ● | ○ | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| MONITORING AND MODELLING | Monitored sea level | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ○ | ● | ○ | ● | ● | ○ | ● | ● | ● |
| | - Accessed through GTS | ○ | ○ | ○ | | ● | ● | ● | ● | ● | ○ | n/a | n/a | ○ | n/a | ● | ○ | n/a | ● | ● | - |
| | - Accessed through IOC Sea Level Observation Facility | ○ | ○ | ● | | ● | ○ | ○ | ● | ○ | ● | n/a | n/a | ● | n/a | ● | ○ | n/a | ○ | ● | - |
| | - Accessed through other systems | ● | ● | ○ | ● | ○ | ○ | ○ | ○ | ● | ● | n/a | n/a | ● | n/a | ● | ● | n/a | ○ | ● | - |
| | Knowledge on accessing sea level data through GTS | N/A | N/A | N/A | N/A | ● | ● | N/A | ● | ● | N/A | ○ | ○ | N/A | ○ | ● | ● | ● | ● | - | ● |
| | Knowledge on accessing sea level data through IOC Sea Level Observation Facility | N/A | N/A | ● | N/A | ● | N/A | ● | ● | N/A | ● | ○ | ○ | N/A | ○ | ● | ● | ● | ● | ● | ● |
| | Used numerical modelling | ● | N/A | ● | ○ | ○ | ● | ● | ● | ● | ● | ○ | ○ | ● | ○ | ● | ● | ○ | ● | ○ | ● |

Table 5.1 Summary of responses by countries to “yes/no” questions

AUS=Australia; CHI=Chile; COL=Colombia; FNC=New Caledonia; FRP=French Polynesia; ECU=Ecuador; ESAV=El Salvador; CHK= China HK=Hong-Kong; JAP=Japan; NZ=New Zealand; NIC=Nicaragua; PAN=Panama; PER=Peru; PAL=Palau; RF-K=Russian Federation- Kamchatka; RF-S=Russian Federation Sukhalin; SIN=Singapore; THA=Thailand; TUV= Tuvalu; USA=United States.

●= yes, ○= no, n/a= not applicable, NA= No answer provided

| Country | Time learnt | Means of Notification | PTWC | WC/ATWC |
|---|---|---|---|---|
| Palau | 06:30 | Received call from Japan Embassy in | 06:53 | |
| Nicaragua | 06:40 | Through the Seismic Network Nicaragua | 06:47 | |
| Japan | 06:41 | Seismic analysis by JMA system | 06:48 | 06:50 |
| Tuvalu | 6:43 | On the CISN (California Integrated | - | |
| Colombia - OSSO | 06:44 | Email | 06:47 | 10:49 |
| Australia | 06:45 | PTWC P-Time Message | 06:47 | 06:50 |
| El Salvador | 06:45 | SMS | 06:47 | |
| French Polynesia | 06:45 | TREMORS system sent warning by | 06:47 | |
| Peru | 06:46 | PTWC/CISN | 06:46 | |
| New Zealand | 06:47 | Email, fax | 06:47 | |
| Singapore | 06:47 | PTWC via email and GTS | 06:47 | |
| Thailand | 06:48 | Email, phone, geofon, EMSC, USG | 06 :55 | |
| China- Hong-Kong | 06:49 | PTWC RANET SMS | 06:48 | |
| Russian Federation-Sukhalin TWC | 06:50 | PTWC bulletin 1 | 06:50 | - |
| Russian Federation – Kamchatka TWC | 06:51 | PTWC bulletin 1 | 06:51 | |
| France- New Caledonia | 06:52 | SMS | 06:58 | |
| Ecuador | 06:56 | USGS-NEI-PTWC | 06:56 | |

Table 5.2 Time of earthquake awareness by countries and means of notification. Time of receipt of first PTWC and WC/ATWC bulletins. All times are in UTC. See also Figure 5.1.

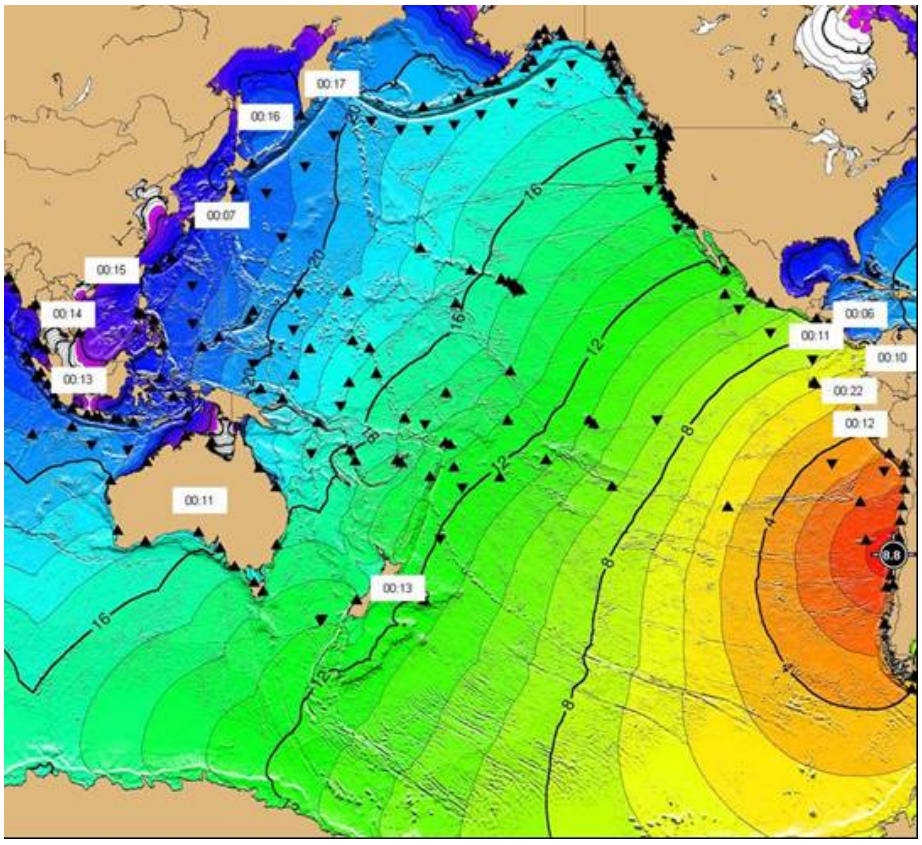



Figure 5.1
Time of earthquake awareness expressed as lapsed time since earthquake

| Country | Bull. 1 | Bull. 2 | Bull. 3 |
|---|---|---|---|
| Chile | 06:46 | 07 :45 | 08:44 |
| Panama | 06:46 | 07 :45 | 08:44 |
| Peru | 06:46 | 07 :45 | 08:44 |
| Australia | 06:47 | 07:46 | 08:44 |
| Colombia | 06:47 | 07:45 | 08:44 |
| El Salvador | 06:47 | 07:46 | 08:45 |
| French Polynesia | 06:47 | 07:45 | 08:44 |
| New Zealand | 06:47 | 07:46 | 08:44 |
| Nicaragua | 06:47 | 07:45 | 08:47 |
| Singapore | 06:47 | 07:45 | 08:45 |
| Japan | 06:48 | 07:46 | 08:46 |
| China – Hong-Kong | 06:48 | 07:46 | 08:44 |
| Russian Federation-Sukhalin TWC | 06:50 | 07:49 | 08:49 |
| Russian Federation – Kamchatka TWC | 06:51 | 07:49 | 08:46 |
| Palau | 06:53 | 07:46 | 08:45 |
| Thailand | 06:55 | 07:55 | 08:55 |
| Ecuador | 06:56 | 07:55 | 08:54 |
| France- New Caledonia | 06:58 | 07 :47 | 08 :45 |

Table 5.3 Time of receipt by countries of three first PTWC bulletins.

| Country | | Origin Time (UTC) | Location (lat and long) | Depth (Km) | Magnitude | Type of Mag | Time UTC |
|---|---|---|---|---|---|---|---|
| Australia | 1st estimate | 06:34 | -35.72, -72.68 | 0 Km | 8.5 | Mwp | 06:50 |
| | 2nd estimate | 06:34 | -35.32, -72.93 | 50 Km | 8.8 | Mwp | 07:19 |
| Chile | 1st estimate | 06:35:43 | -33, - 71,8 | Not estimated | 8.9 | Mw | 06:48 |
| China-Hong-Kong | 1st estimate | 06:34 | -35.6, -72.6 | 16 Km | 8.4 | Ms | 06:44 |
| | 2nd estimate | 06:34 | -35.6,-72.6 | 17 Km | 8.8 | Mwp | 06:45 |
| French Polynesia | 1st estimate | 06:34 | -36.0, - 72.6 | Shallow (<40 Km) | Mw=8.5 (Mm = 9.0) | Moment magnitude | 07:15 |
| | 2nd estimate | | | | Mw= 8.7 (Mm=9.2 ) | Moment magnitude | 08:00 |
| | 3rd estimate | 06:34 | -35.8, -72.7 | 35 Km | Mw= 8.8 | Computed from CMT (PDFM) | |
| Nicaragua | 1st estimate | 06:52 | -36.04, -72,66 | 55 Km | 8.9 | Ms | 06:34 |
| Panama | 1st estimate | 06:34 | -36.09, -72,56 | 50 Km | Mw=8.7 | | 06:34 |
| Russian Federation- | 1st estimate | 06:34 | -36.05, -72.59 | 8 | | | 06:47 |

| Country | | Origin Time (UTC) | Location (lat and long) | Depth (Km) | Magnitude | Type of Mag | Time UTC |
|---|---|---|---|---|---|---|---|
| Sukhalin TWC | 2nd estimate | 06:34 | -36.10, -72.64 | | 8.5 | | 06:48 |
| Russian Federation – Kamchatka TWC | 1st estimate | 06:34 | | | | | 06:54 |
| | 2nd estimate | 06:34 | -35.16,-73.78 | 33 Km | 8.3 | Ms | 08:21 |
| Thailand | 1st estimate | P-wave 06:53 | | | 8.2 | Ms | 08:31 |
| United States | 1st estimate | 06:34 | -36.1, -72,6 | 55 Km | 8.5 | Mw | 06:46 |
| | 2nd estimate | 06:34 | -36.1, -72,6 | 55 Km | 8.6 | Mw | 07:47 |
| | 3rd estimate | 06:34 | -36.1, -72.6 | 55 Km | 8.8 | Mw | 08:44 |

Table 5.4 Earthquake parameters calculated by countries

| Country | Action details |
|---|---|
| Australia | • Initiated seismic assessment of earthquake location and magnitude. |
| Ecuador | • Harbourmasters were communicated on the event.<br>• Bulletin was issued on INOCAR website.<br>• All the personnel of the warning centre met up. |
| El Salvador | • The action protocol was activated by the National Oceanographic Service.<br>• Deep water sea level stations near to the epicentre were monitored. |
| French Polynesia | • Own seismic warning called the geophysist on duty. |
| Japan | • Seismic analysis by JMA system. |

Table 5.5 Actions taken by countries before the first PTWC/ WC/ATWC bulletin was received

| Country | Time | Details |
|---|---|---|
| Australia | 06:50 | Issued JATWC Earthquake Bulletin |
| | 08:45 | Tsunami Watch 1 for NSW, Queensland, Lord Howe and Norfolk Islands. |
| | 09:48 | Tsunami Warning 1 for NSW: Marine Threat Broken Bay to Point Danger |
| | 09:48 | Tsunami Warning 1 for Queensland: Marine Threat Point Danger to Double Island Point. |
| | 09:48 | Tsunami Warning 1 for Norfolk Island: Marine Threat |
| | 09:48 | Tsunami Warning 1 for Lord Howe Island: Marine Threat |
| | | Hourly updates were then issued for all warnings until cancellation |
| | 16:57 | Tsunami Warnings (Marine Threat) were extended to central and southern Qld, all NSW, eastern Victorian and Tasmania coasts. |
| Chile | 06:51 | SHOA communicated warning to ONEMI |
| | 07:05 | Issuance of the warning to the Navy through messages by wired communication and email. |
| | 07:07 | Issuance of tsunami warning via fax // attempt to communicate via fixed line, mobile and satellital telephone. |

| Country | Time | Details |
|---|---|---|
| China-Hong-Kong | 06:50 | Informed relevant personnel |
| | 06:50 | Started tsunami operation procedures |
| | 07:21 | Issued a press release on earthquake |
| Colombia | 06:48 | Revision of the earthquake parameters |
| | 06:56 | Internal communication among the OSSO members |
| | 07:37 | Sent SMS to person responsible in CCO in Colombia, in order to inform about the earthquake and that there was any danger for Colombian coasts. |
| | 9:15 | Revision of information available on TWCs websites in Ecuador, Peru and Chile. |
| | 08:23 | OSSO Corporation Information Bulletin No. 1 sent to the National Institution of Risk Management (DFR) – per email. |
| | 12:25 | OSSO Corporation Information Bulletin No. 2 sent to the National Institution of Risk Management (DFR). |
| | 13:50 | Phone communication with people on the coast in order to obtain information of direct observation of the sea level. |
| | From 11:15 - rest of the day | Phone communication with local risk management entities in order to inform that there was no danger for Colombian coasts. |
| | 00:30 (28/02) | OSSO Corporation Information Bulletin No. 3 sent to the National Institution of Risk Management (DFR) and to the media to clarify confusion and reiterate the absence of danger in Columbia coasts. |
| Ecuador | 07:00 | Called INOCAR Director |
| | 07:10 | Called Ministry of Risk Management |
| | 07:10 | Called the harbourmaster |
| El Salvador | 06:50 | Deep water sea level stations monitored |
| | 08:17 | Sea levels sensors in the coastline of Chile and Peru monitored |
| | 10:00 | Defence Civil contacted in order to inform them about the earthquake. |
| | 12:30 | National press conference to issue tsunami warning |
| France- New Caledonia | 07:47 | Operational Centre started watch |
| | 14:47 | Information was sent to the Police |
| | 14:47 | Pre-warning status |
| | 15:00 | Operational Centre was activated |
| French Polynesia | 07:24 | Yellow warning level given to Civil Defense |
| | 09:26 | Red warning level given to Civil Defense |
| | 20:10 | Green (cancellation) for Polynesia except Marquesas |
| | 21:30 | Green (cancellation) for Marquesas |
| Japan | 06:52 | Starting monitoring sea level station data in the Pacific region |
| | 06:55 | Assembling staff concerned |
| | 07:00 | Issuance of Earthquake Information and providing it to the national disaster management organizations. |
| | 10:00 | Media Briefing |
| | 23:30 | Media Briefing |
| | 00:33 | Issuance of Tsunami Warning/Advisory<br>Establishing a JMA disaster response headquarters |
| | 07:50 | Media Briefing |
| | 12:45 28.02.10 | Media Briefing |
| | 01:00 | Media Briefing |

| Country | Time | Details |
|---|---|---|
| | 01.03.10 | |
| | 1-2 Mar. | Dispatching JMA Mobile Observation Team to the disaster areas for field survey. |
| New Zealand | 06:55 | MCDEM Duty Officer and Duty Manager received a page message from the New Zealand Fire Service notifying them of the receipt of a PTWC Bulletin (Note: NZFS are contracted by MCDEM to monitor hazard notifications and issue warning messages via the National Warning System on a 24/7 basis on behalf of MCDEM). |
| | 06:57 | MCDEM Duty Officer confirmed receipt with New Zealand Fire Service and requested to await further instruction following scientific advice to be provided by GNS Science. |
| | 06:57 | MCDEM Duty Manager contacted GNS Science Duty Officer for scientific assessment and modeling related to New Zealand. |
| | 07:20 | MCDEM Duty Officer, MCDEM Duty Manager and National Controller held a teleconference to decide on action to take following GNS Science assessment of threat to NZ. |
| | 07:33 | Contacted the New Zealand Fire Service, and requested a 'National Advisory: No Threat' message be issued via the National Warning System. |
| | 07:38 | 'National Advisory: No Threat' issued to response agencies and the media via the National Warning System. |
| | 07:45 | MCDEM website updated to include warning information. |
| | ongoing | Monitored the situation and PTWC bulletins. Teleconferences held between the MCDEM Duty Officer, MCDEM Duty Manager and the National Controller following the issue of updated PTWC Bulletins. Discussions held on whether to upgrade the 'National Advisory: No Threat message as the earthquake parameters were refined, and the watch and warning criteria continued to widen. |
| | 09:00 | Duty Team requested to activate the National Crisis Management Centre (NCMC). Relevant agency liaison officers requested to staff the NCMC. |
| | 11:00 | Following the issuing of PTWC Bulletin 005 (1045Z) placing New Zealand under a 'warning' and further GNS Science assessment and modeling a 'National Warning: Threat to NZ' was issued. |
| | 11:15 | Requested the broadcast of an emergency announcement via national TV and radio broadcasters (using the existing memorandum of understanding between MCDEM and national broadcasters- broadcasting every 15 minutes). |
| | ongoing | Monitoring of the situation at the national level and engagement with local response organizations continued. Issuing of updated 'National Warning' messages to response agencies and the media continued approximately every hour. |
| | 12:10 | National Warning Update #02 |
| | 13:10 | National Warning Update #03 |
| | 14:07 | National Warning Update #04 |
| | 15:11 | National Warning Update #05 |
| | 16:22 | National Warning Update #06 |
| | 17:09 | National Warning Update #07 |
| | 16:18 | National Warning Update #08 |
| | 19:01 | National Warning Update #09 |
| | 19:42 | National Warning Update #10 |

| Country | Time | Details |
|---|---|---|
| | 20:21 | National Warning Update #11 |
| | 21:12 | National Warning Update #12 |
| | 22:17 | National Warning Update #13 |
| | 23:45 | National Warning Update #14 |
| | 00:52 | National Warning Update #15 - 01:52 pm on 28/02 |
| | 02:00 | National Advisory Update #16 - 03:00 pm on 28/02 (downgraded National Warning to National Advisory). |
| | 04:14 | National Advisory Update #17 - 05:14 pm on 28/02 (National Advisory to remain in effect overnight). |
| | 19:35 | National Advisory Update #18 - 08:37am on 01/03 (National Advisory Cancellation). |
| | 19:40 | Cancellation of Request for Broadcast |
| Palau | 11:30 | Specific NEC members (Vice President, Public Safety, General Manager of PNCC, Minister of Health and Director of Communications Development, were called in and were informed of Tsunami Warning. |
| | 12:30 | Issued public announcement through local radio stations |
| | 13:39 | Scroll message sent to local T.V. Station |
| | 22:29 | Update scroll message sent to T.V. Station |
| | 00:12 | Cancellation announcement sent to local radio station and to T.V. Station. |
| Russian Federation – Kamchatka TWC | 06: 55 | Estimated the arrival time of the initial tsunami wave to the coast of Kamchatka . |
| Russian Federation- Sukhalin TWC | 06:51 | Analysis of the situation and transmission of the information to the Sukhalin Department of the Ermercom of Russie. |
| Tonga | | • Public Awareness on National Radio and TV to inform people of likely direction, what to do,<br>• Consequences, direction, possible height of wave, nature of tsunami, direct people where to go,<br>• Direct people of where to go and what they need to take. Activate emergencyCoordinate operation,<br>• Emergency management system; Activate the Coordination Centre. |
| Tuvalu | 11:15 | Bulletin 5 was dispatched to Scientific Officer, Chief Met Officer, Disaster Officer and Secretary to Government (SEGOV). |
| | 11:20 | Dispatch bulletin 5 to police. Because this happened early mornings, police has to get National Disaster Committee (NDC) members for a meeting. |
| | 12:00 | After Disaster officer and Secretary to government made the decision to issue the warning, Funafuti informed Met outer island offices via HF about the bulletin 5. // Funafuti Met Office released the warning to outer islands (Nanumea, Nui, Niulakita) Met Offices. |
| | 12:30 | Meeting NDC, tasks allocated to NDC members, tasks done should be reported right away. |
| | 13:30 | Funafuti Met update bulletin and check with other countries of their hit time etc. |
| | Time not known | Boats travelled to inform residents on Funafuti motu (Amatuku, Funafala, Papaelise). |

| Country | Time | Details |
|---|---|---|
| | Time not known | Telecom/Police/Red Cross/Disaster Office inform outer-islands |
| | 13:30 | SEGOV informed Cabinet of tasks carried out by NDC |
| | 15:00 | Radio Tuvalu on the air and Police went on patrol car informing residents on Funafuti. |
| | | Radio Tuvalu on the air until morning after 9am when warning was cancelled. |

Table 5.6 Actions taken by countries after the first PTWC/WC/ATWC bulletin was received

| Country | Earthquake Notification | Warning issued | Time lapse (h:mm) | Information for warning |
|---|---|---|---|---|
| Australia | 06:45 | **09:48** (Queensland, Norfolk Island, Lord Howe Island); **16:57** (Central and southern Qld, all NSW, eastern Victorian and Tasmania coasts) | 3:03 / 10:10 | National TWC |
| France- New Caledonia | 06:52 | 15:00 | 8:08 | PTWC |
| French Polynesia | 06:48 | 14:00 | 7:12 | National TWC |
| Ecuador | 06:56 | 07:20 | 1:24 | PTWC |
| El Salvador | 06:45 | 12:30 | 5:45 | PTWC and National TWC |
| Japan | 06:41 | 00:33 | 17:52 | National TWC |
| New Zealand | 06:46 | 07:45 | 0:59 | PTWC and National TWC |
| Nicaragua | 06:40 | 09:30 | 2:50 | PTWC |
| Palau | 11:30 | 12:30 | 1:00 | PTWC |
| Peru | 06:46 | 07:51 | 1:05 | PTWC |
| Russian Federation-Kamchatka | 06:50 | 01:22 | 18:32 | PTWC and National TWC |
| Russian Federation - Sukhalin | 06:51 | 00:47 | 17:56 | National TWC |
| Singapore | 06:55 | 06:55 | 0:00 | PTWC |
| United States | 06:44 | 10:46 | 4:02 | - |

Table 5.7 Time of national warnings issued by countries (UTC). “Time lapse” is period between earthquake awareness and issuance of first warning. “Information for warning” is the source on which the warning was based. See also Figure 5.2.

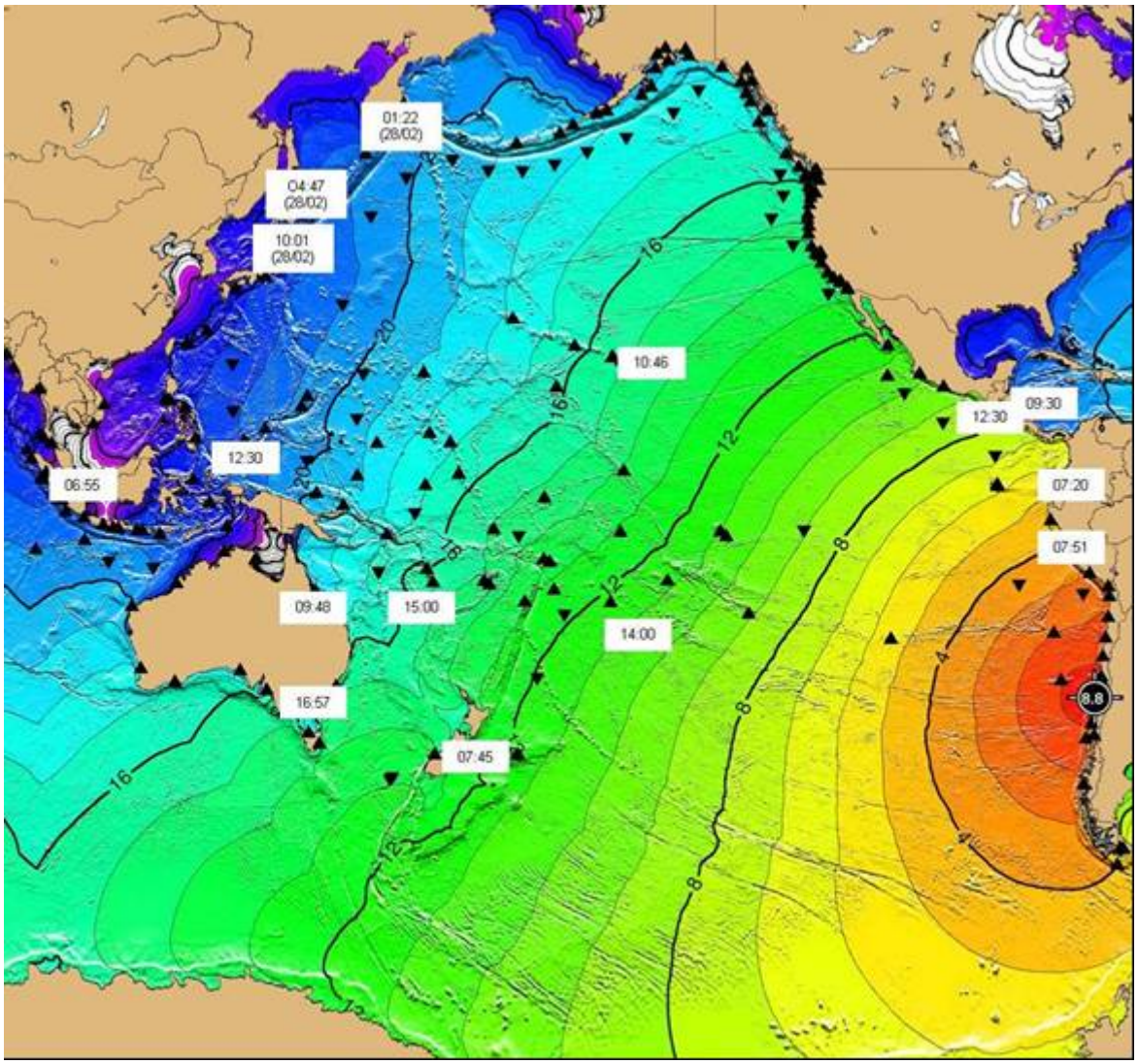



Figure 5.2 Time of official tsunami warnings issued by countries and modelled tsunami arrival times. All times in UTC.

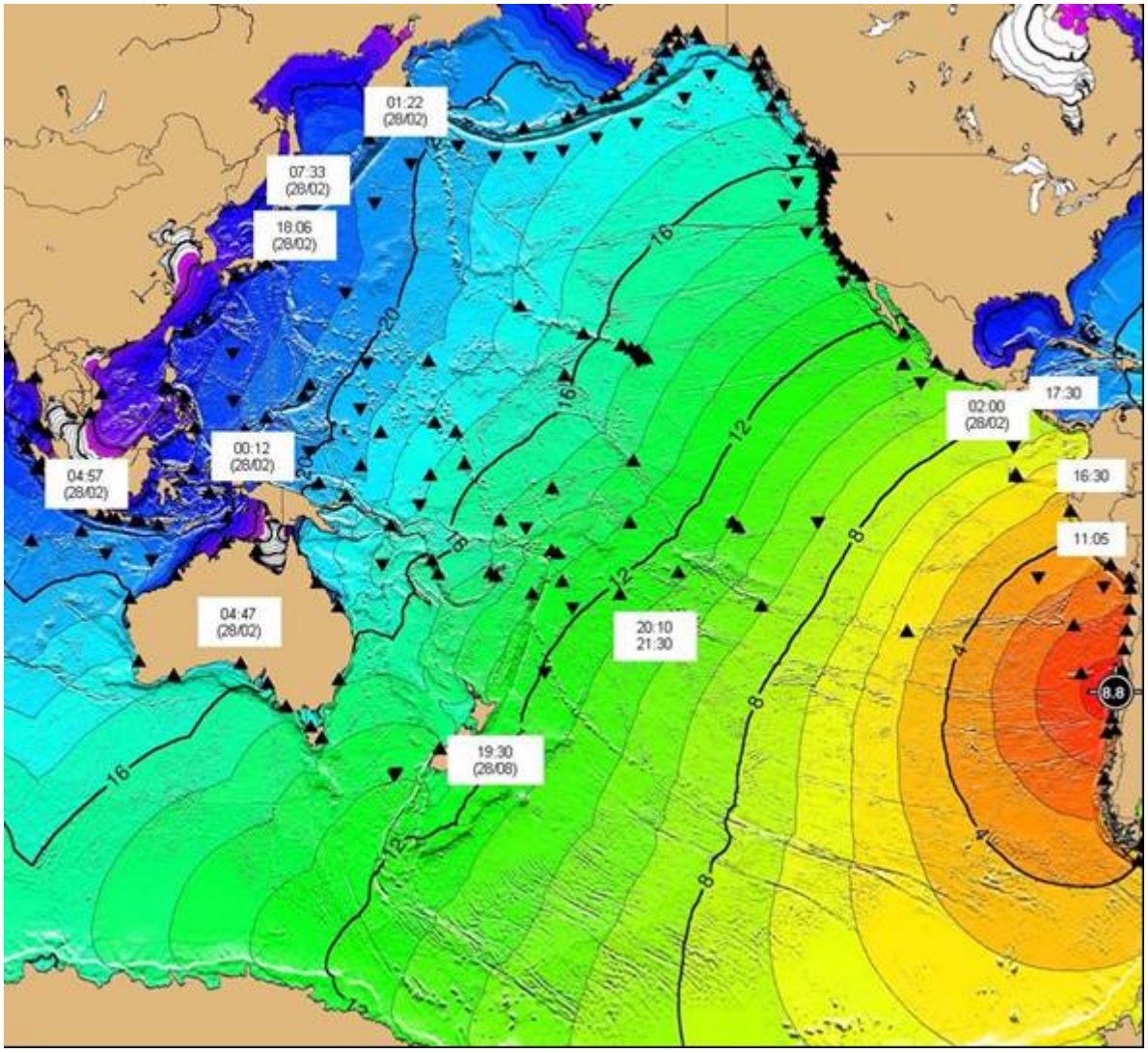



Figure 5.3 Time of warning cancellation for countries that issued warnings and modelled tsunami travel times. All times in UTC.

| Country | Time of warning | Cancel time | Time on alert (hh:mm) | Reason for cancellation | Mode of cancellation |
|---|---|---|---|---|---|
| Australia | 09:48<br>16:57 | 04:47<br>(28/02) | 18:59 | Sea-level gauge observations below marine threat threshold for extended period | Phone, fax, radio, television, Web pages |
| Ecuador | 07:20 | 16:30 | 09:10 | It was confirmed that sea level did not increase drastically according to the sea level stations near the Ecuadorian coasts. Aditionally, according to the arrival time, no | Web INOCAR, Press bulletin, Email, phone and radio |

| Country | Time of warning | Cancel time | Time on alert (hh:mm) | Reason for cancellation | Mode of cancellation |
|---|---|---|---|---|---|
| | | | | destructive effects were estimated for Ecuadorian coasts. | |
| El Salvador | 12:30 | 02:00 (28/02) | 13:30 | PTWC cancellation | Fax and email |
| France-New Caledonia | 15:00 | N/A | | The tsunami had already passed by the coasts. | Radio, fax |
| French Polynesia | 14:00 | 20:10 except for Marquesas (21:30) | 06:10 / 07:30 | Tsunami risk discarded. | Media (radio, TV) |
| Japan | 00:33 (28/02) | 18:06 (28/02) | 17:33 | Tsunami danger had passed. | Fax and online systemto mass media, governmental disaster management organizations, local governments, etc |
| New Zealand | 11:00 | 19:35 (28/02) | 1 day and 08:35 | Scientific assessment information: sea level data. | Via the National Warning System to all response and media agencies using email, SMS and fax. Media forwarded this message to the public using TV and radio broadcasts |
| Nicaragua | 9:30 | 17:30 | 8:00 | The impact time had passed and there was no impact registed in the southern countries. | Media, radio, prensa, TV |
| Palau | 12:30 | 00:12 (28/02) | 11:42 | Little or no destructive waves recorded. | NWS office |
| Peru | 7:51 | 11:05 | 03:14 | Short wave from tidal gauge. | Phone |
| Russian Federation – Kamchatka TWC | 01:22 (28/02) | 07:00 (28/02) | 05:38 | According to supervision, the amplitude did not exceed 0.20 m. | Phone, fax, email |
| Russian Federation-Sukhalin TWC | 00:47 (28/02) | 07:33 (28/02) | 06:46 | Small fluctuations of the sea level. | Telegraph channel, TV, radio, phone |
| Thailand | 06:55 | 04:57 (28/02) | 22:02 | There was no effect in Thailand. | SMS, fax, opencare |

Table 5.8 Time of warning cancellation for those countries that issued warnings (UTC). Time on alert indicates the time between warning issuance and cancellation. See also Figure 5.3.

| Country | Time | Response |
|---|---|---|
| Australia | On issue of Watch 08:45 | Emergency Management Australia advised State emergency service managers and federal government ministers. |
| | On issue of Warning 10:00 | State emergency services alerted coastal units |
| | From predicted tsunami arrival time – approx 21:00 | Surf-Life Saving closed beaches to swimming |
| China – Hong Kong | 06:50 (27 Feb) | Monitor sea-level readings and tsunami messages |
| | 07:21 (27 Feb) | Issue a press release on earthquake |
| | 11:30 (28 Feb) | Issue a press release on conclusion of the event |
| Colombia | From 10:00 and over the day | DGR phone communication with local committees of Emergency Management in the Colombian coast to inform that there was no danger. |
| | From 12:00 | Press release from the National Institution of Risk Management to the press and community, informing the absence of danger for Colombia. |
| Ecuador | 8:00 | Constant communication with INOCAR |
| | Over the day | Constant communication with the President of the country. |
| El Salvador | 12:30 | National press conference to issue tsunami warning |
| | 13:00 | National institutions related to emergency management were contacted (National Police, Navy, Civil Defence, etc). |
| France- New Caledonia | 16:00 | Census of information regarding the distribution of messages. |
| French Polynesia | 08:30 | Cell crisis established with High Commisionner – Civil Defence. |
| | 09:30 – 10:00 | Majors and communes advertised by High Commisionner. |
| | 14:00 | Sirens |
| New Zealand | Commenced at 06:55- ongoing | MCDEM Duty Team responded to the bulletins as received by PTWC and according to our set Standard Operating Procedures. |
| | Commenced at 07:38 - ongoing | Issuing of national advisories and warnings to repose agencies and the public via the National Warning System (managed and operated by MCDEM). This began with the first PTWC bulletin and finished after the threat having passed for New Zealand. |
| | 09:00 (27 Feb) – 19:35 (28 Feb) | The National Crisis Management Centre (NCMC) an all-of-Government facility providing for the national management of an emergency was activated by MCDEM and used by MCDEM and other national level response agencies for the entirety of the event until stand down following the threat having passed for New Zealand. |
| | 07:38 (27 Feb) – 19:35 (28 Feb) | Media liaison and issuing of public information took place from the NCMC following the first PTWC Bulletin and up until the issuing of the Cancellation of the National Warning at 1935Z (28 Feb). |
| Nicaragua | 07:00 | Monitoring of the information received |
| | 17:00 | Warning cancellation |
| Palau | 11:30 | Alert NEC members |
| | 12:30 | Issue public announcement via radio station, TV |
| Russian Federation- | 23:23 | National Disaster Management Organization was brought |

| Country | Time | Response |
|---|---|---|
| Kamchatka TWC | | into the higher state of readiness. |
| Russian Federation-Sukhalin TWC | 00:47 | Dissemination of the tsunami warning |
| Thailand | 06:56 | Department of Disaster Prevention and Mitigation |
| | 06:57 | Miang Island |
| | 06:58 | Navy |

Table 5.9 Actions taken by National Disaster Management Organisations

| Country | Warning Time | Evacuation Area | Evacuation Time | Number of people evacuated |
|---|---|---|---|---|
| Australia | 09:48 | Kingston, Norfolk Island | Aprox. 18:30 | 200 |
| Chile | Some people evacuated by own initiative or by guided by local authorites. | | | |
| France- New Caledonia | 15:00 | Coastal lines and east coast | N/A | N/A |
| | 15:00 | Coast lines at Loyaute Islands | N/A | N/A |
| French Polynesia | 14:00 | French Polynesia | 14:00 - 15:00 | Several thousands |
| Ecuador | 07:20 | Galapagos Islands | 10:55 | Around 300,000 |
| Japan | 00:33 (28 Feb) | Hokkaido Prefecture | unknown | 7,465 |
| | | Aomori Prefecture | unknown | 3,014 |
| | | Iwate Prefecture | unknown | 10,117 |
| | | Miyagi Prefecture | unknown | 12,512 |
| | | Fukushima Prefecture | unknown | 931 |
| | | Ibaraki Prefecture | unknown | 768 |
| | | Chiba Prefecture | unknown | 383 |
| | | Kanagawa Prefecture | unknown | 355 |
| | | Tokyo | unknown | 492 |
| | | Shizuoka Prefecture | unknown | 2,679 |
| | | Aichi Prefecture | unknown | 104 |
| | | Mie Prefecture | unknown | 3,460 |
| | | Wakayama Prefecture | unknown | 442 |
| | | Tokushima Prefecture | unknown | 229 |
| | | Ehime Prefecture | unknown | 1,909 |
| | | Kochi Prefecture | unknown | 3,483 |
| | | Oita Prefecture | unknown | 374 |
| | | Miyazaki Prefecture | unknown | 344 |
| | | Kagoshima Prefecture | unknown | 926 |
| | | Okinawa Prefecture | unknown | 13,229 |
| New Zealand | 11:00 | Hawkes Bay (self evacuation) | unknown | unknown |
| | | Gisborne (self evacuation) | unknown | unknown |
| | | Tararua District (self evacuation) | unknown | unknown |
| | | Horowhena District (self evacuation) | unknown | unknown |
| Peru | 7:51 | Mollendo Beach | 08:50 | 800 |
| | | ILO city | 08:00 | 2500 |

| Country | Warning Time | Evacuation Area | Evacuation Time | Number of people evacuated |
|---|---|---|---|---|
| Russian Federation-Sukhalin TWC | 00:47 | Severo-Kourilsk, | 00:50 – 01:05 | 100 |
| | | YuzhnoKurilsk | 00:50 – 01:05 | 15 |
| | | Bourevestnik, | 00:50 – 01:05 | 10 |
| | | Malo-Kurilsk, | 00:50 – 01:05 | 8 |
| Tuvalu | 12:00 | Funafuti Coastal Area | 12:00-08:00 | 800 |
| | | Vaitupu | 12:00-08:00 | 980 |
| | | Nui | 12:00-08:00 | 210 |

Table 5.10 Evacuations by countries. All times in UTC

| Country | Sea Level Station | Monitoring method |
|---|---|---|
| Australia | Honiara, Solomon Is | Other (Bureau of Meteorology comms links) |
| | Luganville, Vanuatu | Other (Bureau of Meteorology comms links) |
| | Port Vila, Vanuatu | Other (Bureau of Meteorology comms links) |
| | Avatiu, Cook Is | Other (Bureau of Meteorology comms links) |
| | Nuku'alofa, Tonga | Other (Bureau of Meteorology comms links) |
| | Apia, Samoa | Other (Bureau of Meteorology comms links) |
| | Suva, Fiji | Other (Bureau of Meteorology comms links) |
| | Lautoka, Fiji | Other (Bureau of Meteorology comms links) |
| | Fongfale, Tuvalu | Other (Bureau of Meteorology comms links) |
| | Betio, Kiribati | Other (Bureau of Meteorology comms links) |
| | Aiwo, Nauru | Other (Bureau of Meteorology comms links) |
| | Uliga, Marshall Is | Other (Bureau of Meteorology comms links) |
| | Dekehtik, FSM | Other (Bureau of Meteorology comms links) |
| | Cape Ferguson, Qld | Other (Bureau of Meteorology comms links) |
| | Rosslyn Bay, Qld | Other (Bureau of Meteorology comms links) |
| | Port Kembla, NSW | Other (Bureau of Meteorology comms links) |
| | Burnie, Tas | Other (Bureau of Meteorology comms links) |
| | Spring Bay, Tas | Other (Bureau of Meteorology comms links) |
| | Southport, Tas | Other (Bureau of Meteorology comms links) |
| | Jackson Bay, NZ | Other (Bureau of Meteorology comms links) |
| | DART 32401, Chile | Other (Direct comms to US DART data server) |
| | DART 32412 Peru | Other (Direct comms to US DART data server) |
| | DART 55013 Australia | Other (Direct comms to US DART data server) |
| | DART 55015 Australia | Other (Direct comms to US DART data server) |
| Chile | Valparaíso | Other |
| | San Antonio | Other |
| | Talcahuano | Other |
| | Corral | Other |
| | Juan Fernández | Other |
| | Coquimbo | Other |
| | Isla de Pascua | Other |
| | San Felix | Other |

| Country | Sea Level Station | Monitoring method |
|---|---|---|
| Colombia | San Felix CL | IOC Sea Level Monitoring Facility |
| | Talcahuano CL | IOC Sea Level Monitoring Facility |
| | Callao, La Punta Peru | IOC Sea Level Monitoring Facility |
| Ecuador | Valparaíso | GTS |
| | Talcahuano | GTS |
| | Callao | GTS |
| | San Cristobal | GTS |
| | Baltra | GTS |
| El Salvador | Talcahuano CL | IOC Sea Level Monitoring Facility |
| | Valparaíso CL | IOC Sea Level Monitoring Facility |
| | DART Peru | IOC Sea Level Monitoring Facility |
| | DART Marquesas | IOC Sea Level Monitoring Facility |
| | DART Panama | IOC Sea Level Monitoring Facility |
| France- New Caledonia | Sea level station of the Hydrographic Service of the National Navy (Ducos) | Other |
| French Polynesia - Tahiti | 32412 DART | IOC Sea Level Monitoring Facility |
| | 52406 DART | IOC Sea Level Monitoring Facility |
| | Easter Island | GTS and IOC Sea Level Monitoring Facility |
| | Rikiteae | GTS and IOC Sea Level Monitoring Facility |
| | Papeete | GTS and IOC Sea Level Monitoring Facility |
| | Hiva Oa | GTS and IOC Sea Level Monitoring Facility |
| | Nuku Hiva | GTS and IOC Sea Level Monitoring Facility |
| Japan | Severo Kurilsk | GTS |
| | Ust Kamchatsk | GTS |
| | Adak | GTS |
| | Dutch Harbour | GTS |
| | Kodiak | GTS |
| | Midway Is. | GTS |
| | Tern, Fr. Frigate | GTS |
| | Hilo | GTS |
| | Honolulu | GTS |
| | Johnston Is. | GTS |
| | Wake Is. | GTS |
| | Saipan | GTS |
| | Pago Pago | GTS |
| | Quarry Bay | GTS |
| | Shek Pik | GTS |
| | Qui Nhon | GTS |
| | Vung Tau | GTS |
| | Subic Bay | GTS |
| | Manila | GTS |
| | Davao | GTS |
| | Legaspi | GTS |
| | Yap | GTS |
| | Pohnpei | GTS |

| Country | Sea Level Station | Monitoring method |
|---|---|---|
| Japan | Kapingamarangi | GTS |
| | Malakal | GTS |
| | Manus | GTS |
| | Honiara | GTS |
| | Majuro | GTS |
| | Nauru | GTS |
| | Funafuti | GTS |
| | Port Vila | GTS |
| | Lautoka | GTS |
| | Suva | GTS |
| | Nuku Alofa | GTS |
| | Jackson Bay | GTS |
| | Betio | GTS |
| | Kanton | GTS |
| | Christmas | GTS |
| | Apia | GTS |
| | Penrhyn | GTS |
| | Rarotonga | GTS |
| | Rikitea | GTS |
| | Astoria | GTS |
| | Monterey | GTS |
| | Socorro Is. | GTS |
| | Santa Cruz | GTS |
| | Callao | GTS |
| | Iquique | GTS |
| | Antofagasta | GTS |
| | Coquimbo | GTS |
| | Juan Fernández | GTS |
| | San Antonio | GTS |
| | Talcahuano | GTS |
| | Corral | GTS |
| | Puerto Montt | GTS |
| | Ancud | GTS |
| | San Pedro | GTS |
| | Puerto Williams | GTS |
| | Easter | GTS |
| | Port Kembla | GTS |
| | Spring Bay | GTS |
| | Hanasaki | Other |
| | Ofunato | Other |
| | Omaezaki | Other |
| | Tosashimizu | Other |
| | Naha | Other |
| | Ishigakijima | Other |

| Country | Sea Level Station | Monitoring method |
|---|---|---|
| New Zealand | New Zealand Stations | Other |
| | South Pacific Stations | IOC Sea Level Monitoring Facility |
| Palau | 32412 | GTS |
| | 21413 | GTS |
| | 21418 | GTS |
| | 55015 | GTS |
| | 23401 | GTS |
| Peru | NDBC Station 42407 | IOC Sea Level Monitoring Facility |
| | Tidal Gauge Callo | Other |
| | Tidal Gauge Matarini | Other |
| | Tidal Gauge San Juan | Other |
| | Tidal Gauge Mollendo | Other |
| Russian Federation – Sukhalin TWC | Kahului | GTS and IOC Sea Level Monitoring Facility |
| | Alaska Station | Other |
| | Japan Station | Other |
| | Russian Stations | Other |
| Russian Federation - Kamchatka | Vodopadnaya | Other |
| | Petropavlovsk-Kamchatski | Other |
| | Bering's Island | Other |
| Thailand | 32412 | GTS |
| | 21413 | GTS |
| | 21418 | GTS |
| | 55015 | GTS |
| | 23401 | GTS |

Table 5.11 Sea level stations monitored by countries

## 6. SUMMARY

A series of severe earthquakes hit Central Chile on Saturday, 27th February 2010. The main shock off Concepcion at 06:34 UTC (3:34 AM local time) had a magnitude of 8.8 Mw. The Pacific Tsunami Warning Center PTWC in Hawaii, USA issued a regional warning at 06:46 UTC (12 minutes after the event). This was the first ocean wide scale test of a system that was put in place nearly 50 years ago by UNESCO's Member States through its Intergovernmental Oceanographic Commission (IOC), after a 9.5 magnitude earthquake on May 22, 1960 off Chile triggered a wide ocean tsunami that killed people in Hawaii and in Japan, several hours after the earthquake.

As indicated above, 12 minutes after the 27th February 2010 earthquake the Pacific Ocean Tsunami Warning System (PTWS) went into action, with timely and adequate information produced and disseminated across the Pacific Ocean. However, near the epicenter, official accounts indicate 156 fatalities due to the tsunami. Preliminary measures of a Rapid Survey Team deployed the week after the event by UNESCO showed run up measurements as high as 30 meters with most common measurements between 6 and 10 meters in the most affected area of the central-southern Chilean coast.

This earthquake and tsunami event presented an ideal opportunity to assess the performance of the PTWS. To that end the UNESCO IOC Secretariat for the PTWS sent out a post-event survey questionnaire to the Tsunami Warning Focal Points (TWFPs) and Tsunami National Contacts

(TNCs) from its 32 Member States and territories. This report has been prepared by the Secretariat based on the responses received from 19 TWFPs and TNCs. Factual details of the earthquake event and the tsunami are presented and the results of the survey are listed in tables and displayed as timelines and maps.

It is beyond the scope of this report to conduct a detailed interpretation of the results; however it is expected that the survey results are useful for individual Member States and the PTWS to draw conclusions from this exercise and decide on future action. In this regard, some highlights can be noted:

- From the 19 response, 18 National Tsunami Warning Centres (NTWCs) received the first bulletins from PTWC and or WC/ATWC.
- 16 NTWCs received subsequent tsunami bulletins from PTWC.
- 17 NTWCs received information from other sources other than PTWC and or WC/ATWC.
- 9 Member States and territories took some action before receiving the PTWC and or WC/ATWC bulletin.
- 17 Member States and territories took some action after receiving the PTWC and or WC/ATWC bulletin.
- **14 Member States and territories issued a tsunami warning.**
- 3 Member States and territories reported communication problems when issuing the warning.
- In 9 Member States there were areas evacuated.
- 8 Member States forecasted tsunami wave height.
- 15 Member States and territories monitored sea level.
  - 7 through the World Metorological Organisation (WMO)'s Global Telecommunications Systems (GTS).
  - 7 through the IOC Sea Level Station Monitoring Facility.
  - 8 by other methods.
- 11 undertook their own earthquake analysis.
- **12 NTWCs used numerical models in their analysis.**
- 9 Member States affirmed to have knowledge on how to access sea level data through GTS.
- 10 Member States affirmed to have knowledge on how to access sea level data through the IOC Sea Level Station Monitoring Facility website.

We underscore that all NTWCs received the first PTWC bulletin. However, not all NTWCs reported to have received all the PTWC bulletins. In addition, most of the countries reported PTWC as source of awareness of the earthquake. Furthermore, some countries undertook actions before the reception of the PTWC bulletin. Among these actions, it was mentioned: (1) Seismic monitoring; (2) Sea level monitoring; (3) Gathering of especialized personnel.

In addition, as mentioned before, 14 countries issued tsunami a warning. The media (radio, TV and/or press) was used as communication channel by 11 of the Member States and territories for both emission and cancellation of the warning. Three countries reported communication problems (i.e. no answer from the part of the concerned institutions because of holiday; insufficient technical

capacity to answer public calls – saturation of phone lines; zones that were not covered by the network GSM).

Furthermore, in 9 Member States coastal zones were evacuated. The decision of issuing an evacuation order is based on the estimation of the tsunami travel time, the wave height and the identification of the potentially impacted zones. In this regard, evacuations were carried out where it was considered necessary from a technical point of view. It would be pertinent that each Member State analyse if an evacuation would have been necessary in zones where no evacuation was made. In 4 countries, some areas were evacuated preventively (self-evacuation). Moreover, it was observed that sea level was monitored by most of the countries. Moreover, some countries also used numerical modelling and calculated earthquake parameters.

Based on data and information collected from Member States the PTWS acted promptly and efficiently throughout the Pacific. However, and at the same time, this event demonstrated the need to reinforce the work of PTWS for near field events, particularly with denser sea level real time networks close to active subduction areas. Indeed, as it has been demonstrated by the case of the sea level station in Talcahuano, Chile, sea level stations close to the epicenter may be partially or totally destroyed by the impact of a tsunami. Given the critical role sea level readings play in tsunami warning systems, the sea level monitoring networks should be densified close to active subduction areas.

Most of the issues revealed by the survey can be addressed both by the PTWS and at the national level through increased regional cooperation and training where needed. Post-event assessments assist in this process by highlighting the strengths and weaknesses of the PTWS at regional, national and local levels and by raising the awareness of how Member States responded, both individually and collectively. The true value of such assessments is that it allows Member States to share information and experiences for the mutual benefit of improving the PTWS for all members.

## 7. REFERENCES

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ANNEX I

# PTWC BULLETINS

## PTWC MESSAGES – 27 FEBRUARY 2010

**TSUNAMI BULLETIN NUMBER 001**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0646Z 27 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A TSUNAMI WARNING AND WATCH ARE IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU

A TSUNAMI WATCH IS IN EFFECT FOR

ECUADOR

FOR ALL OTHER AREAS COVERED BY THIS BULLETIN... IT IS FOR INFORMATION ONLY AT THIS TIME.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.5

EVALUATION

IT IS NOT KNOWN THAT A TSUNAMI WAS GENERATED. THIS WARNING IS BASED ONLY ON THE EARTHQUAKE EVALUATION. AN EARTHQUAKE OF THIS SIZE HAS THE POTENTIAL TO GENERATE A DESTRUCTIVE TSUNAMI THAT CAN STRIKE COASTLINES NEAR THE EPICENTER WITHIN MINUTES AND MORE DISTANT COASTLINES WITHIN HOURS. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL MONITOR SEA LEVEL DATA FROM GAUGES NEAR THE EARTHQUAKE TO DETERMINE IF A TSUNAMI WAS GENERATED AND ESTIMATE THE SEVERITY OF THE THREAT.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |

| | | | |
|---|---|---|---|
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
| | IQUIQUE | 20.2S 70.1W | 0911Z 27 FEB |
| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING AND WATCH WILL REMAIN IN EFFECT UNTIL
FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 002**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0745Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... A TSUNAMI WARNING AND WATCH ARE IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU

A TSUNAMI WATCH IS IN EFFECT FOR

ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA

FOR ALL OTHER AREAS COVERED BY THIS BULLETIN... IT IS FOR
INFORMATION ONLY AT THIS TIME.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY
NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.6

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

TALCAHUANO CL 36.7S 73.4W 0652Z 1.15M / 3.8FT 46MIN

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER AND COULD ALSO BE A THREAT TO MORE DISTANT COASTS. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
| | IQUIQUE | 20.2S 70.1W | 0911Z 27 FEB |
| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |
| | BALTRA IS. | 0.5S 90.3W | 1313Z 27 FEB |
| COLOMBIA | TUMACO | 1.8N 78.9W | 1253Z 27 FEB |
| | BAHIA SOLANO | 6.3N 77.4W | 1327Z 27 FEB |
| | BUENAVENTURA | 3.8N 77.2W | 1340Z 27 FEB |
| ANTARCTICA | THURSTON IS. | 72.0S 100.0W | 1312Z 27 FEB |
| PANAMA | PUERTO PINA | 7.4N 78.1W | 1331Z 27 FEB |
| | PUNTA MALA | 7.5N 79.9W | 1334Z 27 FEB |
| | PUNTA BURICA | 8.0N 82.8W | 1340Z 27 FEB |
| COSTA RICA | CABO MATAPALO | 8.4N 83.3W | 1344Z 27 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING AND WATCH WILL REMAIN IN EFFECT UNTIL

FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

TSUNAMI BULLETIN NUMBER 003
PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 0844Z 27 FEB 2010

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A TSUNAMI WARNING AND WATCH ARE IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU

A TSUNAMI WATCH IS IN EFFECT FOR

ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA

FOR ALL OTHER AREAS COVERED BY THIS BULLETIN... IT IS FOR INFORMATION ONLY AT THIS TIME.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0652Z | 1.15M / 3.8FT | 46MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER AND COULD ALSO BE A THREAT TO MORE DISTANT COASTS. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT

OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
| | IQUIQUE | 20.2S 70.1W | 0911Z 27 FEB |
| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| | PUERTO WILLIAMS | 54.8S 68.2W | 1404Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |
| | BALTRA IS. | 0.5S 90.3W | 1313Z 27 FEB |
| COLOMBIA | TUMACO | 1.8N 78.9W | 1253Z 27 FEB |
| | BAHIA SOLANO | 6.3N 77.4W | 1327Z 27 FEB |
| | BUENAVENTURA | 3.8N 77.2W | 1340Z 27 FEB |
| ANTARCTICA | THURSTON IS. | 72.0S 100.0W | 1312Z 27 FEB |
| PANAMA | PUERTO PINA | 7.4N 78.1W | 1331Z 27 FEB |
| | PUNTA MALA | 7.5N 79.9W | 1334Z 27 FEB |
| | PUNTA BURICA | 8.0N 82.8W | 1340Z 27 FEB |
| COSTA RICA | CABO MATAPALO | 8.4N 83.3W | 1344Z 27 FEB |
| | PUERTO QUEPOS | 9.4N 84.2W | 1417Z 27 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING AND WATCH WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

TSUNAMI BULLETIN NUMBER 004
PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 0947Z 27 FEB 2010

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A TSUNAMI WARNING AND WATCH ARE IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR

A TSUNAMI WATCH IS IN EFFECT FOR

COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA /
PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA

FOR ALL OTHER AREAS COVERED BY THIS BULLETIN... IT IS FOR
INFORMATION ONLY AT THIS TIME.

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DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0832Z | 0.40M / 1.3FT | 58MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED. IT MAY HAVE
BEEN DESTRUCTIVE ALONG COASTS NEAR THE EARTHQUAKE EPICENTER AND
COULD ALSO BE A THREAT TO MORE DISTANT COASTS. AUTHORITIES SHOULD
TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY. THIS
CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE
EXTENT AND SEVERITY OF THE THREAT.

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AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT
OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME
THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN
CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL
CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE
ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS
WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL
ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE
LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN
SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
| | IQUIQUE | 20.2S 70.1W | 0911Z 27 FEB |
| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| | PUERTO WILLIAMS | 54.8S 68.2W | 1404Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |
| | BALTRA IS. | 0.5S 90.3W | 1313Z 27 FEB |
| COLOMBIA | TUMACO | 1.8N 78.9W | 1253Z 27 FEB |
| | BAHIA SOLANO | 6.3N 77.4W | 1327Z 27 FEB |
| | BUENAVENTURA | 3.8N 77.2W | 1340Z 27 FEB |
| ANTARCTICA | THURSTON IS. | 72.0S 100.0W | 1312Z 27 FEB |
| PANAMA | PUERTO PINA | 7.4N 78.1W | 1331Z 27 FEB |
| | PUNTA MALA | 7.5N 79.9W | 1334Z 27 FEB |
| | PUNTA BURICA | 8.0N 82.8W | 1340Z 27 FEB |
| | BALBOA HTS. | 9.0N 79.6W | 1457Z 27 FEB |
| COSTA RICA | CABO MATAPALO | 8.4N 83.3W | 1344Z 27 FEB |
| | PUERTO QUEPOS | 9.4N 84.2W | 1417Z 27 FEB |
| | CABO SAN ELENA | 10.9N 86.0W | 1452Z 27 FEB |
| NICARAGUA | SAN JUAN DL SUR | 11.2N 85.9W | 1452Z 27 FEB |
| | PUERTO SANDINO | 12.2N 86.8W | 1512Z 27 FEB |
| | CORINTO | 12.5N 87.2W | 1520Z 27 FEB |
| PITCAIRN | PITCAIRN IS. | 25.1S 130.1W | 1455Z 27 FEB |
| HONDURAS | AMAPALA | 13.2N 87.6W | 1520Z 27 FEB |
| EL SALVADOR | ACAJUTLA | 13.6N 89.8W | 1531Z 27 FEB |
| GUATEMALA | SIPICATE | 13.9N 91.2W | 1539Z 27 FEB |
| FR. POLYNESIA | RIKITEA | 23.1S 135.0W | 1542Z 27 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING AND WATCH WILL REMAIN IN EFFECT UNTIL
FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 005**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1045Z 27 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA /
COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR /

GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI /
KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA /
SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI /
AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU /
HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. /
NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA /
POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA /
N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES /
CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| IQUIQUE CL | 20.2S | 70.1W | 0906Z | 0.27M / 0.9FT | 72MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| ARICA CL | 18.5S | 70.3W | 1007Z | 0.94M / 3.1FT | 44MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
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| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| | PUERTO WILLIAMS | 54.8S 68.2W | 1404Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |
| | BALTRA IS. | 0.5S 90.3W | 1313Z 27 FEB |
| COLOMBIA | TUMACO | 1.8N 78.9W | 1253Z 27 FEB |
| | BAHIA SOLANO | 6.3N 77.4W | 1327Z 27 FEB |
| | BUENAVENTURA | 3.8N 77.2W | 1340Z 27 FEB |
| ANTARCTICA | THURSTON IS. | 72.0S 100.0W | 1312Z 27 FEB |
| | CAPE ADARE | 71.0S 170.0E | 1650Z 27 FEB |
| PANAMA | PUERTO PINA | 7.4N 78.1W | 1331Z 27 FEB |
| | PUNTA MALA | 7.5N 79.9W | 1334Z 27 FEB |
| | PUNTA BURICA | 8.0N 82.8W | 1340Z 27 FEB |
| | BALBOA HTS. | 9.0N 79.6W | 1457Z 27 FEB |
| COSTA RICA | CABO MATAPALO | 8.4N 83.3W | 1344Z 27 FEB |
| | PUERTO QUEPOS | 9.4N 84.2W | 1417Z 27 FEB |
| | CABO SAN ELENA | 10.9N 86.0W | 1452Z 27 FEB |
| NICARAGUA | SAN JUAN DL SUR | 11.2N 85.9W | 1452Z 27 FEB |
| | PUERTO SANDINO | 12.2N 86.8W | 1512Z 27 FEB |
| | CORINTO | 12.5N 87.2W | 1520Z 27 FEB |
| PITCAIRN | PITCAIRN IS. | 25.1S 130.1W | 1455Z 27 FEB |
| HONDURAS | AMAPALA | 13.2N 87.6W | 1520Z 27 FEB |
| EL SALVADOR | ACAJUTLA | 13.6N 89.8W | 1531Z 27 FEB |
| GUATEMALA | SIPICATE | 13.9N 91.2W | 1539Z 27 FEB |
| FR. POLYNESIA | RIKITEA | 23.1S 135.0W | 1542Z 27 FEB |
| | HIVA OA | 10.0S 139.0W | 1723Z 27 FEB |
| | PAPEETE | 17.5S 149.6W | 1748Z 27 FEB |
| MEXICO | PUERTO MADERO | 14.8N 92.5W | 1552Z 27 FEB |
| | ACAPULCO | 16.9N 99.9W | 1615Z 27 FEB |
| | MANZANILLO | 19.1N 104.3W | 1709Z 27 FEB |
| | SOCORRO | 18.8N 111.0W | 1719Z 27 FEB |
| | CABO SAN LUCAS | 22.8N 110.0W | 1749Z 27 FEB |
| | MAZATLAN | 23.2N 106.4W | 1753Z 27 FEB |
| | PUNTA ABREOJOS | 26.7N 113.6W | 1856Z 27 FEB |
| | ENSENADA | 31.8N 116.8W | 2016Z 27 FEB |
| COOK ISLANDS | RAROTONGA | 21.2S 159.8W | 1814Z 27 FEB |
| | PENRYN IS. | 8.9S 157.8W | 1925Z 27 FEB |
| | PUKAPUKA IS. | 10.8S 165.9W | 1950Z 27 FEB |
| KIRIBATI | FLINT IS. | 11.4S 151.8W | 1836Z 27 FEB |
| | MALDEN IS. | 3.9S 154.9W | 1934Z 27 FEB |
| | CHRISTMAS IS. | 2.0N 157.5W | 2028Z 27 FEB |

| | | | |
|---|---|---|---|
| | KANTON IS. | 2.8S 171.7W | 2112Z 27 FEB |
| | TARAWA IS. | 1.5N 173.0E | 2258Z 27 FEB |
| KERMADEC IS | RAOUL IS. | 29.2S 177.9W | 1912Z 27 FEB |
| NIUE | NIUE IS. | 19.0S 170.0W | 1918Z 27 FEB |
| NEW ZEALAND | EAST CAPE | 37.7S 178.5E | 1918Z 27 FEB |
| | GISBORNE | 38.7S 178.0E | 1922Z 27 FEB |
| | DUNEDIN | 45.9S 170.5E | 1952Z 27 FEB |
| | NAPIER | 39.5S 176.9E | 1954Z 27 FEB |
| | WELLINGTON | 41.3S 174.8E | 1955Z 27 FEB |
| | MILFORD SOUND | 44.6S 167.9E | 2005Z 27 FEB |
| | NORTH CAPE | 34.4S 173.3E | 2010Z 27 FEB |
| | BLUFF | 46.6S 168.3E | 2030Z 27 FEB |
| | LYTTELTON | 43.6S 172.7E | 2040Z 27 FEB |
| | AUCKLAND(E) | 36.7S 175.0E | 2056Z 27 FEB |
| | NELSON | 41.3S 173.3E | 2127Z 27 FEB |
| | WESTPORT | 41.8S 171.6E | 2129Z 27 FEB |
| | AUCKLAND(W) | 37.1S 174.2E | 2140Z 27 FEB |
| | NEW PLYMOUTH | 39.1S 174.1E | 2219Z 27 FEB |
| TONGA | NUKUALOFA | 21.0S 175.2W | 1940Z 27 FEB |
| AMERICAN SAMOA | PAGO PAGO | 14.3S 170.7W | 1951Z 27 FEB |
| SAMOA | APIA | 13.8S 171.8W | 2006Z 27 FEB |
| JARVIS IS. | JARVIS IS. | 0.4S 160.1W | 2026Z 27 FEB |
| WALLIS-FUTUNA | WALLIS IS. | 13.2S 176.2W | 2028Z 27 FEB |
| TOKELAU | NUKUNONU IS. | 9.2S 171.8W | 2030Z 27 FEB |
| FIJI | SUVA | 18.1S 178.4E | 2104Z 27 FEB |
| AUSTRALIA | HOBART | 43.3S 147.6E | 2105Z 27 FEB |
| | SYDNEY | 33.9S 151.4E | 2146Z 27 FEB |
| | BRISBANE | 27.2S 153.3E | 2310Z 27 FEB |
| | GLADSTONE | 23.8S 151.4E | 0101Z 28 FEB |
| | CAIRNS | 16.7S 145.8E | 0159Z 28 FEB |
| | MACKAY | 21.1S 149.3E | 0251Z 28 FEB |
| HAWAII | HILO | 19.7N 155.1W | 2119Z 27 FEB |
| | HONOLULU | 21.3N 157.9W | 2152Z 27 FEB |
| | NAWILIWILI | 22.0N 159.4W | 2158Z 27 FEB |
| PALMYRA IS. | PALMYRA IS. | 6.3N 162.4W | 2124Z 27 FEB |
| TUVALU | FUNAFUTI IS. | 7.9S 178.5E | 2125Z 27 FEB |
| VANUATU | ANATOM IS. | 20.2S 169.9E | 2137Z 27 FEB |
| | ESPERITU SANTO | 15.1S 167.3E | 2235Z 27 FEB |
| HOWLAND-BAKER | HOWLAND IS. | 0.6N 176.6W | 2154Z 27 FEB |
| NEW CALEDONIA | NOUMEA | 22.3S 166.5E | 2218Z 27 FEB |
| JOHNSTON IS. | JOHNSTON IS. | 16.7N 169.5W | 2245Z 27 FEB |
| SOLOMON IS. | KIRAKIRA | 10.4S 161.9E | 2321Z 27 FEB |
| | MUNDA | 8.4S 157.2E | 0001Z 28 FEB |
| | GHATERE | 7.8S 159.2E | 0001Z 28 FEB |
| | AUKI | 8.8S 160.6E | 0004Z 28 FEB |
| | HONIARA | 9.3S 160.0E | 0004Z 28 FEB |
| | FALAMAE | 7.4S 155.6E | 0017Z 28 FEB |
| | PANGGOE | 6.9S 157.2E | 0020Z 28 FEB |
| NAURU | NAURU | 0.5S 166.9E | 2331Z 27 FEB |
| MARSHALL IS. | MAJURO | 7.1N 171.4E | 2339Z 27 FEB |
| | KWAJALEIN | 8.7N 167.7E | 0013Z 28 FEB |
| | ENIWETOK | 11.4N 162.3E | 0102Z 28 FEB |
| MIDWAY IS. | MIDWAY IS. | 28.2N 177.4W | 0022Z 28 FEB |
| KOSRAE | KOSRAE IS. | 5.5N 163.0E | 0026Z 28 FEB |
| PAPUA NEW GUINE | AMUN | 6.0S 154.7E | 0036Z 28 FEB |
| | KIETA | 6.1S 155.6E | 0038Z 28 FEB |
| | RABAUL | 4.2S 152.3E | 0102Z 28 FEB |
| | PORT MORESBY | 9.3S 146.9E | 0123Z 28 FEB |
| | LAE | 6.8S 147.0E | 0128Z 28 FEB |
| | KAVIENG | 2.5S 150.7E | 0135Z 28 FEB |
| | MADANG | 5.2S 145.8E | 0154Z 28 FEB |
| | MANUS IS. | 2.0S 147.5E | 0214Z 28 FEB |
| | WEWAK | 3.5S 143.6E | 0237Z 28 FEB |
| | VANIMO | 2.6S 141.3E | 0258Z 28 FEB |
| POHNPEI | POHNPEI IS. | 7.0N 158.2E | 0111Z 28 FEB |
| WAKE IS. | WAKE IS. | 19.3N 166.6E | 0112Z 28 FEB |
| CHUUK | CHUUK IS. | 7.4N 151.8E | 0213Z 28 FEB |

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|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| MARCUS IS. | MARCUS IS. | 24.3N 154.0E | 0248Z 28 FEB |
| INDONESIA | JAYAPURA | 2.4S 140.8E | 0302Z 28 FEB |
| | WARSA | 0.6S 135.8E | 0345Z 28 FEB |
| | MANOKWARI | 0.8S 134.2E | 0405Z 28 FEB |
| | SORONG | 0.8S 131.1E | 0433Z 28 FEB |
| | BEREBERE | 2.5N 128.7E | 0452Z 28 FEB |
| | PATANI | 0.4N 128.8E | 0505Z 28 FEB |
| | GEME | 4.6N 126.8E | 0512Z 28 FEB |
| N. MARIANAS | SAIPAN | 15.3N 145.8E | 0303Z 28 FEB |
| GUAM | GUAM | 13.4N 144.7E | 0311Z 28 FEB |
| YAP | YAP IS. | 9.5N 138.1E | 0352Z 28 FEB |
| BELAU | MALAKAL | 7.3N 134.5E | 0413Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |
| PHILIPPINES | DAVAO | 6.8N 125.7E | 0527Z 28 FEB |
| | PALANAN | 17.1N 122.6E | 0559Z 28 FEB |
| | LEGASPI | 13.2N 123.8E | 0604Z 28 FEB |
| CHINESE TAIPEI | HUALIEN | 24.0N 121.6E | 0626Z 28 FEB |
| | HUALIEN | 24.0N 121.7E | 0626Z 28 FEB |
| | CHILUNG | 25.2N 121.8E | 0654Z 28 FEB |
| | TAITUNG | 22.7N 121.2E | 0655Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 006**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1147Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA /
COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR /
GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI /
KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA /
SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI /
AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU /
HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. /
NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA /
POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA /
N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES /
CHINESE TAIPEI

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NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 007**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1249Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| EASTER CL | 27.2S | 109.5W | 1160Z | 0.44M / 1.4FT | 08MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE

APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
| | IQUIQUE | 20.2S 70.1W | 0911Z 27 FEB |
| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| | PUERTO WILLIAMS | 54.8S 68.2W | 1404Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |
| | BALTRA IS. | 0.5S 90.3W | 1313Z 27 FEB |
| COLOMBIA | TUMACO | 1.8N 78.9W | 1253Z 27 FEB |
| | BAHIA SOLANO | 6.3N 77.4W | 1327Z 27 FEB |
| | BUENAVENTURA | 3.8N 77.2W | 1340Z 27 FEB |
| ANTARCTICA | THURSTON IS. | 72.0S 100.0W | 1312Z 27 FEB |
| | CAPE ADARE | 71.0S 170.0E | 1650Z 27 FEB |
| PANAMA | PUERTO PINA | 7.4N 78.1W | 1331Z 27 FEB |
| | PUNTA MALA | 7.5N 79.9W | 1334Z 27 FEB |
| | PUNTA BURICA | 8.0N 82.8W | 1340Z 27 FEB |
| | BALBOA HTS. | 9.0N 79.6W | 1457Z 27 FEB |
| COSTA RICA | CABO MATAPALO | 8.4N 83.3W | 1344Z 27 FEB |
| | PUERTO QUEPOS | 9.4N 84.2W | 1417Z 27 FEB |
| | CABO SAN ELENA | 10.9N 86.0W | 1452Z 27 FEB |
| NICARAGUA | SAN JUAN DL SUR | 11.2N 85.9W | 1452Z 27 FEB |
| | PUERTO SANDINO | 12.2N 86.8W | 1512Z 27 FEB |
| | CORINTO | 12.5N 87.2W | 1520Z 27 FEB |
| PITCAIRN | PITCAIRN IS. | 25.1S 130.1W | 1455Z 27 FEB |
| HONDURAS | AMAPALA | 13.2N 87.6W | 1520Z 27 FEB |
| EL SALVADOR | ACAJUTLA | 13.6N 89.8W | 1531Z 27 FEB |
| GUATEMALA | SIPICATE | 13.9N 91.2W | 1539Z 27 FEB |

| | | | |
|---|---|---|---|
| FR. POLYNESIA | RIKITEA | 23.1S 135.0W | 1542Z 27 FEB |
| | HIVA OA | 10.0S 139.0W | 1723Z 27 FEB |
| | PAPEETE | 17.5S 149.6W | 1748Z 27 FEB |
| MEXICO | PUERTO MADERO | 14.8N 92.5W | 1552Z 27 FEB |
| | ACAPULCO | 16.9N 99.9W | 1615Z 27 FEB |
| | MANZANILLO | 19.1N 104.3W | 1709Z 27 FEB |
| | SOCORRO | 18.8N 111.0W | 1719Z 27 FEB |
| | CABO SAN LUCAS | 22.8N 110.0W | 1749Z 27 FEB |
| | MAZATLAN | 23.2N 106.4W | 1753Z 27 FEB |
| | PUNTA ABREOJOS | 26.7N 113.6W | 1856Z 27 FEB |
| | ENSENADA | 31.8N 116.8W | 2016Z 27 FEB |
| COOK ISLANDS | RAROTONGA | 21.2S 159.8W | 1814Z 27 FEB |
| | PENRYN IS. | 8.9S 157.8W | 1925Z 27 FEB |
| | PUKAPUKA IS. | 10.8S 165.9W | 1950Z 27 FEB |
| KIRIBATI | FLINT IS. | 11.4S 151.8W | 1836Z 27 FEB |
| | MALDEN IS. | 3.9S 154.9W | 1934Z 27 FEB |
| | CHRISTMAS IS. | 2.0N 157.5W | 2028Z 27 FEB |
| | KANTON IS. | 2.8S 171.7W | 2112Z 27 FEB |
| | TARAWA IS. | 1.5N 173.0E | 2258Z 27 FEB |
| KERMADEC IS | RAOUL IS. | 29.2S 177.9W | 1912Z 27 FEB |
| NIUE | NIUE IS. | 19.0S 170.0W | 1918Z 27 FEB |
| NEW ZEALAND | EAST CAPE | 37.7S 178.5E | 1918Z 27 FEB |
| | GISBORNE | 38.7S 178.0E | 1922Z 27 FEB |
| | DUNEDIN | 45.9S 170.5E | 1952Z 27 FEB |
| | NAPIER | 39.5S 176.9E | 1954Z 27 FEB |
| | WELLINGTON | 41.3S 174.8E | 1955Z 27 FEB |
| | MILFORD SOUND | 44.6S 167.9E | 2005Z 27 FEB |
| | NORTH CAPE | 34.4S 173.3E | 2010Z 27 FEB |
| | BLUFF | 46.6S 168.3E | 2030Z 27 FEB |
| | LYTTELTON | 43.6S 172.7E | 2040Z 27 FEB |
| | AUCKLAND(E) | 36.7S 175.0E | 2056Z 27 FEB |
| | NELSON | 41.3S 173.3E | 2127Z 27 FEB |
| | WESTPORT | 41.8S 171.6E | 2129Z 27 FEB |
| | AUCKLAND(W) | 37.1S 174.2E | 2140Z 27 FEB |
| | NEW PLYMOUTH | 39.1S 174.1E | 2219Z 27 FEB |
| TONGA | NUKUALOFA | 21.0S 175.2W | 1940Z 27 FEB |
| AMERICAN SAMOA | PAGO PAGO | 14.3S 170.7W | 1951Z 27 FEB |
| SAMOA | APIA | 13.8S 171.8W | 2006Z 27 FEB |
| JARVIS IS. | JARVIS IS. | 0.4S 160.1W | 2026Z 27 FEB |
| WALLIS-FUTUNA | WALLIS IS. | 13.2S 176.2W | 2028Z 27 FEB |
| TOKELAU | NUKUNONU IS. | 9.2S 171.8W | 2030Z 27 FEB |
| FIJI | SUVA | 18.1S 178.4E | 2104Z 27 FEB |
| AUSTRALIA | HOBART | 43.3S 147.6E | 2105Z 27 FEB |
| | SYDNEY | 33.9S 151.4E | 2146Z 27 FEB |
| | BRISBANE | 27.2S 153.3E | 2310Z 27 FEB |
| | GLADSTONE | 23.8S 151.4E | 0101Z 28 FEB |
| | CAIRNS | 16.7S 145.8E | 0159Z 28 FEB |
| | MACKAY | 21.1S 149.3E | 0251Z 28 FEB |
| HAWAII | HILO | 19.7N 155.1W | 2119Z 27 FEB |
| | HONOLULU | 21.3N 157.9W | 2152Z 27 FEB |
| | NAWILIWILI | 22.0N 159.4W | 2158Z 27 FEB |
| PALMYRA IS. | PALMYRA IS. | 6.3N 162.4W | 2124Z 27 FEB |
| TUVALU | FUNAFUTI IS. | 7.9S 178.5E | 2125Z 27 FEB |
| VANUATU | ANATOM IS. | 20.2S 169.9E | 2137Z 27 FEB |
| | ESPERITU SANTO | 15.1S 167.3E | 2235Z 27 FEB |
| HOWLAND-BAKER | HOWLAND IS. | 0.6N 176.6W | 2154Z 27 FEB |
| NEW CALEDONIA | NOUMEA | 22.3S 166.5E | 2218Z 27 FEB |
| JOHNSTON IS. | JOHNSTON IS. | 16.7N 169.5W | 2245Z 27 FEB |
| SOLOMON IS. | KIRAKIRA | 10.4S 161.9E | 2321Z 27 FEB |
| | MUNDA | .4S 157.2E | 0001Z 28 FEB |
| | GHATERE | 7.8S 159.2E | 0001Z 28 FEB |
| | AUKI | 8.8S 160.6E | 0004Z 28 FEB |
| | HONIARA | 9.3S 160.0E | 0004Z 28 FEB |
| | FALAMAE | 7.4S 155.6E | 0017Z 28 FEB |
| | PANGGOE | 6.9S 157.2E | 0020Z 28 FEB |
| NAURU | NAURU | 0.5S 166.9E | 2331Z 27 FEB |
| MARSHALL IS. | MAJURO | 7.1N 171.4E | 2339Z 27 FEB |

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|---|---|---|---|
| | KWAJALEIN | 8.7N 167.7E | 0013Z 28 FEB |
| | ENIWETOK | 11.4N 162.3E | 0102Z 28 FEB |
| MIDWAY IS. | MIDWAY IS. | 28.2N 177.4W | 0022Z 28 FEB |
| KOSRAE | KOSRAE IS. | 5.5N 163.0E | 0026Z 28 FEB |
| PAPUA NEW GUINE | AMUN | 6.0S 154.7E | 0036Z 28 FEB |
| | KIETA | 6.1S 155.6E | 0038Z 28 FEB |
| | RABAUL | 4.2S 152.3E | 0102Z 28 FEB |
| | PORT MORESBY | 9.3S 146.9E | 0123Z 28 FEB |
| | LAE | 6.8S 147.0E | 0128Z 28 FEB |
| | KAVIENG | 2.5S 150.7E | 0135Z 28 FEB |
| | MADANG | 5.2S 145.8E | 0154Z 28 FEB |
| | MANUS IS. | 2.0S 147.5E | 0214Z 28 FEB |
| | WEWAK | 3.5S 143.6E | 0237Z 28 FEB |
| | VANIMO | 2.6S 141.3E | 0258Z 28 FEB |
| POHNPEI | POHNPEI IS. | 7.0N 158.2E | 0111Z 28 FEB |
| WAKE IS. | WAKE IS. | 19.3N 166.6E | 0112Z 28 FEB |
| CHUUK | CHUUK IS. | 7.4N 151.8E | 0213Z 28 FEB |
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| MARCUS IS. | MARCUS IS. | 24.3N 154.0E | 0248Z 28 FEB |
| INDONESIA | JAYAPURA | 2.4S 140.8E | 0302Z 28 FEB |
| | WARSA | 0.6S 135.8E | 0345Z 28 FEB |
| | MANOKWARI | 0.8S 134.2E | 0405Z 28 FEB |
| | SORONG | 0.8S 131.1E | 0433Z 28 FEB |
| | BEREBERE | 2.5N 128.7E | 0452Z 28 FEB |
| | PATANI | 0.4N 128.8E | 0505Z 28 FEB |
| | GEME | 4.6N 126.8E | 0512Z 28 FEB |
| N. MARIANAS | SAIPAN | 15.3N 145.8E | 0303Z 28 FEB |
| GUAM | GUAM | 13.4N 144.7E | 0311Z 28 FEB |
| YAP | YAP IS. | 9.5N 138.1E | 0352Z 28 FEB |
| BELAU | MALAKAL | 7.3N 134.5E | 0413Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |
| PHILIPPINES | DAVAO | 6.8N 125.7E | 0527Z 28 FEB |
| | PALANAN | 17.1N 122.6E | 0559Z 28 FEB |
| | LEGASPI | 13.2N 123.8E | 0604Z 28 FEB |
| CHINESE TAIPEI | HUALIEN | 24.0N 121.6E | 0626Z 28 FEB |
| | HUALIEN | 24.0N 121.7E | 0626Z 28 FEB |
| | CHILUNG | 25.2N 121.8E | 0654Z 28 FEB |
| | TAITUNG | 22.7N 121.2E | 0655Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 008**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1346Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA /

COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR /
GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI /
KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA /
SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI /
AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU /
HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. /
NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA /
POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA /
N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES /
CHINESE TAIPEI

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME

THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 009**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1446Z 27 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| QUEPOS CR | 0.0N | 9.4E | 1418Z | 0.24M / 0.8FT | 44MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1313Z | 0.25M / 0.8FT | 36MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |

VALPARAÍSO CL 33.0S 71.6W 0708Z 1.29M / 4.2FT 20MIN

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

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FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 010**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1545Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| DART MARQUESAS | 5140 | 8.5S | 125.0W 1519Z | 0.28M / 0.9FT | 48MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|

| | | | |
|---|---|---|---|
| CHILE | TALCAHUANO | 36.7S 73.1W | 0729Z 27 FEB |
| | VALPARAÍSO | 33.0S 71.6W | 0739Z 27 FEB |
| | COQUIMBO | 29.9S 71.3W | 0801Z 27 FEB |
| | CORRAL | 39.8S 73.5W | 0810Z 27 FEB |
| | CALDERA | 27.1S 70.8W | 0821Z 27 FEB |
| | ANTOFAGASTA | 23.3S 70.4W | 0844Z 27 FEB |
| | IQUIQUE | 20.2S 70.1W | 0911Z 27 FEB |
| | ARICA | 18.5S 70.3W | 0929Z 27 FEB |
| | GOLFO DE PENAS | 47.1S 74.9W | 0934Z 27 FEB |
| | PUERTO MONTT | 41.5S 73.0W | 1052Z 27 FEB |
| | EASTER IS. | 27.1S 109.4W | 1205Z 27 FEB |
| | PUNTA ARENAS | 53.2S 70.9W | 1213Z 27 FEB |
| | PUERTO WILLIAMS | 54.8S 68.2W | 1404Z 27 FEB |
| PERU | MOLLENDO | 17.1S 72.0W | 0936Z 27 FEB |
| | SAN JUAN | 15.3S 75.2W | 0952Z 27 FEB |
| | LA PUNTA | 12.1S 77.2W | 1045Z 27 FEB |
| | PIMENTAL | 6.9S 80.0W | 1114Z 27 FEB |
| | TALARA | 4.6S 81.5W | 1127Z 27 FEB |
| | CHIMBOTE | 9.0S 78.8W | 1132Z 27 FEB |
| ECUADOR | LA LIBERTAD | 2.2S 81.2W | 1202Z 27 FEB |
| | ESMERELDAS | 1.2N 79.8W | 1234Z 27 FEB |
| | BALTRA IS. | 0.5S 90.3W | 1313Z 27 FEB |
| COLOMBIA | TUMACO | 1.8N 78.9W | 1253Z 27 FEB |
| | BAHIA SOLANO | 6.3N 77.4W | 1327Z 27 FEB |
| | BUENAVENTURA | 3.8N 77.2W | 1340Z 27 FEB |
| ANTARCTICA | THURSTON IS. | 72.0S 100.0W | 1312Z 27 FEB |
| | CAPE ADARE | 71.0S 170.0E | 1650Z 27 FEB |
| PANAMA | PUERTO PINA | 7.4N 78.1W | 1331Z 27 FEB |
| | PUNTA MALA | 7.5N 79.9W | 1334Z 27 FEB |
| | PUNTA BURICA | 8.0N 82.8W | 1340Z 27 FEB |
| | BALBOA HTS. | 9.0N 79.6W | 1457Z 27 FEB |
| COSTA RICA | CABO MATAPALO | 8.4N 83.3W | 1344Z 27 FEB |
| | PUERTO QUEPOS | 9.4N 84.2W | 1417Z 27 FEB |
| | CABO SAN ELENA | 10.9N 86.0W | 1452Z 27 FEB |
| NICARAGUA | SAN JUAN DL SUR | 11.2N 85.9W | 1452Z 27 FEB |
| | PUERTO SANDINO | 12.2N 86.8W | 1512Z 27 FEB |
| | CORINTO | 12.5N 87.2W | 1520Z 27 FEB |
| PITCAIRN | PITCAIRN IS. | 25.1S 130.1W | 1455Z 27 FEB |
| HONDURAS | AMAPALA | 13.2N 87.6W | 1520Z 27 FEB |
| EL SALVADOR | ACAJUTLA | 13.6N 89.8W | 1531Z 27 FEB |
| GUATEMALA | SIPICATE | 13.9N 91.2W | 1539Z 27 FEB |
| FR. POLYNESIA | RIKITEA | 23.1S 135.0W | 1542Z 27 FEB |
| | HIVA OA | 10.0S 139.0W | 1723Z 27 FEB |
| | PAPEETE | 17.5S 149.6W | 1748Z 27 FEB |
| MEXICO | PUERTO MADERO | 14.8N 92.5W | 1552Z 27 FEB |
| | ACAPULCO | 16.9N 99.9W | 1615Z 27 FEB |
| | MANZANILLO | 19.1N 104.3W | 1709Z 27 FEB |
| | SOCORRO | 18.8N 111.0W | 1719Z 27 FEB |
| | CABO SAN LUCAS | 22.8N 110.0W | 1749Z 27 FEB |
| | PUNTA ABREOJOS | 26.7N 113.6W | 1856Z 27 FEB |
| | ENSENADA | 31.8N 116.8W | 2016Z 27 FEB |
| COOK ISLANDS | RAROTONGA | 21.2S 159.8W | 1814Z 27 FEB |
| | PENRYN IS. | 8.9S 157.8W | 1925Z 27 FEB |
| | PUKAPUKA IS. | 10.8S 165.9W | 1950Z 27 FEB |
| KIRIBATI | FLINT IS. | 11.4S 151.8W | 1836Z 27 FEB |
| | MALDEN IS. | 3.9S 154.9W | 1934Z 27 FEB |
| | CHRISTMAS IS. | 2.0N 157.5W | 2028Z 27 FEB |
| | KANTON IS. | 2.8S 171.7W | 2112Z 27 FEB |
| | TARAWA IS. | 1.5N 173.0E | 2258Z 27 FEB |
| KERMADEC IS | RAOUL IS. | 29.2S 177.9W | 1912Z 27 FEB |
| NIUE | NIUE IS. | 19.0S 170.0W | 1918Z 27 FEB |
| NEW ZEALAND | EAST CAPE | 37.7S 178.5E | 1918Z 27 FEB |
| | GISBORNE | 38.7S 178.0E | 1922Z 27 FEB |
| | DUNEDIN | 45.9S 170.5E | 1952Z 27 FEB |
| | NAPIER | 39.5S 176.9E | 1954Z 27 FEB |
| | WELLINGTON | 41.3S 174.8E | 1955Z 27 FEB |
| | MILFORD SOUND | 44.6S 167.9E | 2005Z 27 FEB |

| | | | |
|---|---|---|---|
| | NORTH CAPE | 34.4S 173.3E | 2010Z 27 FEB |
| | BLUFF | 46.6S 168.3E | 2030Z 27 FEB |
| | LYTTELTON | 43.6S 172.7E | 2040Z 27 FEB |
| | AUCKLAND(E) | 36.7S 175.0E | 2056Z 27 FEB |
| | NELSON | 41.3S 173.3E | 2127Z 27 FEB |
| | WESTPORT | 41.8S 171.6E | 2129Z 27 FEB |
| | AUCKLAND(W) | 37.1S 174.2E | 2140Z 27 FEB |
| | NEW PLYMOUTH | 39.1S 174.1E | 2219Z 27 FEB |
| TONGA | NUKUALOFA | 21.0S 175.2W | 1940Z 27 FEB |
| AMERICAN SAMOA | PAGO PAGO | 14.3S 170.7W | 1951Z 27 FEB |
| SAMOA | APIA | 13.8S 171.8W | 2006Z 27 FEB |
| JARVIS IS. | JARVIS IS. | 0.4S 160.1W | 2026Z 27 FEB |
| WALLIS-FUTUNA | WALLIS IS. | 13.2S 176.2W | 2028Z 27 FEB |
| TOKELAU | NUKUNONU IS. | 9.2S 171.8W | 2030Z 27 FEB |
| FIJI | SUVA | 18.1S 178.4E | 2104Z 27 FEB |
| AUSTRALIA | HOBART | 43.3S 147.6E | 2105Z 27 FEB |
| | SYDNEY | 33.9S 151.4E | 2146Z 27 FEB |
| | BRISBANE | 27.2S 153.3E | 2310Z 27 FEB |
| | GLADSTONE | 23.8S 151.4E | 0101Z 28 FEB |
| | CAIRNS | 16.7S 145.8E | 0159Z 28 FEB |
| | MACKAY | 21.1S 149.3E | 0251Z 28 FEB |
| HAWAII | HILO | 19.7N 155.1W | 2119Z 27 FEB |
| | HONOLULU | 21.3N 157.9W | 2152Z 27 FEB |
| | NAWILIWILI | 22.0N 159.4W | 2158Z 27 FEB |
| PALMYRA IS. | PALMYRA IS. | 6.3N 162.4W | 2124Z 27 FEB |
| TUVALU | FUNAFUTI IS. | 7.9S 178.5E | 2125Z 27 FEB |
| VANUATU | ANATOM IS. | 20.2S 169.9E | 2137Z 27 FEB |
| | ESPERITU SANTO | 15.1S 167.3E | 2235Z 27 FEB |
| HOWLAND-BAKER | HOWLAND IS. | 0.6N 176.6W | 2154Z 27 FEB |
| NEW CALEDONIA | NOUMEA | 22.3S 166.5E | 2218Z 27 FEB |
| JOHNSTON IS. | JOHNSTON IS. | 16.7N 169.5W | 2245Z 27 FEB |
| SOLOMON IS. | KIRAKIRA | 10.4S 161.9E | 2321Z 27 FEB |
| | MUNDA | 8.4S 157.2E | 0001Z 28 FEB |
| | GHATERE | 7.8S 159.2E | 0001Z 28 FEB |
| | AUKI | 8.8S 160.6E | 0004Z 28 FEB |
| | HONIARA | 9.3S 160.0E | 0004Z 28 FEB |
| | FALAMAE | 7.4S 155.6E | 0017Z 28 FEB |
| | PANGGOE | 6.9S 157.2E | 0020Z 28 FEB |
| NAURU | NAURU | 0.5S 166.9E | 2331Z 27 FEB |
| MARSHALL IS. | MAJURO | 7.1N 171.4E | 2339Z 27 FEB |
| | KWAJALEIN | 8.7N 167.7E | 0013Z 28 FEB |
| | ENIWETOK | 11.4N 162.3E | 0102Z 28 FEB |
| MIDWAY IS. | MIDWAY IS. | 28.2N 177.4W | 0022Z 28 FEB |
| KOSRAE | KOSRAE IS. | 5.5N 163.0E | 0026Z 28 FEB |
| PAPUA NEW GUINE | AMUN | 6.0S 154.7E | 0036Z 28 FEB |
| | KIETA | 6.1S 155.6E | 0038Z 28 FEB |
| | RABAUL | 4.2S 152.3E | 0102Z 28 FEB |
| | PORT MORESBY | 9.3S 146.9E | 0123Z 28 FEB |
| | LAE | 6.8S 147.0E | 0128Z 28 FEB |
| | KAVIENG | 2.5S 150.7E | 0135Z 28 FEB |
| | MADANG | 5.2S 145.8E | 0154Z 28 FEB |
| | MANUS IS. | 2.0S 147.5E | 0214Z 28 FEB |
| | WEWAK | 3.5S 143.6E | 0237Z 28 FEB |
| | VANIMO | 2.6S 141.3E | 0258Z 28 FEB |
| POHNPEI | POHNPEI IS. | 7.0N 158.2E | 0111Z 28 FEB |
| WAKE IS. | WAKE IS. | 19.3N 166.6E | 0112Z 28 FEB |
| CHUUK | CHUUK IS. | 7.4N 151.8E | 0213Z 28 FEB |
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| MARCUS IS. | MARCUS IS. | 24.3N 154.0E | 0248Z 28 FEB |
| INDONESIA | JAYAPURA | 2.4S 140.8E | 0302Z 28 FEB |
| | WARSA | 0.6S 135.8E | 0345Z 28 FEB |
| | MANOKWARI | 0.8S 134.2E | 0405Z 28 FEB |
| | SORONG | 0.8S 131.1E | 0433Z 28 FEB |

| | | | |
|---|---|---|---|
| | BEREBERE | 2.5N 128.7E | 0452Z 28 FEB |
| | PATANI | 0.4N 128.8E | 0505Z 28 FEB |
| | GEME | 4.6N 126.8E | 0512Z 28 FEB |
| N. MARIANAS | SAIPAN | 15.3N 145.8E | 0303Z 28 FEB |
| GUAM | GUAM | 13.4N 144.7E | 0311Z 28 FEB |
| YAP | YAP IS. | 9.5N 138.1E | 0352Z 28 FEB |
| BELAU | MALAKAL | 7.3N 134.5E | 0413Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |
| PHILIPPINES | DAVAO | 6.8N 125.7E | 0527Z 28 FEB |
| | PALANAN | 17.1N 122.6E | 0559Z 28 FEB |
| | LEGASPI | 13.2N 123.8E | 0604Z 28 FEB |
| CHINESE TAIPEI | HUALIEN | 24.0N 121.6E | 0626Z 28 FEB |
| | HUALIEN | 24.0N 121.7E | 0626Z 28 FEB |
| | CHILUNG | 25.2N 121.8E | 0654Z 28 FEB |
| | TAITUNG | 22.7N 121.2E | 0655Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 011**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1650Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA /
COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR /
GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI /
KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA /
SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI /
AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU /
HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. /
NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA /
POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA /
N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES /
CHINESE TAIPEI

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DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

GAUGE LOCATION LAT LON TIME AMPL PER

| | | | | | |
|---|---|---|---|---|---|
| DART MANZANILLO | 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT 24MIN |
| ACAPULCO MX | | 16.8N | 99.9W | 1549Z | 0.16M / 0.5FT 24MIN |
| RIKITEA PF | | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT 22MIN |
| DART MARQUESAS | 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT 18MIN |
| BALTRA GALAPAGS EC | | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT 14MIN |
| EASTER CL | | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT 52MIN |
| ANCUD CL | | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT 84MIN |
| CALLAO LA-PUNTA PE | | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT 30MIN |
| ARICA CL | | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT 42MIN |
| IQUIQUE CL | | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT 68MIN |
| ANTOFAGASTA CL | | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT 52MIN |
| DART LIMA 32412 | | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT 36MIN |
| CALDERA CL | | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT 20MIN |
| TALCAHUANO CL | | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT 88MIN |
| COQUIMBO CL | | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT 30MIN |
| CORRAL CL | | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT 16MIN |
| SAN FELIX CL | | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT 08MIN |
| VALPARAÍSO CL | | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

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FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 012**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1752Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA /
COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR /
GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI /
KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA /
SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI /
AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU /
HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. /
NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA /
POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA /
N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES /
CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1549Z | 0.16M / 0.5FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

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LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 013**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1843Z 27 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1743Z | 0.28M / 0.9FT | 18MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1549Z | 0.16M / 0.5FT | 24MIN |

| | | | |
|---|---|---|---|
| RIKITEA PF | 23.1S | 134.9W 1559Z | 0.15M / 0.5FT 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W 1531Z | 0.18M / 0.6FT 18MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W 1452Z | 0.35M / 1.2FT 14MIN |
| EASTER CL | 27.2S | 109.5W 1205Z | 0.35M / 1.1FT 52MIN |
| ANCUD CL | 41.9S | 73.8W 0838Z | 0.62M / 2.0FT 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W 1029Z | 0.36M / 1.2FT 30MIN |
| ARICA CL | 18.5S | 70.3W 1008Z | 0.94M / 3.1FT 42MIN |
| IQUIQUE CL | 20.2S | 70.1W 0907Z | 0.28M / 0.9FT 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W 0941Z | 0.49M / 1.6FT 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W 0941Z | 0.24M / 0.8FT 36MIN |
| CALDERA CL | 27.1S | 70.8W 0843Z | 0.45M / 1.5FT 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W 0653Z | 2.34M / 7.7FT 88MIN |
| COQUIMBO CL | 30.0S | 71.3W 0852Z | 1.32M / 4.3FT 30MIN |
| CORRAL CL | 39.9S | 73.4W 0739Z | 0.90M / 2.9FT 16MIN |
| SAN FELIX CL | 26.3S | 80.1W 0815Z | 0.53M / 1.7FT 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W 0708Z | 1.29M / 4.2FT 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
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EVALUATION

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**TSUNAMI BULLETIN NUMBER 014**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 1934Z 27 FEB 2010**

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... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA /

COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR /
GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI /
KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA /
SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI /
AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU /
HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. /
NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA /
POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA /
N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES /
CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 1844Z | 0.04M / 0.1FT | 30MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1549Z | 0.16M / 0.5FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
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EVALUATION

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**TSUNAMI BULLETIN NUMBER 015**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 2028Z 27 FEB 2010**

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... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |

| | | | | | |
|---|---|---|---|---|---|
| DART TONGA 51426 | 23.0S | 168.1W | 1844Z | 0.04M / 0.1FT | 30MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1549Z | 0.16M / 0.5FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
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| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
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LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
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**TSUNAMI BULLETIN NUMBER 016**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 2132Z 27 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 1844Z | 0.04M / 0.1FT | 30MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1549Z | 0.16M / 0.5FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |

VALPARAÍSO CL 33.0S 71.6W 0708Z 1.29M / 4.2FT 20MIN

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 017**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 2241Z 27 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / JOHNSTON IS. / SOLOMON IS. / NAURU / MARSHALL IS. / MIDWAY IS. / KOSRAE / PAPUA NEW GUINEA / POHNPEI / WAKE IS. / CHUUK / RUSSIA / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / JAPAN / PHILIPPINES / CHINESE TAIPEI

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2140Z | 0.19M / 0.6FT | 76MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2151Z | 0.28M / 0.9FT | 44MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2132Z | 0.66M / 2.2FT | 12MIN |
| MONTEREY HARBOR CA | 36.6N | 121.9W | 2031Z | 0.32M / 1.1FT | 56MIN |
| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / 1.4FT | 32MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2029Z | 0.22M / 0.7FT | 48MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 1844Z | 0.04M / 0.1FT | 30MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO | 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| QUEPOS CR | 9.4E | 81.2W | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
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| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE

APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

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BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 018**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0012Z 28 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... THE TSUNAMI WARNING REMAINS IN EFFECT FOR RUSSIA / JAPAN ...

THE TSUNAMI WARNING IS NOW CANCELLED FOR

CHILE / PERU / ECUADOR / COLOMBIA / ANTARCTICA / PANAMA / COSTA RICA / NICARAGUA / PITCAIRN / HONDURAS / EL SALVADOR / GUATEMALA / FR. POLYNESIA / MEXICO / COOK ISLANDS / KIRIBATI / KERMADEC IS / NIUE / NEW ZEALAND / TONGA / AMERICAN SAMOA / SAMOA / JARVIS IS. / WALLIS-FUTUNA / TOKELAU / FIJI / AUSTRALIA / HAWAII / PALMYRA IS. / JOHNSTON IS. / MARSHALL IS. / MIDWAY IS. / WAKE IS. / TUVALU / VANUATU / HOWLAND-BAKER / NEW CALEDONIA / SOLOMON IS. / NAURU / KOSRAE / PAPUA NEW GUINEA / POHNPEI / CHUUK / MARCUS IS. / INDONESIA / N. MARIANAS / GUAM / YAP / BELAU / PHILIPPINES / CHINESE TAIPEI

A TSUNAMI WARNING REMAINS IN EFFECT FOR

RUSSIA / JAPAN

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2151Z | 0.28M / 0.9FT | 44MIN |
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| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
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| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
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| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
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| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
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| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
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| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
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LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

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A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM

ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 019**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0135Z 28 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... THE TSUNAMI WARNING REMAINS IN EFFECT FOR RUSSIA / JAPAN ...

A TSUNAMI WARNING REMAINS IN EFFECT FOR

RUSSIA / JAPAN

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

GAUGE LOCATION LAT LON TIME AMPL PER

| | | | | | |
|---|---|---|---|---|---|
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2151Z | 0.28M / 0.9FT | 44MIN |
| MONTEREY HARBOR CA | 36.6N | 121.9W | 2031Z | 0.32M / 1.1FT | 56MIN |
| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / 1.4FT | 32MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 1844Z | 0.04M / 0.1FT | 30MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE DAMAGE FAR FROM ITS SOURCE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

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ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 020**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0235Z 28 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... THE TSUNAMI WARNING REMAINS IN EFFECT FOR RUSSIA / JAPAN ...

A TSUNAMI WARNING REMAINS IN EFFECT FOR

RUSSIA / JAPAN

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / 0.3FT | 24MIN |

| | | | | | |
|---|---|---|---|---|---|
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / 1.2FT | 10MIN |
| HONOLULU OAHU | 21.3N | 157.9W | 2200Z | 0.25M / 0.8FT | 46MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
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| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
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| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
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| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
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| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
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| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
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| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
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LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
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PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

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| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

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THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 021**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0344Z 28 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

RUSSIA / JAPAN

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| MIDWAY | 28.2N | 177.4W | 0137Z | 0.28M / 0.9FT | 10MIN |
| WAKE US | 19.3N | 166.6E | 0259Z | 0.26M / 0.8FT | 12MIN |

| | | | | | |
|---|---|---|---|---|---|
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / 0.3FT | 24MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / 1.2FT | 10MIN |
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| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
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| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
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| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
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| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
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| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
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| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
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AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
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VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
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EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND

THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 022**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0449Z 28 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

RUSSIA / JAPAN

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| GUAM US | 13.4N | 144.7E | 0307Z | 0.16M / 0.5FT | 34MIN |
| DART SAIPAN 52401 | 19.3N | 155.8E | 0355Z | 0.08M / 0.3FT | 18MIN |
| MIDWAY | 28.2N | 177.4W | 0137Z | 0.28M / 0.9FT | 10MIN |
| WAKE US | 19.3N | 166.6E | 0259Z | 0.26M / 0.8FT | 12MIN |
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / 0.3FT | 24MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / 1.2FT | 10MIN |
| HONOLULU OAHU | 21.3N | 157.9W | 2200Z | 0.25M / 0.8FT | 46MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
| MONTEREY HARBOR CA | 36.6N | 121.9W | 2031Z | 0.32M / 1.1FT | 56MIN |
| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / 1.4FT | 32MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.
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| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
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**TSUNAMI BULLETIN NUMBER 023**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0556Z 28 FEB 2010**

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| OFUNATO HONSHU | 39.0N | 141.8E | 0532Z | 0.21M / 0.7FT | 32MIN |
| HANASAKI HOKKAIDO | 43.3N | 145.6E | 0456Z | 0.31M / 1.0FT | 60MIN |
| GUAM US | 13.4N | 144.7E | 0307Z | 0.16M / 0.5FT | 34MIN |
| DART SAIPAN 52401 | 19.3N | 155.8E | 0355Z | 0.08M / 0.3FT | 18MIN |
| MIDWAY | 28.2N | 177.4W | 0137Z | 0.28M / 0.9FT | 10MIN |
| WAKE US | 19.3N | 166.6E | 0259Z | 0.26M / 0.8FT | 12MIN |
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / 0.3FT | 24MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / 1.2FT | 10MIN |
| HONOLULU OAHU | 21.3N | 157.9W | 2200Z | 0.25M / 0.8FT | 46MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
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| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / 1.4FT | 32MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
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| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
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| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
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| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED

WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

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| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

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THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 024**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0700Z 28 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... A WIDESPREAD TSUNAMI WARNING IS IN EFFECT ...

A TSUNAMI WARNING IS IN EFFECT FOR

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AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| OMAEZAKI HONSHU | 34.6N | 138.2E | 0555Z | 0.19M / 0.6FT | 42MIN |
| OFUNATO HONSHU | 39.0N | 141.8E | 0558Z | 0.41M / 1.4FT | 48MIN |
| HANASAKI HOKKAIDO | 43.3N | 145.6E | 0551Z | 0.45M / 1.5FT | 44MIN |
| DUTCH HBR UNALASKA | 53.9N | 166.5W | 0325Z | 0.18M / 0.6FT | 28MIN |
| ADAK AK | 51.9N | 176.6W | 0412Z | 0.35M / 1.2FT | 20MIN |
| GUAM US | 13.4N | 144.7E | 0307Z | 0.16M / 0.5FT | 34MIN |
| DART SAIPAN 52401 | 19.3N | 155.8E | 0355Z | 0.08M / 0.3FT | 18MIN |
| MIDWAY | 28.2N | 177.4W | 0137Z | 0.28M / 0.9FT | 10MIN |
| WAKE US | 19.3N | 166.6E | 0259Z | 0.26M / 0.8FT | 12MIN |
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / 0.3FT | 24MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / 1.2FT | 10MIN |
| HONOLULU OAHU | 21.3N | 157.9W | 2200Z | 0.25M / 0.8FT | 46MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
| MONTEREY HARBOR CA | 36.6N | 121.9W | 2031Z | 0.32M / 1.1FT | 56MIN |
| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / 1.4FT | 32MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS 1 | 3.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |

| | | | | | | |
|---|---|---|---|---|---|---|
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / | 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / | 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / | 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / | 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / | 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / | 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / | 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / | 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / | 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / | 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / | 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / | 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / | 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / | 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / | 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| --- | --- | --- | |

| | | | |
|---|---|---|---|
| RUSSIA | MEDNNY IS | 54.7N 167.4E | 0236Z 28 FEB |
| | UST KAMCHATSK | 56.1N 162.6E | 0302Z 28 FEB |
| | PETROPAVLOVSK K | 53.2N 159.6E | 0333Z 28 FEB |
| | URUP IS | 46.1N 150.5E | 0354Z 28 FEB |
| | SEVERO KURILSK | 50.8N 156.1E | 0410Z 28 FEB |
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 025**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0757Z 28 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... THE TSUNAMI WARNING REMAINS IN EFFECT FOR JAPAN ...

THE TSUNAMI WARNING IS NOW CANCELLED FOR RUSSIA

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY
NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| OFUNATO HONSHU | 39.0N | 141.8E | 0559Z | 0.41M / 1.3FT | 48MIN |
| OMAEZAKI HONSHU | 34.6N | 138.2E | 0616Z | 0.34M / 1.1FT | 70MIN |
| HANASAKI HOKKAIDO | 43.3N | 145.6E | 0636Z | 0.82M / 2.7FT | 24MIN |
| DUTCH HBR UNALASKA | 53.9N | 166.5W | 0325Z | 0.18M / 0.6FT | 28MIN |
| ADAK AK | 51.9N | 176.6W | 0412Z | 0.35M / 1.2FT | 20MIN |
| GUAM US | 13.4N | 144.7E | 0307Z | 0.16M / 0.5FT | 34MIN |
| DART SAIPAN 52401 | 19.3N | 155.8E | 0355Z | 0.08M / 0.3FT | 18MIN |

| | | | | | | |
|---|---|---|---|---|---|---|
| MIDWAY | 28.2N | 177.4W | 0137Z | 0.28M / | 0.9FT | 10MIN |
| WAKE US | 19.3N | 166.6E | 0259Z | 0.26M / | 0.8FT | 12MIN |
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / | 0.3FT | 24MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / | 1.2FT | 10MIN |
| HONOLULU OAHU | 21.3N | 157.9W | 2200Z | 0.25M / | 0.8FT | 46MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / | 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / | 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / | 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / | 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / | 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / | 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / | 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / | 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / | 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / | 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / | 3.2FT | 22MIN |
| MONTEREY HARBOR CA | 36.6N | 121.9W | 2031Z | 0.32M / | 1.1FT | 56MIN |
| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / | 1.4FT | 32MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / | 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / | 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / | 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / | 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / | 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / | 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / | 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / | 1.2FT | 12MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / | 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / | 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / | 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / | 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / | 0.2FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / | 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / | 0.6FT | 18MIN |
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / | 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / | 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / | 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / | 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / | 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / | 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / | 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / | 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / | 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / | 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / | 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / | 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / | 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / | 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / | 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |
| | KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| | HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| | SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| | OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT. THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 020**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0859Z 28 FEB 2010**

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA... WASHINGTON...OREGON AND CALIFORNIA.

... THE TSUNAMI WARNING REMAINS IN EFFECT FOR JAPAN ...

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

EVALUATION

SEA LEVEL READINGS CONFIRM THAT A TSUNAMI HAS BEEN GENERATED WHICH COULD CAUSE WIDESPREAD DAMAGE. AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS THREAT. THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL DATA TO DETERMINE THE EXTENT AND SEVERITY OF THE THREAT.

A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

FOR ALL AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

ESTIMATED INITIAL TSUNAMI WAVE ARRIVAL TIMES AT FORECAST POINTS WITHIN THE WARNING AND WATCH AREAS ARE GIVEN BELOW. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN SUCCESSIVE WAVES CAN BE FIVE MINUTES TO ONE HOUR.

| LOCATION | FORECAST POINT | COORDINATES | ARRIVAL TIME |
|---|---|---|---|
| JAPAN | KUSHIRO | 42.9N 144.3E | 0435Z 28 FEB |

| | | |
|---|---|---|
| KATSUURA | 35.1N 140.3E | 0453Z 28 FEB |
| HACHINOHE | 40.5N 141.5E | 0509Z 28 FEB |
| SHIMIZU | 32.8N 133.0E | 0557Z 28 FEB |
| OKINAWA | 26.2N 127.8E | 0610Z 28 FEB |

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS WARRANT.
THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS
FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

**TSUNAMI BULLETIN NUMBER 027**
**PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS**
**ISSUED AT 0940Z 28 FEB 2010**

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THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

... TSUNAMI WARNING CANCELLATION ...

THIS BULLETIN APPLIES TO AREAS WITHIN AND BORDERING THE PACIFIC
OCEAN AND ADJACENT SEAS...EXCEPT ALASKA...BRITISH COLUMBIA...
WASHINGTON...OREGON AND CALIFORNIA.

THE PACIFIC-WIDE TSUNAMI WARNING ISSUED BY THE PACIFIC TSUNAMI
WARNING CENTER IS NOW CANCELLED FOR ALL COUNTRIES.

THIS BULLETIN IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY
NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE
DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND
ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

ORIGIN TIME - 0634Z 27 FEB 2010
COORDINATES - 36.1 SOUTH 72.6 WEST
DEPTH - 55 KM
LOCATION - NEAR COAST OF CENTRAL CHILE
MAGNITUDE - 8.8

MEASUREMENTS OR REPORTS OF TSUNAMI WAVE ACTIVITY

| GAUGE LOCATION | LAT | LON | TIME | AMPL | PER |
|---|---|---|---|---|---|
| NAHA OKINAWA | 26.2N | 127.7E | 0754Z | 0.19M / 0.6FT | 32MIN |
| OFUNATO HONSHU | 39.0N | 141.8E | 0559Z | 0.41M / 1.3FT | 48MIN |
| OMAEZAKI HONSHU | 34.6N | 138.2E | 0616Z | 0.34M / 1.1FT | 70MIN |
| HANASAKI HOKKAIDO | 43.3N | 145.6E | 0636Z | 0.82M / 2.7FT | 24MIN |
| DUTCH HBR UNALASKA | 53.9N | 166.5W | 0325Z | 0.18M / 0.6FT | 28MIN |
| ADAK AK | 51.9N | 176.6W | 0412Z | 0.35M / 1.2FT | 20MIN |
| GUAM US | 13.4N | 144.7E | 0307Z | 0.16M / 0.5FT | 34MIN |
| DART SAIPAN 52401 | 19.3N | 155.8E | 0355Z | 0.08M / 0.3FT | 18MIN |

| | | | | | |
|---|---|---|---|---|---|
| MIDWAY | 28.2N | 177.4W | 0137Z | 0.28M / 0.9FT | 10MIN |
| WAKE US | 19.3N | 166.6E | 0259Z | 0.26M / 0.8FT | 12MIN |
| SITKA AK | 57.1N | 135.3W | 0111Z | 0.08M / 0.3FT | 24MIN |
| NAWILIWILI KAUAI | 22.0N | 159.4W | 2323Z | 0.37M / 1.2FT | 10MIN |
| HONOLULU OAHU | 21.3N | 157.9W | 2200Z | 0.25M / 0.8FT | 46MIN |
| DART TONGA 51426 | 23.0S | 168.1W | 2003Z | 0.04M / 0.1FT | 32MIN |
| CRESCENT CITY CA | 41.7N | 124.2W | 2213Z | 0.37M / 1.2FT | 50MIN |
| SANTA BARBARA CA | 34.4N | 119.7W | 2150Z | 0.53M / 1.7FT | 20MIN |
| PAGO PAGO AS | 14.3S | 170.7W | 2027Z | 0.70M / 2.3FT | 12MIN |
| JOHNSTON US | 16.7N | 169.5W | 2248Z | 0.22M / 0.7FT | 64MIN |
| VANUATU | 17.8S | 168.3E | 2246Z | 0.15M / 0.5FT | 22MIN |
| BARBERS PT HI | 21.3N | 158.1W | 2157Z | 0.12M / 0.4FT | 54MIN |
| NUKUALOFA TO | 21.1S | 175.2W | 2024Z | 0.10M / 0.3FT | 62MIN |
| KAWAIHAE HAWAII | 20.0N | 155.8W | 2211Z | 0.52M / 1.7FT | 24MIN |
| KAUMALAPAU HAWAII | 20.8N | 156.9W | 2136Z | 0.18M / 0.6FT | 56MIN |
| KAHULUI MAUI | 20.9N | 156.5W | 2147Z | 0.98M / 3.2FT | 22MIN |
| MONTEREY HARBOR CA | 36.6N | 121.9W | 2031Z | 0.32M / 1.1FT | 56MIN |
| SANTA MONICA CA | 34.0N | 118.5W | 2035Z | 0.41M / 1.4FT | 32MIN |
| SAN DIEGO CA | 32.7N | 117.2W | 2036Z | 0.13M / 0.4FT | 20MIN |
| APIA UPOLU WS | 13.8S | 171.8W | 2018Z | 0.16M / 0.5FT | 16MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1907Z | 0.15M / 0.5FT | 24MIN |
| ACAPULCO MX | 16.8N | 99.9W | 1931Z | 0.62M / 2.0FT | 26MIN |
| DART SAN DIEGO 4641 | 32.2N | 120.7W | 1931Z | 0.06M / 0.2FT | 24MIN |
| LOTTIN PT NZ | 37.6S | 178.2E | 1934Z | 0.15M / 0.5FT | 10MIN |
| RAROTONGA CK | 21.2S | 159.8W | 1918Z | 0.32M / 1.0FT | 06MIN |
| CABO SAN LUCAS MX | 22.9N | 109.9W | 1833Z | 0.36M / 1.2FT | 12MIN |
| HIVA OA MARQUESAS | 9.8S | 139.0W | 1741Z | 1.79M / 5.9FT | 12MIN |
| PAPEETE TAHITI | 17.5S | 149.6W | 1810Z | 0.16M / 0.5FT | 10MIN |
| NUKU HIVA MARQUESAS | 8.9S | 140.1W | 1745Z | 0.95M / 3.1FT | 04MIN |
| MANZANILLO MX | 19.1N | 104.3W | 1705Z | 0.32M / 1.0FT | 24MIN |
| DART MANZANILLO 434 | 16.0N | 107.0W | 1611Z | 0.07M / 0.2FT | 24MIN |
| RIKITEA PF | 23.1S | 134.9W | 1559Z | 0.15M / 0.5FT | 22MIN |
| DART MARQUESAS 5140 | 8.5S | 125.0W | 1531Z | 0.18M / 0.6FT | 18MIN |
| QUEPOS CR | 0.0N | 9.4E | 1416Z | 0.24M / 0.8FT | 52MIN |
| BALTRA GALAPAGS EC | 0.4S | 90.3W | 1452Z | 0.35M / 1.2FT | 14MIN |
| EASTER CL | 27.2S | 109.5W | 1205Z | 0.35M / 1.1FT | 52MIN |
| ANCUD CL | 41.9S | 73.8W | 0838Z | 0.62M / 2.0FT | 84MIN |
| CALLAO LA-PUNTA PE | 12.1S | 77.2W | 1029Z | 0.36M / 1.2FT | 30MIN |
| ARICA CL | 18.5S | 70.3W | 1008Z | 0.94M / 3.1FT | 42MIN |
| IQUIQUE CL | 20.2S | 70.1W | 0907Z | 0.28M / 0.9FT | 68MIN |
| ANTOFAGASTA CL | 23.2S | 70.4W | 0941Z | 0.49M / 1.6FT | 52MIN |
| DART LIMA 32412 | 18.0S | 86.4W | 0941Z | 0.24M / 0.8FT | 36MIN |
| CALDERA CL | 27.1S | 70.8W | 0843Z | 0.45M / 1.5FT | 20MIN |
| TALCAHUANO CL | 36.7S | 73.4W | 0653Z | 2.34M / 7.7FT | 88MIN |
| COQUIMBO CL | 30.0S | 71.3W | 0852Z | 1.32M / 4.3FT | 30MIN |
| CORRAL CL | 39.9S | 73.4W | 0739Z | 0.90M / 2.9FT | 16MIN |
| SAN FELIX CL | 26.3S | 80.1W | 0815Z | 0.53M / 1.7FT | 08MIN |
| VALPARAÍSO CL | 33.0S | 71.6W | 0708Z | 1.29M / 4.2FT | 20MIN |

LAT - LATITUDE (N-NORTH, S-SOUTH)
LON - LONGITUDE (E-EAST, W-WEST)
TIME - TIME OF THE MEASUREMENT (Z IS UTC IS GREENWICH TIME)
AMPL - TSUNAMI AMPLITUDE MEASURED RELATIVE TO NORMAL SEA LEVEL.
IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.

VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).
PER - PERIOD OF TIME IN MINUTES(MIN) FROM ONE WAVE TO THE NEXT.

EVALUATION

SEA LEVEL DATA INDICATE THAT A WIDESPREAD TSUNAMI HAS OCCURRED. HOWEVER - ADDITIONAL DESTRUCTIVE TSUNAMI IMPACTS ARE NOT EXPECTED FOR COASTAL AREAS NOT ALREADY AFFECTED. FOR THOSE AFFECTED AREAS - WHEN NO MAJOR WAVES ARE OBSERVED FOR TWO HOURS AFTER THE ESTIMATED TIME OF ARRIVAL OR DAMAGING WAVES HAVE NOT OCCURRED FOR AT LEAST TWO HOURS THEN LOCAL AUTHORITIES CAN ASSUME THE THREAT IS PASSED. DANGER TO BOATS AND COASTAL STRUCTURES CAN CONTINUE FOR SEVERAL HOURS DUE TO RAPID CURRENTS. AS LOCAL CONDITIONS CAN CAUSE A WIDE VARIATION IN TSUNAMI WAVE ACTION THE ALL CLEAR DETERMINATION MUST BE MADE BY LOCAL AUTHORITIES.

NO TSUNAMI THREAT EXISTS FOR OTHER COASTAL AREAS IN THE PACIFIC ALTHOUGH SOME OTHER AREAS MAY EXPERIENCE SMALL SEA LEVEL CHANGES. FOR ALL AREAS COVERED BY THIS CENTER...THE TSUNAMI WARNING IS CANCELLED.

THIS WILL BE THE FINAL BULLETIN ISSUED FOR THIS EVENT UNLESS ADDITIONAL INFORMATION BECOMES AVAILABLE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE PRODUCTS FOR ALASKA...BRITISH COLUMBIA...WASHINGTON...OREGON...CALIFORNIA.

ANNEX II

# SURVEY QUESTIONNAIRE

## 27 FEBRUARY 2010 CHILE EARTHQUAKE AND TSUNAMI EVENT

## POST-EVENT ASSESSMENT QUESTIONNAIRE

**COUNTRY:** _____

**Contact Details**

| | | |
|---|---|---|
| Contact Name: | | |
| Name of Organisation | | |
| | | |
| Address | | |
| | | |
| | | |
| Phone | | Fax: |
| Email | | |

**Instructions:**

This is an electronic form which can be filled out in several ways:

- If you use Microsoft Word software you can fill out the form electronically. To tick checkboxes (yes/no answers), you can either use the tab button or the mouse to move to the required answer. Written answers can be typed in the grey area next to the questions, and the area will expand to fit longer answers.
- If the form fields don't work, then you can type your answers next to the relevant question.
- Please give all times in UTC, not local time.
- Please include as much information as possible in your answers. If there is not enough room on the questionnaire form, then please send extra information in a separate document.
- Where multiple answers are possible, please feel free to tick more than one box.

**You may also print the questionnaire and fill out by hand, then scan/email or fax it back to us.**

**We may need to contact you to clarify your answers, so please include a contact phone number where we can reach you.**

## 27 FEBRUARY 2010 CHILE EARTHQUAKE AND TSUNAMI EVENT

## POST-EVENT ASSESSMENT QUESTIONNAIRE

### SECTION A – WARNING/WATCH SERVICE

1) **How and at what time (UTC) did you learn that a big earthquake had taken place?**

   How: Time (UTC):

2) **Did you receive the first tsunami warning bulletin from the PTWC (0646Z) and/or tsunami information statement from WC/ATWC (1049 PM PST)?**

   Yes ☐ No ☐

   If YES to either or both, at what time was the bulletin received (UTC)?

   PTWC: WC/ATWC:

3) **If yes, how did you receive the bulletin/statement (cross more than one box if appropriate)?**

   Email:☐ Fax: ☐ GTS: ☐

   Phone:☐ Other (please specify):

4) **Did you acknowledge receipt of the bulletin?**

   Yes ☐ No ☐

5) **Were subsequent bulletins/advisories received from PTWC, WC/ATWC or another source?**

   Yes ☐ No ☐

   If YES, please indicate the time (UTC) you received them.

| PTWC | Time UTC | PTWC | Time UTC | PTWC | Time UTC |
|---|---|---|---|---|---|
| **No 1** | | **No 10** | | **No 19** | |
| **No 2** | | **No 11** | | **No 20** | |
| **No 3** | | **No 12** | | **No 21** | |
| **No 4** | | **No 13** | | **No 22** | |
| **No 5** | | **No 14** | | **No 23** | |
| **No 6** | | **No 15** | | **No 24** | |
| **No 7** | | **No 16** | | **No 25** | |
| **No 8** | | **No 17** | | **No 26** | |
| **No 9** | | **No 18** | | **No 27** | |

| WC/ATWC | Time UTC | WC/ATWC | Time UTC | WC/ATWC | Time UTC |
|---|---|---|---|---|---|
| **No 1** | | **No 10** | | **No 19** | |
| **No 2** | | **No 11** | | **No 20** | |
| **No 3** | | **No 12** | | **No 21** | |
| **No 4** | | **No 13** | | **No 22** | |
| **No 5** | | **No 14** | | **No 23** | |
| **No 6** | | **No 15** | | **No 24** | |
| **No 7** | | **No 16** | | **No 25** | |
| **No 8** | | **No 17** | | | |
| **No 9** | | **No 18** | | | |

**6) Was information about the earthquake received from other sources?**

Yes ☐ No ☐ If YES, please provide details:

**SECTION B – NATIONAL ACTIONS**

The purpose of this section is to find out what actions were taken by National Warning Centres, including independent analysis of the event, notification of relevant organisations, issuing and cancellation of warnings.

**7) Were any earthquake parameters calculated at the national level?**

Yes ☐ No ☐

If YES, please specify:

| | Origin Time (UTC) | Location (Lat and Long) | Depth | Magnitude | Type of Mag. | Time UTC |
|---|---|---|---|---|---|---|
| **1st estimate** | | | | | | |
| **2nd estimate** | | | | | | |
| | | | | | | |

**8) Was any action taken BEFORE receiving the PTWC/WC/ATWC information?**

Yes ☐ No ☐

If YES, please give details:

**9) What action was taken AFTER receiving the first bulletin? Please list times (UTC) as well as actions. Include details of organisations or government agencies contacted.**

| Action Taken | Time (UTC) |
|---|---|
| | |
| | |
| | |
| | |
| | |

(Add more rows if necessary)

**10) Did your National Warning Centre issue a tsunami warning and tsunami related information to the public? If yes, what time was it issued (UTC)?**

Yes: ☐ No: ☐

If NO then please go to Section C Question 16

If YES, please specify:

| Type of information released to the public | Time (UTC) |
|---|---|
| | |
| | |
| | |
| | |
| | |

**11) If a tsunami warning was issued to the public, was the warning based on bulletins from the PTWC and/or WC/ATWC, or on information determined by your National Warning Centre?**

PTWC: ☐ WC/ATWC: ☐ National TWC: ☐

**12) If a tsunami warning was issued to the public, was a tsunami wave height forecast provided?**

Yes ☐ No ☐

If YES, please provide details:

**13) How was the warning issued? (eg phone, fax, email, sirens, police, etc). Cross more than one box if appropriate.**

Phone: ☐ Fax: ☐ Email: ☐ sirens: ☐

Other (please specify):

14) **If a warning was issued, at what time was the warning cancelled (UTC)? What was the reason for cancellation? How was this information communicated to the public?**

Time of Cancellation:

Reason for Cancellation:

Communication method:

15) **Were there any communication problems with distributing the tsunami warning or cancellation information? (eg mobile phone network overload, people not answering phones etc).**

Yes ☐ No ☐

If YES, please provide details:

## SECTION C – NATIONAL RESPONSE

The purpose of this section is to find out what the national and local response was to the event after the tsunami warning had been issued by the National Warning Centre.

16) **Where any actions taken by the national disaster management organisation (or equivalent)?**

Yes: ☐ No: ☐

If YES provide details**:**

| Action taken | Time (UTC) |
|---|---|
| | |
| | |
| | |
| | |
| | |

(Add more rows if necessary)

17) **Were any areas evacuated?**

Yes: ☐ No: ☐

If YES, please provide details in the following table:

| Area Evacuated | Time (UTC) | Estimated No. People |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

(Add more rows if necessary)

**18) If an evacuation occurred, did the process happen smoothly?**

Yes: ☐ No: ☐

If NO, please provide details of problems encountered:

**19) Did people in some areas self-evacuate before a warning was issued?**

Yes: ☐ No: ☐

If YES, please provide details in the following table:

| Area | Time (UTC) | Estimated No. People |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

(Add more rows if necessary)

## SECTION D – MONITORING AND MODELLING

**20) Were sea level data monitored during the event?**

Yes ☐ No ☐

If YES, which stations were monitored and how where they monitored?

| Sea Level station | Monitoring method | | |
|---|---|---|---|
| | GTS ☐ | IOC Sea Level Station Monitoring Facility ☐ | Other ☐ |
| | GTS ☐ | IOC Sea Level Station Monitoring Facility ☐ | Other ☐ |
| | GTS ☐ | IOC Sea Level Station Monitoring Facility ☐ | Other ☐ |
| | GTS ☐ | IOC Sea Level Station Monitoring Facility ☐ | Other ☐ |
| | GTS ☐ | IOC Sea Level Station Monitoring Facility ☐ | Other ☐ |

(Add more rows if necessary)

If “Other” please specify:

**21) If the answer to question 20 is NO, does your National Warning Centre know how to access sea level data over the GTS or on the IOC Sea Level Station Monitoring Facility**?

GTS: Yes ☐ No ☐

IOC Sea Level Facility: Yes ☐ No ☐

22) **Did your National Warning Centre use any numerical model scenarios during the event (deep ocean propagation and/or inundation model scenarios)?**

Yes: ☐ No: ☐

## SECTION E – OTHER INFORMATION

Please feel free to provide any further information you would like to be included in the report. This could include comments which you can type below, or attachments such as photographs, or any other documents you consider relevant. We would particularly welcome copies of any national post-event assessment reports that are available.

ANNEX III

## PICTURES

**1.French Polynesia – The Marquesas islands**

Credit: Photo from Eric Olivier, *Les Nouvelles Press* : Tahauku, Hiva Oa Marquesas.

Low and high level of the tsunami. The run-up in more than 3.6 m, (so tsunami amplitude larger than 6 m).

**2.Nuku Hiva, Taiohae, Marquesas islands**
Credit from: Lionel Gouverneur, Photographer, Taiohae, Nuku Hiva

**3.Ua Pou, Hakahau bay, Marquesas islands**
Credit from: Jacques Vitellini, Ua Pou, Hakahau

| No. | Title | Languages |
|---|---|---|
| 1 | Manual on International Oceanographic Data Exchange. 1965 | (out of stock) |
| 2 | Intergovernmental Oceanographic Commission (Five years of work). 1966 | (out of stock) |
| 3 | Radio Communication Requirements of Oceanography. 1967 | (out of stock) |
| 4 | Manual on International Oceanographic Data Exchange - Second revised edition. 1967 | (out of stock) |
| 5 | Legal Problems Associated with Ocean Data Acquisition Systems (ODAS). 1969 | (out of stock) |
| 6 | Perspectives in Oceanography, 1968 | (out of stock) |
| 7 | Comprehensive Outline of the Scope of the Long-term and Expanded Programme of Oceanic Exploration and Research. 1970 | (out of stock) |
| 8 | IGOSS (Integrated Global Ocean Station System) - General Plan Implementation Programme for Phase I. 1971 | (out of stock) |
| 9 | Manual on International Oceanographic Data Exchange - Third Revised Edition. 1973 | (out of stock) |
| 10 | Bruun Memorial Lectures, 1971 | E, F, S, R |
| 11 | Bruun Memorial Lectures, 1973 | (out of stock) |
| 12 | Oceanographic Products and Methods of Analysis and Prediction. 1977 | E only |
| 13 | International Decade of Ocean Exploration (IDOE), 1971-1980. 1974 | (out of stock) |
| 14 | A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines. 1976 | E, F, S, R |
| 15 | Bruun Memorial Lectures, 1975 - Co-operative Study of the Kuroshio and Adjacent Regions. 1976 | (out of stock) |
| 16 | Integrated Ocean Global Station System (IGOSS) General Plan and Implementation Programme 1977-1982. 1977 | E, F, S, R |
| 17 | Oceanographic Components of the Global Atmospheric Research Programme (GARP) . 1977 | (out of stock) |
| 18 | Global Ocean Pollution: An Overview. 1977 | (out of stock) |
| 19 | Bruun Memorial Lectures - The Importance and Application of Satellite and Remotely Sensed Data to Oceanography. 1977 | (out of stock) |
| 20 | A Focus for Ocean Research: The Intergovernmental Oceanographic Commission - History, Functions, Achievements. 1979 | (out of stock) |
| 21 | Bruun Memorial Lectures, 1979: Marine Environment and Ocean Resources. 1986 | E, F, S, R |
| 22 | Scientific Report of the Interealibration Exercise of the IOC-WMO-UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open Ocean Waters. 1982 | (out of stock) |
| 23 | Operational Sea-Level Stations. 1983 | E, F, S, R |
| 24 | Time-Series of Ocean Measurements. Vol.1. 1983 | E, F, S, R |
| 25 | A Framework for the Implementation of the Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment. 1984 | (out of stock) |
| 26 | The Determination of Polychlorinated Biphenyls in Open-ocean Waters. 1984 | E only |
| 27 | Ocean Observing System Development Programme. 1984 | E, F, S, R |
| 28 | Bruun Memorial Lectures, 1982: Ocean Science for the Year 2000. 1984 | E, F, S, R |
| 29 | Catalogue of Tide Gauges in the Pacific. 1985 | E only |
| 30 | Time-Series of Ocean Measurements. Vol. 2. 1984 | E only |
| 31 | Time-Series of Ocean Measurements. Vol. 3. 1986 | E only |
| 32 | Summary of Radiometric Ages from the Pacific. 1987 | E only |
| 33 | Time-Series of Ocean Measurements. Vol. 4. 1988 | E only |

(continued)

| No. | Title | Languages |
|---|---|---|
| 34 | Bruun Memorial Lectures, 1987: Recent Advances in Selected Areas of Ocean Sciences in the Regions of the Caribbean, Indian Ocean and the Western Pacific. 1988 | Composite E, F, S |
| 35 | Global Sea-Level Observing System (GLOSS) Implementation Plan. 1990 | E only |
| 36 | Bruun Memorial Lectures 1989: Impact of New Technology on Marine Scientific Research. 1991 | Composite E, F, S |
| 37 | Tsunami Glossary - A Glossary of Terms and Acronyms Used in the Tsunami Literature. 1991 | E only |
| 38 | The Oceans and Climate: A Guide to Present Needs. 1991 | E only |
| 39 | Bruun Memorial Lectures, 1991: Modelling and Prediction in Marine Science. 1992 | E only |
| 40 | Oceanic Interdecadal Climate Variability. 1992 | E only |
| 41 | Marine Debris: Solid Waste Management Action for the Wider Caribbean. 1994 | E only |
| 42 | Calculation of New Depth Equations for Expendable Bathymerographs Using a Temperature-Error-Free Method (Application to Sippican/TSK T-7, T-6 and T-4 XBTS. 1994 | E only |
| 43 | IGOSS Plan and Implementation Programme 1996-2003. 1996 | E, F, S, R |
| 44 | Design and Implementation of some Harmful Algal Monitoring Systems. 1996 | E only |
| 45 | Use of Standards and Reference Materials in the Measurement of Chlorinated Hydrocarbon Residues. 1996 | E only |
| 46 | Equatorial Segment of the Mid-Atlantic Ridge. 1996 | E only |
| 47 | Peace in the Oceans: Ocean Governance and the Agenda for Peace; the Proceedings of *Pacem in Maribus* XXIII, Costa Rica, 1995. 1997 | E only |
| 48 | Neotectonics and fluid flow through seafloor sediments in the Eastern Mediterranean and Black Seas - Parts I and II. 1997 | E only |
| 49 | Global Temperature Salinity Profile Programme: Overview and Future. 1998 | E only |
| 50 | Global Sea-Level Observing System (GLOSS) Implementation Plan-1997. 1997 | E only |
| 51 | L'état actuel de 1'exploitation des pêcheries maritimes au Cameroun et leur gestion intégrée dans la sous-région du Golfe de Guinée *(cancelled)* | F only |
| 52 | Cold water carbonate mounds and sediment transport on the Northeast Atlantic Margin. 1998 | E only |
| 53 | The Baltic Floating University: Training Through Research in the Baltic, Barents and White Seas - 1997. 1998 | E only |
| 54 | Geological Processes on the Northeast Atlantic Margin ($8^{th}$ training-through-research cruise, June-August 1998). 1999 | E only |
| 55 | Bruun Memorial Lectures, 1999: Ocean Predictability. 2000 | E only |
| 56 | Multidisciplinary Study of Geological Processes on the North East Atlantic and Western Mediterranean Margins ($9^{th}$ training-through-research cruise, June-July 1999). 2000 | E only |
| 57 | Ad hoc Benthic Indicator Group - Results of Initial Planning Meeting, Paris, France, 6-9 December 1999. 2000 | E only |
| 58 | Bruun Memorial Lectures, 2001: Operational Oceanography – a perspective from the private sector. 2001 | E only |
| 59 | Monitoring and Management Strategies for Harmful Algal Blooms in Coastal Waters. 2001 | E only |
| 60 | Interdisciplinary Approaches to Geoscience on the North East Atlantic Margin and Mid-Atlantic Ridge ($10^{th}$ training-through-research cruise, July-August 2000). 2001 | E only |
| 61 | Forecasting Ocean Science? Pros and Cons, Potsdam Lecture, 1999. 2002 | E only |

| No. | Title | Languages |
|---|---|---|
| 62 | Geological Processes in the Mediterranean and Black Seas and North East Atlantic (11th training-through-research cruise, July- September 2001). 2002 | E only |
| 63 | Improved Global Bathymetry – Final Report of SCOR Working Group 107. 2002 | E only |
| 64 | R. Revelle Memorial Lecture, 2006: Global Sea Levels, Past, Present and Future. 2007 | E only |
| 65 | Bruun Memorial Lectures, 2003: Gas Hydrates – a potential source of energy from the oceans. 2003 | E only |
| 66 | Bruun Memorial Lectures, 2003: Energy from the Sea: the potential and realities of Ocean Thermal Energy Conversion (OTEC). 2003 | E only |
| 67 | Interdisciplinary Geoscience Research on the North East Atlantic Margin, Mediterranean Sea and Mid-Atlantic Ridge (12th training-through-research cruise, June-August 2002). 2003 | E only |
| 68 | Interdisciplinary Studies of North Atlantic and Labrador Sea Margin Architecture and Sedimentary Processes (13th training-through-research cruise, July-September 2003). 2004 | E only |
| 69 | Biodiversity and Distribution of the Megafauna / Biodiversité et distribution de la mégafaune. 2006<br>Vol.1 The polymetallic nodule ecosystem of the Eastern Equatorial Pacific Ocean / Ecosystème de nodules polymétalliques de l'océan Pacifique Est équatorial<br>Vol.2 Annotated photographic Atlas of the echinoderms of the Clarion-Clipperton fracture zone / Atlas photographique annoté des échinodermes de la zone de fractures de Clarion et de Clipperton<br>Vol.3 Options for the management and conservation of the biodiversity — The nodule ecosystem in the Clarion Clipperton fracture zone: scientific, legal and institutional aspects | E F |
| 70 | Interdisciplinary geoscience studies of the Gulf of Cadiz and Western Mediterranean Basin (14th training-through-research cruise, July-September 2004). 2006 | E only |
| 71 | Indian Ocean Tsunami Warning and Mitigation System, IOTWS. Implementation Plan, 7–9 April 2009 (2nd Revision). 2009 | E only |
| 72 | Deep-water Cold Seeps, Sedimentary Environments and Ecosystems of the Black and Tyrrhenian Seas and the Gulf of Cadiz (15th training-through-research cruise, June–August 2005). 2007 | E only |
| 73 | Implementation Plan for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS), 2007–2011. 2007 *(electronic only)* | E only |
| 74 | Bruun Memorial Lectures, 2005: The Ecology and Oceanography of Harmful Algal Blooms – Multidisciplinary approaches to research and management. 2007 | E only |
| 75 | National Ocean Policy. The Basic Texts from: Australia, Brazil, Canada, China, Colombia, Japan, Norway, Portugal, Russian Federation, United States of America. (Also Law of Sea Dossier 1). 2008 | E only |
| 76 | Deep-water Depositional Systems and Cold Seeps of the Western Mediterranean, Gulf of Cadiz and Norwegian Continental margins (16th training-through-research cruise, May–July 2006). 2008 | E only |
| 77 | Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – 12 September 2007 Indian Ocean Tsunami Event. Post-Event Assessment of IOTWS Performance. 2008 | E only |
| 78 | Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (CARIBE EWS) – Implementation Plan 2008. 2008 | E only |
| 79 | Filling Gaps in Large Marine Ecosystem Nitrogen Loadings Forecast for 64 | E only |

(continued)

| No. | Title | Languages |
|---|---|---|
| | LMEs – GEF/LME global project Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems. 2008 | |
| 80 | Models of the World's Large Marine Ecosystems. GEF/LME Global Project Promoting Ecosystem-based Approaches to Fisheries Conservation and Large Marine Ecosystems. 2008 | E only |
| 81 | Indian Ocean Tsunami Warning and Mitigation System (IOTWS) – Implementation Plan for Regional Tsunami Watch Providers (RTWP). 2008 | E only |
| 82 | Exercise Pacific Wave 08 – A Pacific-wide Tsunami Warning and Communication Exercise, 28–30 October 2008. 2008 | E only |
| 83. | *Cancelled* | |
| 84. | Global Open Oceans and Deep Seabed (GOODS) Bio-geographic Classification. 2009 | E only |
| 85. | Tsunami Glossary | E, F, S |
| 86 | Pacific Tsunami Warning System (PTWS) Implementation Plan *(under preparation)* | |
| 87. | Operational Users Guide for the Pacific Tsunami Warning and Mitigation System (PTWS) – January 2009. 2009 | E only |
| 88. | Exercise Indian Ocean Wave 2009 (IOWave09) – An Indian Ocean-wide Tsunami Warning and Communication Exercise – 14 October 2009. 2009 | E only |
| 89. | Ship-based Repeat Hydrography: A Strategy for a Sustained Global Programme. 2009 | E only |
| 90. | 12 January 2010 Haiti Earthquake and Tsunami Event Post-Event Assessment of CARIBE EWS Performance. 2010 | E only |
| 91. | Compendium of Definitions and Terminology on Hazards, Disasters, Vulnerability and Risks in a coastal context | *Under preparation* |
| 92. | 27 February 2010 Chile Earthquake and Tsunami Event – Post-Event Assessment of PTWS Performance (Pacific Tsunami Warning System). 2010 | E only |