# Southeast Ocean and Coastal Acidification Network

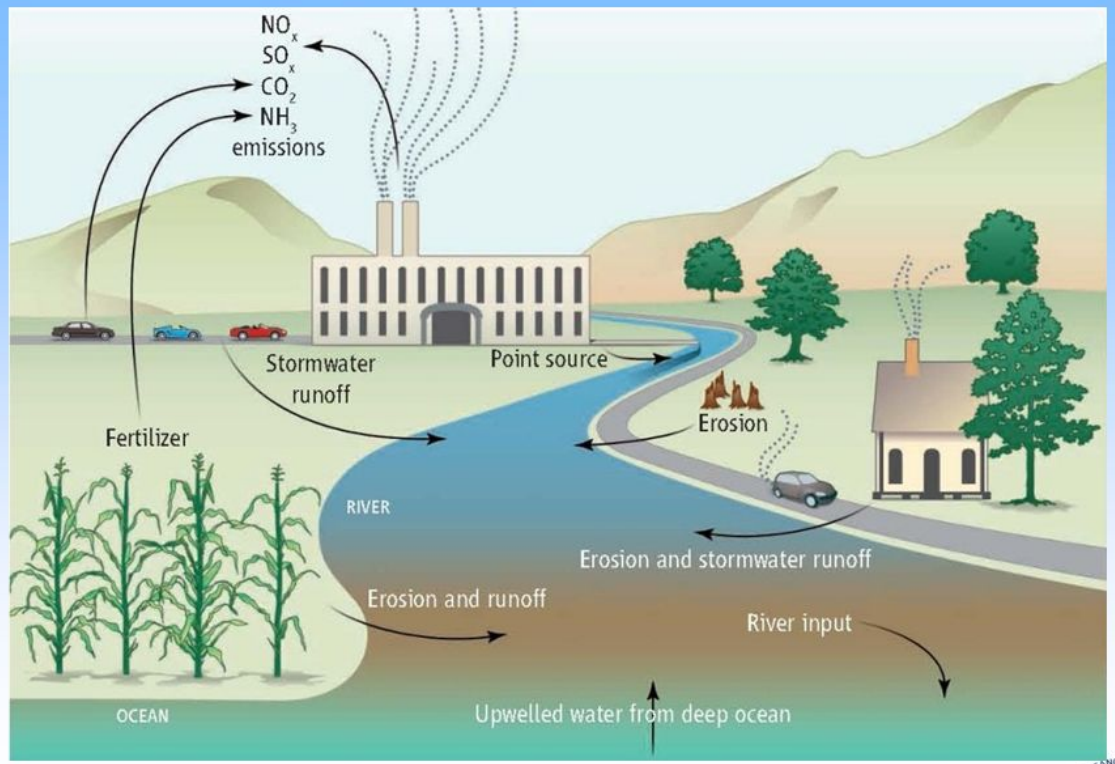
SOCAN

# SCAN Key Points

- Community of experts
  - Science
  - Management/policy
  - Industry
- Facilitates regional (NC, SC, GA, FL) collaboration and communication on:
  - Regional drivers of OA
  - Monitoring
  - State-of-the-art science
  - Vulnerable species and ecosystems
  - Mitigation & adaptation

# SOCAN Key Points

- **Acidification is driven by global uptake of $CO_2$**
  - **Fossil fuel use**
  - **Land use**
  - **Cement production**
- **Local influence and processes**
  - **Eutrophication**
  - **Upwelling**
  - **Freshwater inflow**

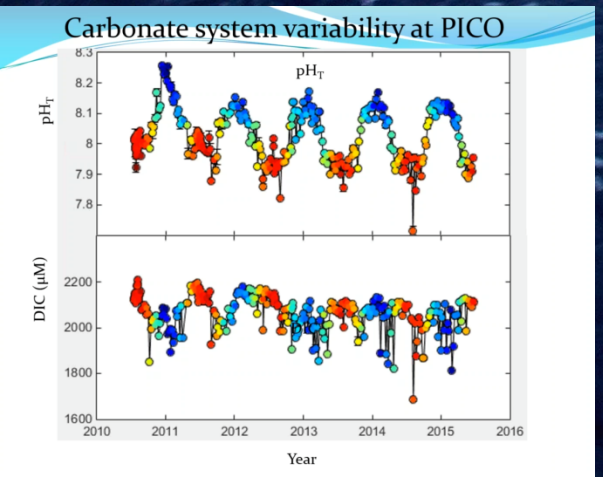


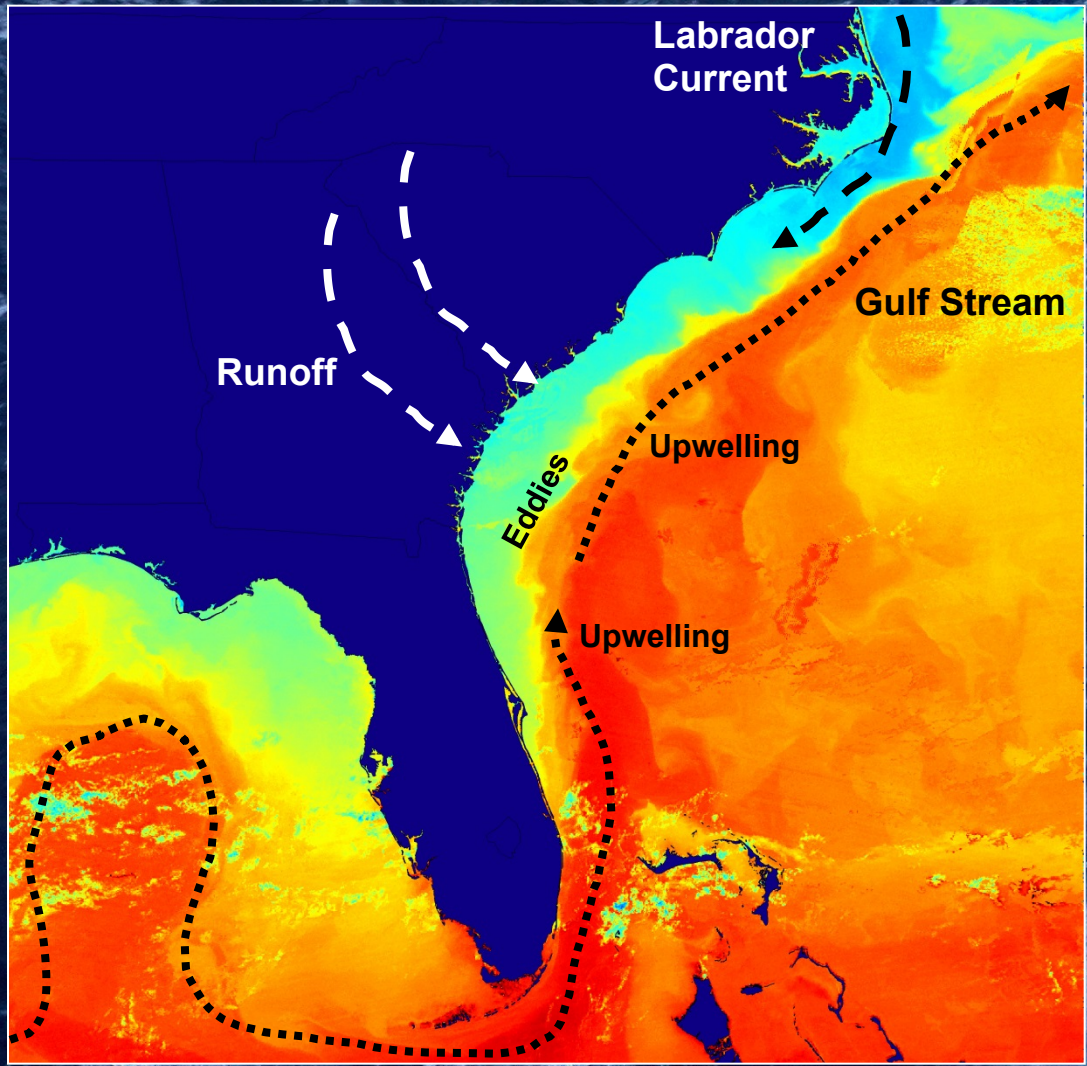

Doney et al. PNAS 2007; Doney Science 2010; Kelly et al. Science 2011

**Libby Jewett, NOAA OAP**
**Kevin Craig, NOAA NMFS**

# SECAN Key Points

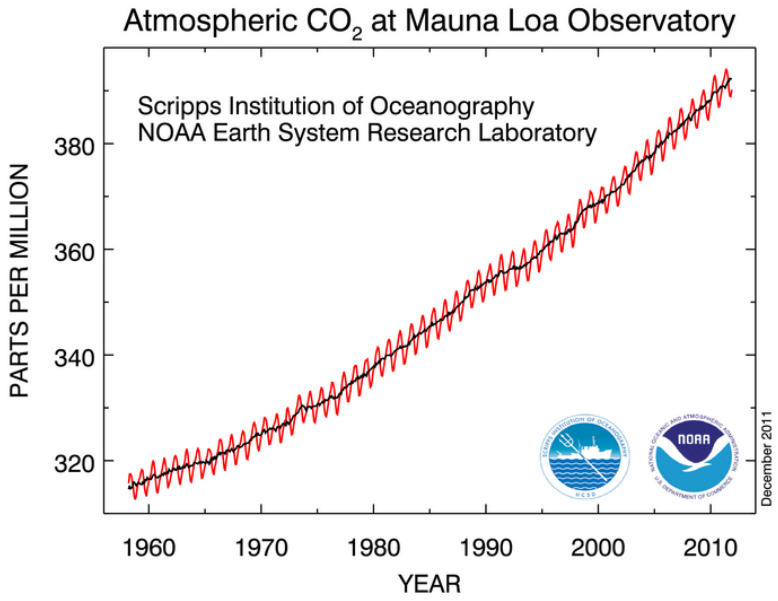
- The Southeast region is unique because it spans subtropical to tropical climate zones, and displays unique and extreme environmental conditions, stressors and gradients

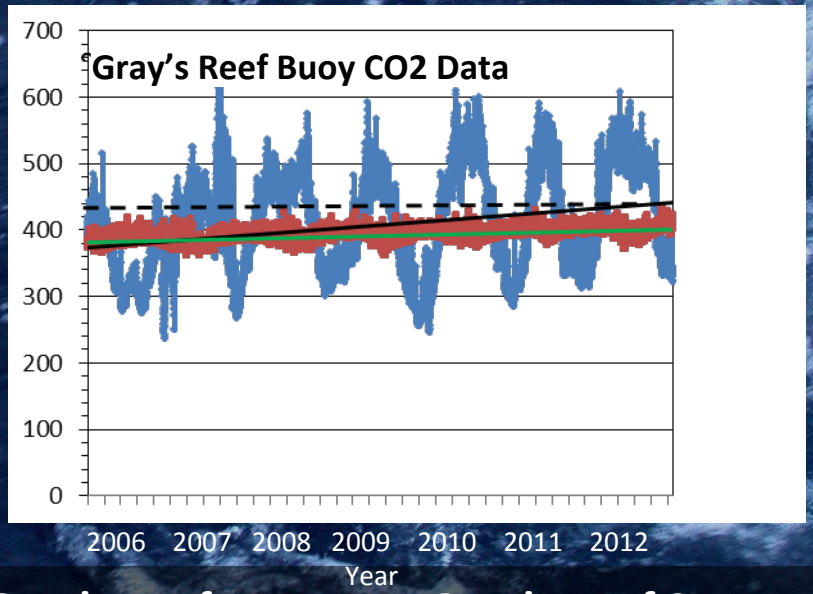


# SCAN Key Points

- **Global ocean acidification is an emerging threat that will exacerbate the coastal acidification that is already occurring in the Southeast**




**HI Atmospheric $CO_2$**
15 ppm in 5 years
=0.783%/year

**Worldwide Seawater $CO_2$**
1.2 to 2.1 ppm/year
= ~0.5%/year

**Gray's Reef Atmospheric $CO_2$**
21 ppm in 7 years
Average=391.7 ppm*
=0.77%/year

**Gray's Reef Seawater $CO_2$**
78 ppm in 7 years
Average=411.6 ppm*
=2.7%/year

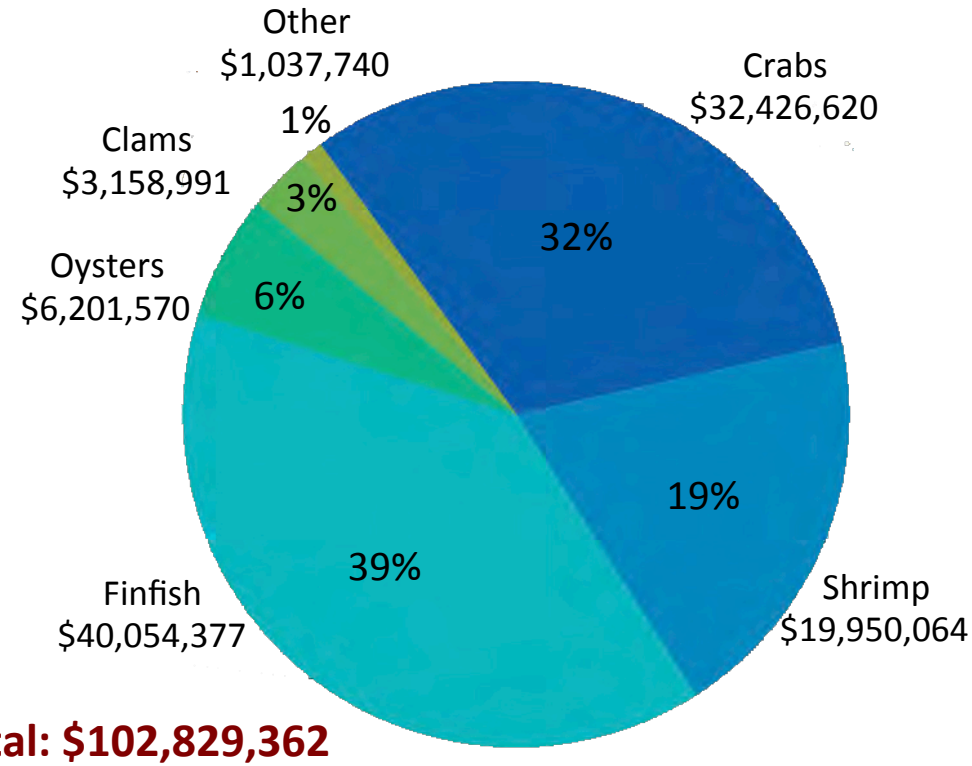
*Averages based on Gray's Reef data set

**Scott Noakes, UGA**

# SCAN Key Points

- Acidification affects all species, including fishery species
  - Shellfish particularly vulnerable

## Average Annual NC/SC Commercial Ex-Vessel Value




**Total: $102,829,362**
**Jobs: 6,581**

M. Bell, SCDNR

Crab, shrimp & lobster account for 57% of regional commercial harvest

# SOCAN Key Points

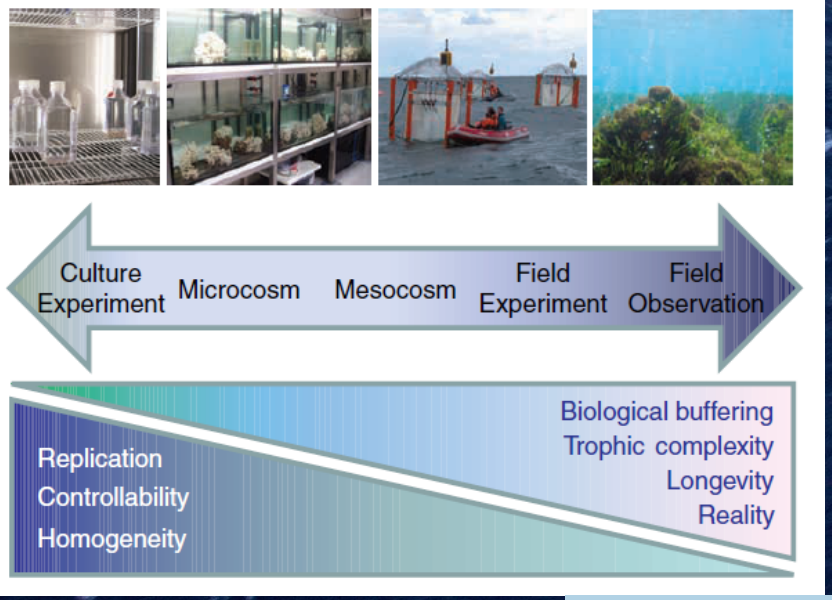
- Acidification affects all species
  - Corals particularly vulnerable
    - High temperatures lead to bleaching and disease
    - Reduced ability to create carbonate skeletons under acidic conditions
    - Increased temperature and acidification work synergistically to create greater impacts on coral reefs
    - Affects fisheries, tourism, coastal resilience
      - Many fishes and crustaceans closely tied to coral and carbonate hard bottom
      - Reduced coral health can lead to impacts to reef fish production
      - Impacts to vibrant commercial & recreational fisheries and diving industries
      - Local communities depend on reefs

# SOCAN Key Points

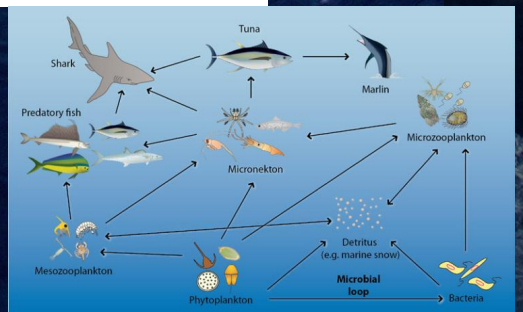
- Acidification affects all species
  - Forage species are vulnerable
    - Food web consequences
      - Mud Snails
    - Saltmarsh Snails (Littorina)
      - Grass Shrimp
      - Mud Crabs
      - Fiddler Crabs
      - Surf Clams
      - Coquina Clams
  - Seagrasses may be enhanced

# SOCAN Key Points

- **Coastal acidification is already negatively impacting coastal ecosystems, such as pelagic and benthic microbial communities**



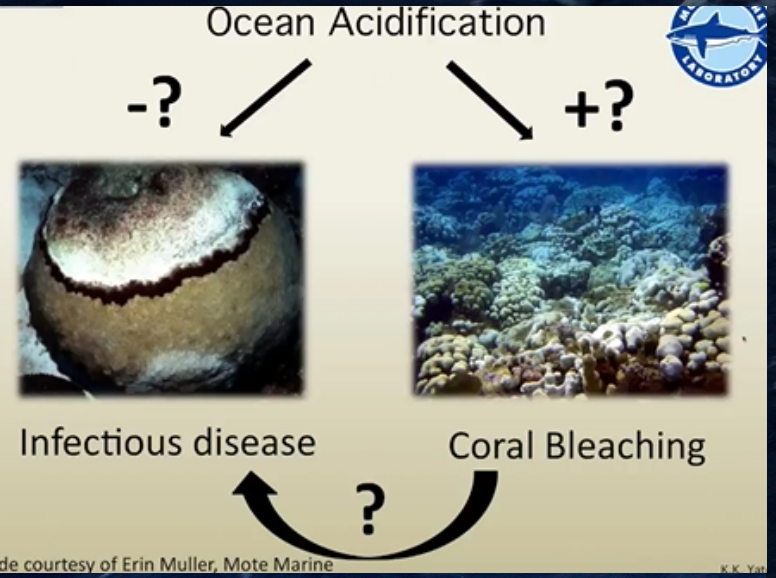

- **Micro-, meso-, and/or macrocosms provide data on effects of OA on microbial assemblage structure and function :**
  - **single to multiple trophic levels**
  - **abundances, structure, composition, diversity**
  - **fluxes, biogeochemical cycles, feedbacks, food webs**
  - **on carbon cycling and flux from pelagic to benthic systems**




**Astrid Schnetzer, NCSU**
**Dennis Hanisak, FAU**

# SOCAN Key Points

- **Coastal acidification is already negatively impacting coastal ecosystems, such as coral reefs**

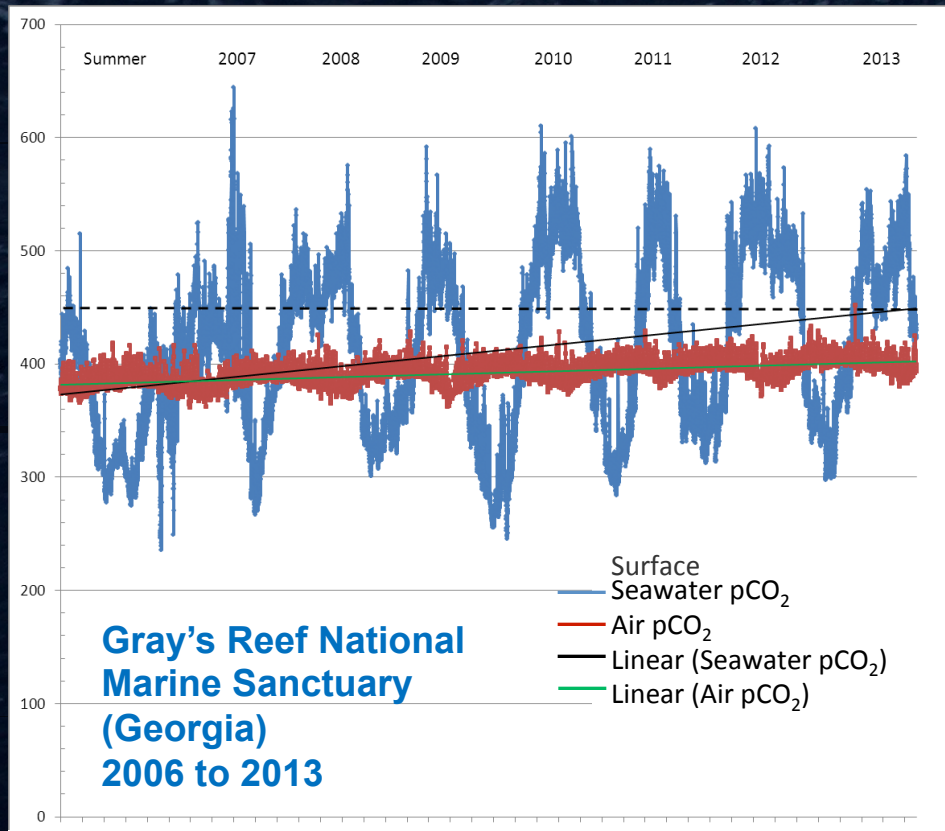



- **Socioeconomic impacts**
  - **Florida: $60B in sales, 70K jobs**
- **Reefs already dissolving**
- **Multiple stressors**
  - **Local: pollution, overfishing, run-off, disease, damage**
  - **Global: sea level rise, ocean acidification, temperature rise**
  - **Change in stressor frequency and magnitude**
  - **Synergistic effects increase vulnerability to disease**

**Astrid Schnetzer, NCSU**
**Dennis Hanisak, FAU**

# SOCAN Key Points

- **Coastal acidification is occurring in the Southeast region**
  - **Monitored at GRNMS**
    - **Atmospheric $CO_2$**
      - 21 ppm increase in 7 years
      - Average = 391.7 ppm*
      - Average = 0.77%/year
    - **Seawater $CO_2$**
      - 78 ppm in 7 years
      - Average = 411.6 ppm*
      - Average = 2.7%/year
  - **Increasing temperature & fisheries expanding north**
    - Blueline Tilefish
    - Snowy Grouper

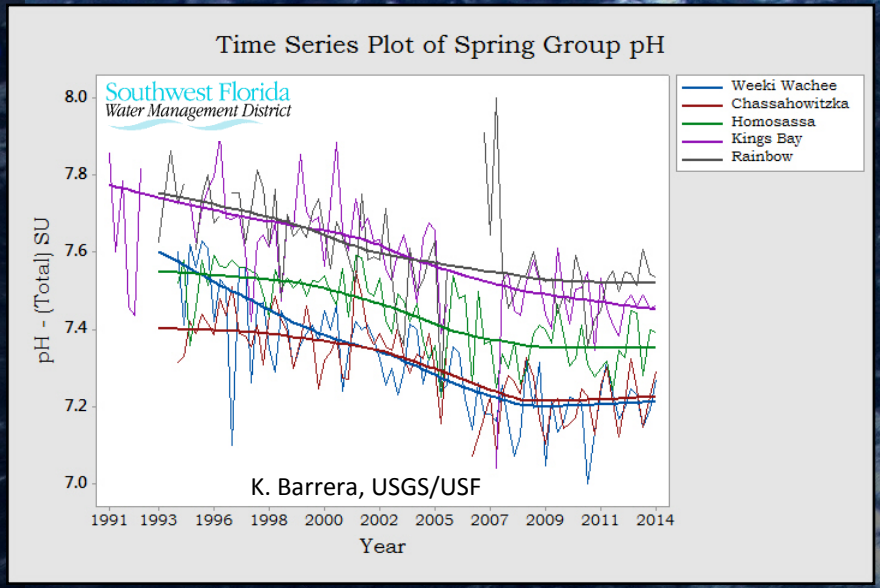


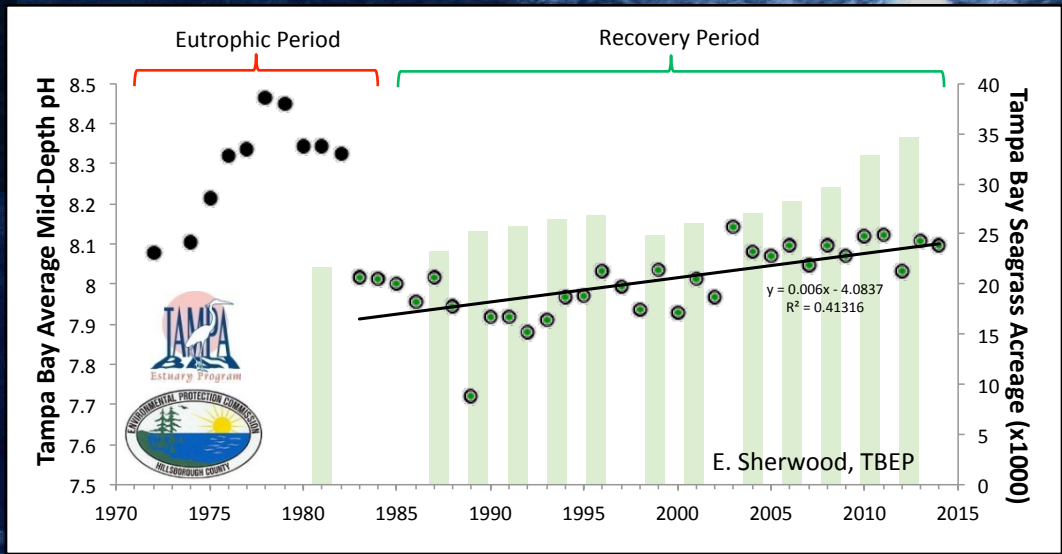

**Periodic variability, with increasing trend in $CO_2$**

Scott Noakes, UGA

# SCAN Key Points

- We have a good base of information to help build our knowledge on impacts to the Southeast, and ways to prepare society to manage the consequences



# SECAN Key Points

- **The known knowns for the SEUS:**
  - **Valuable resources are already being impacted**
    - **Corals**
    - **Shellfish hatcheries**
  - **Many species are, or have been, adapted to extreme environmental conditions**
    - **May or may not make them less vulnerable to OA changes**
    - **OA may or may not be the pressure that tips their survivability into a decline**

# SCAN Key Points

- **Remaining data needs:**
  - **No county level social data available due to confidentiality issues**
  - **No groundwater data or sufficient hydrodynamic data to combine freshwater input factors**
  - **Major gaps in coastal zone water chemistry data need to be filled**
  - **Adaptive capacity of the SE low due to monospecific commercial harvests (clams & oysters)**

# SOCAN Key Points

**SOCAN is working:**

- To bring experts together
- Identify knowledge and information needs
- Set regional priorities for research and monitoring
- Communicate results to help address problems caused by ocean and coastal acidification

SOCAN Steering Committee at the first In-Person Meeting January 2016.

# Steering Committee

**OA Research**

- Wei-Jun Cai, The University of Delaware
- Lou Burnett, College of Charleston
- Leticia Barbero, NOAA/AOML
- M. Dennis Hanisak, FAU Harbor Branch
- Geoffrey I. Scott, University of South Carolina
- Zackary Johnson, Duke University
- Denise M. Sanger, SC Department of Natural Resources
- Astrid Schnetzer, North Carolina State University

**OA Buoys**

- Scott Noakes, University of Georgia

**Conservation and Management**

- Billy D. Causey, NOAA Office of National Marine Sanctuaries
- J. Kevin Craig, National Marine Fisheries Service
- M. Richard DeVoe, S.C. Sea Grant Consortium
- George Sedberry, NOAA Office of National Marine Sanctuaries

**Other Stakeholders**

- William S. Fisher, U.S. Environmental Protection Agency
- Rua S. Mordecai, South Atlantic Landscape Conservation Cooperative
- Kimberly K. Yates, U.S. Geological Survey
- Jay Styron, Carolina Mariculture Co.
- John C. McGovern, National Marine Fisheries Service
- Libby Jewett, NOAA Ocean Acidification Program
- Debra Hernandez, SECOORA
- Terri Kirby Hathaway, NC Sea Grant
- Charlie Phillips, Phillips Seafood and Sapleo Sea Farms
- Paula Keener, NOAA's Office of Ocean Exploration & Research