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Improvement and use of an optical pCO_2 sensor in the marine environment

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There are several reasons to monitor CO_2 in aquatic environments. In, for example, aquaculture high pCO_2 will be toxic to the animals and inhibit growth and in climate/ocean global warming studies it is essential to assess if different marine environments are sinks or sources of CO_2. Commercially available systems for pCO_2 measurements exist, but they are bulky and their energy consumption is relatively high.

Fluorescence dual lifetime detection was implemented in a compact deep sea rated optical CO_2 sensor. We present results from laboratory and fieldwork with these sensors focusing on:

• foil contamination, cross sensitivity and foil pre-conditioning;
• different calibrations methods;
• stability during longer (1-12 months) in situ deployments on marine observatories;
• acid addition to determine both pCO_2 and Dissolved Inorganic Carbon (DIC) on the same water sample;
• sediment-water flux measurements using autonomous benthic landers in situ.