Ocean Acidification observations in Chesapeake Bay

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STAR meeting

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Outline

- Measurements for ocean acidification
- History of observations
- Planned work on Chesapeake Bay ocean acidification
- Role for the Chesapeake Bay Interpretive Buoy System

Measuring ‘ocean acidification’

- Unlike physical conditions, marine chemistry observations are difficult to sample remotely
- Water samples are required
  - Ship time
    - Expensive and infrequent
  - Marine chemistry lab
    - Expensive gadgets and skilled technicians
- Autonomous observations of pH
  - Partner institutions are working with two ‘new’ pH sensors to add to field samples
    - SeapHOx - Sea-bird Electronics
      - University of Delaware deployment on Gooses Reef bottom sensor
    - SAMI-pH - Sunburst Sensors
      - Virginia Institute of Marine Science deployment on York Spit

History of observations

- University of Delaware full-bay observations from 2013 to present
  - Multiple cruise per year aboard the
    - R/V Rachel Carson
    - R/V Hugh Sharp
  - Water samples at depth to determine
    - DIC
    - pCO2
    - Alkalinity
    - pH
  - As a bonus we get
    - Temperature
    - Salinity
      - Useful to calibrate other observations
- Climate scale variability requires time series long enough to resolve long-term changes
  - And - the time required depends on interannual variability
  - But - ten years will enable preliminary estimates of trends
  - Therefore - University of Delaware needs funding for this program through (at least) 2023

Role for CBIBS

- Long-term deployment at Gooses Reef
  - University of Delaware - Cai Lab
    - SeapHOx sensor on the bottom mount
    - SAMI sensor at the surface
- Long-term deployment at York Spit
  - Virginia Institute of Marine Science - Shadwick Lab
    - SeapHOx sensor at the surface
- NOAA Pacific Marine Environmental Laboratory ocean acidification program
  - Co-PIs - Sutton, Cai, Wilson
  - Starting in 2017
  - Chemical sensor buoy to be deployed near the CBIBS First Landing station
  - Maintained by VIMS
  - Water samples analysed at University of Delaware
- CBIBS data provides context for these observations
  - CBIBS has observed wind, currents, and water quality since 2007*
  - And - This (relatively) long time series helps understand the physical processes at work in Chesapeake Bay
  - But - We could do a better job at the above stations to resolve vertical structure and dynamics
  - Therefore - We need CBIBS through (at least) 2023 to better inform current ocean acidification studies

Cooperative efforts

- Designed new ‘clamparatus’ to attach chemical sensors to the sides of CBIBS buoys
  - Provides a space for partners to recover and deploy instruments from our sensors
  - CBIBS data provides context for other observations
  - Can be used for any autonomous instruments
- Work in progress on publications
  - Kilbourne and Cai - Observations of rapid changes in benthic dissolved oxygen due wind-driven baroclinic flows in the Chesapeake Bay
  - Cai and Kilbourne
- Discussion of collaboration with VIMS researchers
  - Shadwick - Physical forcings on pH and DO in the lower Chesapeake Bay
  - Forrest and Freidrichs - Comparing observations and models of dissolved oxygen in Chesapeake Bay