

SAMI-CO₂ : Submersible Autonomous Moored Instrument for CO₂

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Version 1.3 (October 10, 2022)

- Measures the partial pressure of carbon dioxide ($p\text{CO}_2$) in water
 - **Calibration-Free Optical Chemical Sensors**
Michael D. DeGrandpre, Matthew M. Baehr, and Terence R. Hammar
Analytical Chemistry **1999** 71 (6), 1152-1159 DOI: 10.1021/ac9805955
- Uses a highly precise and stable colorimetric indicator method
 - Accuracy, Precision : +/- 10 μatm , <1 μatm
 - Long term drift : <1 μatm per 6 months
 - Thermistor accuracy, precision: 0.1 °C, +/- 0.01 °C
- SAMIs are calibrated prior to deployment in an insulated, temperature controlled 55 gallon water tank equipped with a membrane CO₂ contactor (Hales et al, 2004, L&O Methods), NOAA-ESRL standard (0, 250, 740 ppm) calibrated Licor Li-840A and circulation pumps. CO₂ equilibrated water is passed through the membrane contactor with a counter-flow of air equilibrating with the water CO₂, which then passes through the Licor which measures the equilibrated water CO₂ value. The SAMI absorbance ratio is compared to the Licor value and calibration coefficients are generated.
- Post-deployment calibration/validation is not typically possible due to several factors including but not limited to:
 - membrane drying out following recovery
 - insufficient amount of indicator left following deployment
 - pump/valve airlock issues following recovery
- When possible, Alkalinity and Dissolved Inorganic Carbon (DIC) bottle samples are collected during the deployment. Bottle sample values are input in to CO₂Sys to calculate $p\text{CO}_2$ for QA/QC purposes.

References

- Hales, Burke, Chipman, David, Takahashi, Taro, (2004), High-frequency measurement of partial pressure and total concentration of carbon dioxide in seawater using microporous hydrophobic membrane contactors, *Limnol. Oceanogr. Methods*, 2, doi:10.4319/lom.2004.2.356