Carbonate Parameter Estimation and Its Application in Revealing Temporal and Spatial Variation in the South and Mid-Atlantic Bight, USA

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Estimating carbon variables to achieve higher resolution data sets for acidification research

Why we care

Sporadic measurement of the carbonate system in the Mid-Atlantic Bight and South-Atlantic Bight challenges our ability to understand carbon cycles and the effects of acidification in the coastal zone. In order to respond to ocean change, it is necessary to understand carbon cycling at a high resolution using the information at hand.

What we are doing

In this study, researchers created mathematical models that predict carbonate system parameters from more consistently measured ocean variables like temperature, salinity, and oxygen. They used data from East Coast Ocean Acidification Cruises (ECOA-1 and ECOA-2) and Gulf of Mexico and East Coast Carbon Cruises (GOMECC-1 and GOMECC-2) to create these regression models, and verified the models using high-accuracy pH measurements. The researchers compared their findings to previous studies to evaluate their methods, and applied their regressions to datasets from profiling floats.

What we found

Multiple linear regression models provide a promising tool for reconstructing carbonate parameters using data from autonomous platforms like gliders and buoys. Models differ between the Mid and South Atlantic Bights, and their temporal changes due to atmospheric carbon dioxide are limited over 10 years. Estimating pH from measured pH has smaller uncertainties than estimates calculated from other carbonate parameters.

Benefits of our work

This work created models to help us predict changes in the carbonate system, which is hard to measure and lacks continuous comprehensive sampling, by utilizing commonly measured ocean properties. The predictions over space and time give us a broader view of how the ocean is changing, and helps us prepare for change in areas that are not regularly monitored.