

The 1st ICOS OTC pCO₂ instruments Inter-Comparison 2021: Initial results

Steinhoff Tobias¹, Jones Steve², Neill Craig³, Macovei Vlad⁴, Schuster Ute⁵, Theetaert Hannelore⁶, Verbrugge Silke⁶ and Gkritzalis Thanos⁶

¹ Norwegian Research Centre AS (NORCE), Norway

² University of Bergen, Norway

³ CSIRO Marine and Atmospheric Research, Australia

⁴ Helmholtz-Centre Hereon, Institute of Coastal Ocean Dynamics, Germany

⁵ College of Life and Environmental Sciences University of Exeter, United Kingdom

⁶ Flanders Marine Institute (VLIZ), Wandelaarkaai 7, 8400 Oostende, Belgium

In summer 2021, with one year delay, the Ocean Thematic Centre (OTC) of the European research infrastructure “Integrated Carbon Observation System” organized an inter-comparison exercise for pCO₂ instrumentation. The exercise focused on surface applications and took place at the Flanders Marine Institute’s (VLIZ) Marine Station Ostend in Ostend/Belgium. The goal was the rigorous assessment of instrument capabilities and documenting their measurement uncertainty. Following this exercise, we aim to improve the quality and aid the processing of ocean pCO₂ data, enabling better estimates of ocean CO₂ uptake and ocean acidification. Furthermore, the ongoing interaction between manufacturers and the extensive user group that this experiment enabled facilitates continuous instrument improvement. During the 2 week exercise, we deployed 29 instruments of 18 different types in a temperature-controlled water tank containing ca. 5 m³ seawater. The water pCO₂ was manipulated by changing the temperature or by adding chemicals (acid or base). This allowed us to compare the pCO₂ measurements at different temperatures (10 – 30°C) and pCO₂ levels (200 – 800 µatm). Here we present the first results from the inter-comparison and provide suggestions for future experiments and sensor development.