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An overview of latest cold seep research around New Zealand (2006 and 2007)

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Prior to 2006 the knowledge about cold seeps around New Zealand was mainly based on the accidental recovery of seep fauna or methane-derived carbonates by fishermen and the detection of flares in fish-finding sonars. Lewis and Marshall (1996; NZJGG) compiled these findings, which resulted in 13 seep sites. Four of those are located along the Hikurangi Margin at the east coast of New Zealand's North Island. Geophysical investigations in this area show a widely distributed and in places very strong BSR, often underneath seep sites (e.g. Henrys et al., 1993; GRL). Between June 2006 and March 2007, three research cruises solely devoted to detailed seep studies took place at the Hikurangi Margin. The first two cruises with RV TANGAROA (led by GNS Science and NIWA) focused on extensive reconnaissance work (multibeam mapping, seismic surveys, flare imaging, visual observations) as well as fauna sampling, geochemical pore water analyses and CTD casts including water sampling for methane analyses. Several new seep sites were discovered during these cruises. Based on these findings, the German BMBF provided funds for a 10-week expedition between January and March 2007 divided into 3 legs aboard the RV SONNE (SO191) conducted by IFM-GEOMAR. All research topics currently discussed by the scientific community were addressed using state-of-the-art equipment (e.g. deep-tow side-scan, TV-guided sampling, ROV-deployments). Twelve institutes from six countries were involved (Germany, New Zealand, Belgium, Switzerland, United Kingdom, Australia). All in all, 24 seep sites were identified in six key areas. Seeps sometimes occur in clusters of 5 to 6 separated sites, each few hundred meters wide with up to a mile's distance between them. Seismic images show a large variety in the shape

and width of the related feeder channels. At the seafloor they are in general characterized by aragonite-rich carbonates building irregularly shaped chemoherms several meters high. They are associated with fauna assemblage of tube worms, clams (Calyptogena, Bathymodiolus), a new species of ampharetid polychaetes, and bacteria mats. Bubble release is a common process that in some occasions was observed to occur in strong outbursts lasting several minutes. Water casts by CTD and onboard methane analyses investigated the fate of methane in the water column, using also ADCP measurements and thermistor-moorings to study the influence on currents on the methane distribution and a possible bubble-induced 'up-welling' above seep sites. High resolution deep-tow side scan with sub-bottom profiling and multi channel seismics were linked with visual observations for ecological studies and seep mapping down to a sub-meter scale. Extensive pore water work including insitu measurements during lander deployments aimed at the evaluation of flux rates of dissolved geochemical species and free gas. These fluxes will be linked to geophysical results from multi channel seismic, controlled source electro magnetic and OBS/H deployments to verify the control mechanisms for the widespread methane seepage at the Hikurangi Margin.