

Ocean coastal acidification: Development of a spectrophotometric method for monitoring seawater pH at the Bowdoin Coastal Studies Center
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Ocean acidification (OA) is the decline of seawater pH caused by increasing atmospheric carbon dioxide levels. Coastal environments are acidifying faster than the open ocean due to changes in freshwater flow, biological productivity from nutrient runoff, and coastal upwelling of CO₂-rich waters. Laboratories and ocean science groups in the Gulf of Maine use several different types of pH probes to measure and monitor ocean coastal acidification (OCA). With varying precision and accuracy among these instruments, the development of a spectrophotometric pH method using methyl Red could allow for improved monitoring and quantification of OCA in the Gulf of Maine. This method differs from other methods of measuring pH, because it is a lab-based method that requires collecting samples in bottles and bringing them back to the lab for analysis. Most pH probes use a different technology that make them more portable and accessible, but result in a lower precision and accuracy than the spectrophotometric method. At the Coastal Studies Center, we are setting up the spectrophotometer to validate the sensors measurements and potentially calibrate an automated pH sensor.

Since CO₂ affects pH, many samples have been analyzed to learn how to minimize sample gas exchange. The following table shows the results of the analysis.

pH probe that can be more easily deployed in the field. Further experiments will be conducted to learn if the spectrophotometer could be used to calibrate larger pH probes used for depth profiling. If this is possible, then instruments from other monitoring groups in Maine through the Maine Ocean Coastal Acidification Partnership could use the spectrophotometer to calibrate their pH probes. Other questions for further research include how often the calibration needs to occur, and is it possible to correct for impurities in meta-CO₂.

spectrophotometric pH intercalibration method
is one way to ensure that the data are accurate, precise, and comparable to one another

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References: Dickson A.G., Sabine, and J.R. Christian. 2007. Guide to Best Practices for Ocean CO₂ Measurements. PICES Special Publication. 3:191.