

O-29: METROLOGICAL CHALLENGES FOR THE MONITORING OF THE PARTIAL PRESSURE OF CO₂ IN THE MARINE ENVIRONMENT

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The observed rising levels of carbon dioxide (CO₂) in atmosphere, highly caused by anthropogenic emissions, are responsible for fundamental changes occurring also in seawater carbonate chemistry. The oceans are absorbing more CO₂ from the atmosphere, which is decreasing seawater pH and leading to the acidification of marine waters, with important consequences for the global ecosystem. At present, the partial pressure of CO₂ (*p*CO₂) is one of the few variables of the marine carbon cycle directly measurable *in situ*. In order to achieve meaningful and significant measurement results, it is necessary to reach uncertainties small enough to discriminate observed variations due to natural fluctuations, from those due to real trends. In this framework, the development and validation of proper analytical methods and measurement standards is of utmost importance.

Despite the availability of a variety of *in situ* sensors, currently used to monitor *p*CO₂ in marine environment, there are several problems to be faced, such as the differences in adopted calibration methodologies and non-validated procedures, or the lack of metrological traceability and of operational harmonization for field measurements. In addition, the scarcity and expensiveness of suitable reference materials to calibrate instrumentation used for *p*CO₂ monitoring represents an issue. A promising approach could be the provision, on a larger scale, of appropriate reference standards in gas phase to be used to calibrate *p*CO₂ sensors, due to the stability of the CO₂ in the gas mixtures. In addition, intermediate-level standards and working standards, could represent a more affordable and widespread traceability source. Concerning the analytical methods for *p*CO₂ monitoring, Non Dispersive Infrared (NDIR) photometry is quite used, but its application could be potentiated.

At INRiM, the Italian Metrology Institute, gaseous reference standards of CO₂ at known amount fraction in synthetic air or nitrogen are produced by the gravimetric method. In the framework of the H2020 Project "MINKE - Metrology for Integrated Marine Management and Knowledge-Transfer Network", feasibility studies are ongoing to extend the use of these primary mixtures to the calibration of sensors for *p*CO₂ in seawater, in cooperation with the National Institute of Oceanography and Applied Geophysics (OGS). In the present work, some preliminary results of this activity will be presented.