Ocean Acidification in the Gulf of Mexico: Drivers, Impacts, and Unknowns

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Overview

- This synthesis was conducted by the Gulf of Mexico Coastal Acidification Network (GCAN).
- Includes peer-reviewed literature on Gulf of Mexico (GOM) acidification across ocean-estuarine continuum.
- Provides the foundation for GCAN to coordinate collaboration among regional scientists, resource managers, industry partners, educators, U.S. Global Ocean Acidification Observing Network, international governments, and other networks.
- GCAN aims to advance the understanding of acidification and its impacts in the GOM region.

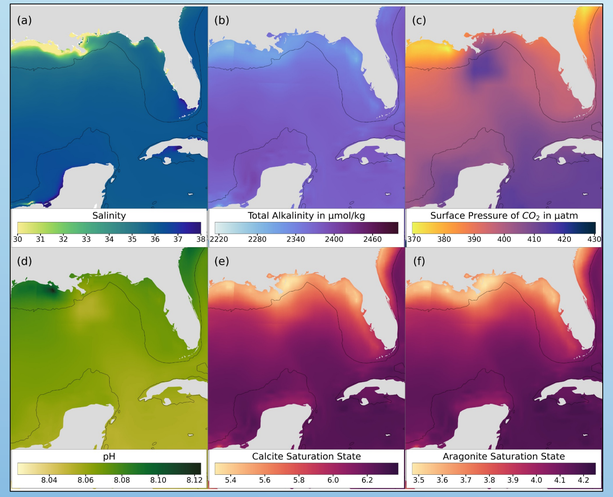

Figure 1. Modelled mean (2014-2020) GOM surface values of (a) HYCOM salinity, (b) total alkalinity (µmol/kg), (c) partial pressure of CO_2 (pCO_2, µatm), (d) pH, (e) calcite saturation state, and (f) aragonite saturation state. Carbonate system parameters presented were produced by calculating the average of the datasets created by the NOAA/AOML ACCRETE (Acidification, Climate, and Coral Reef Ecosystems Team).

Highlights

- Researchers from across all three Gulf of Mexico countries (Cuba, Mexico, and United States) participated in this synthesis.
- Expertise includes chemical oceanography, marine biology and ecology, and socioeconomics.
- Factors that contribute to ocean acidification include air-sea CO_2 exchange, ocean warming, ocean circulation, riverine influences, episodic storm events, submarine groundwater discharge, eutrophication and hypoxia.
- Marine species and habitats that may be affected or provide feedback to ocean acidification include saltmarshes, seagrass beds, mangroves, coral reefs, continental shelf sediments, shellfish, finfish, sea urchins, sponges, phytoplankton and harmful algal bloom species, calcifying plankton, and microbes.

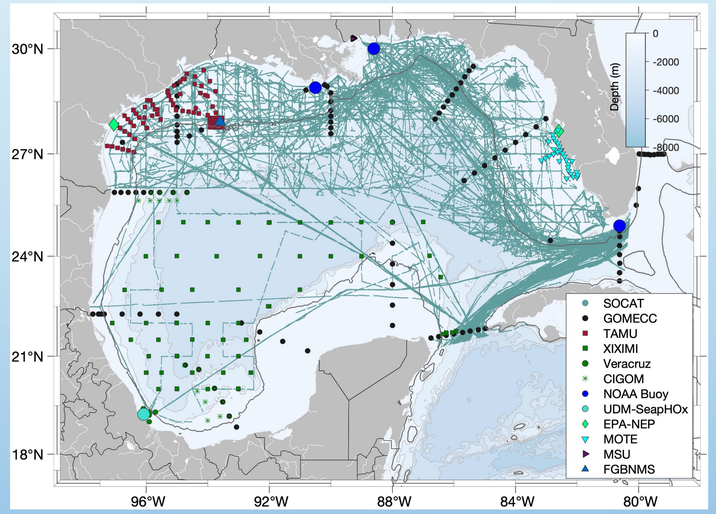

Figure 2. Available carbonate chemistry datasets (published and unpublished) across the GOM region. These datasets have been collected via underway measurements, in situ deployed sensors, and discrete water sampling. Detailed data links are provided on the accompanying webpage (accessed via scanning the QR code at the upper right corner).

Gaps

GOM OA Monitoring Gaps

- Open ocean observing
- Coastal zone observing
- Estuarine observing

GOM OA Research Gaps

- Synthesizing existing OA-relevant data
- Improving near- and long-term regional and sub-regional projections
- Advancing ocean observing technologies
- Generating paleo-records to extend the observational record
- Understanding drivers and environmental influences
  - *Interactions among acidification, HABs, and hypoxia*
  - *impact of surface and deep-water circulation,*
  - *sea level rise and coastal inundation,*
  - *freshwater inflow and episodic storm event,*
  - *oil seeps and spills*
- Response of ecologically and economically important marine species
- Impacts to ecosystems and ecosystem services
- Socioeconomic impacts

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