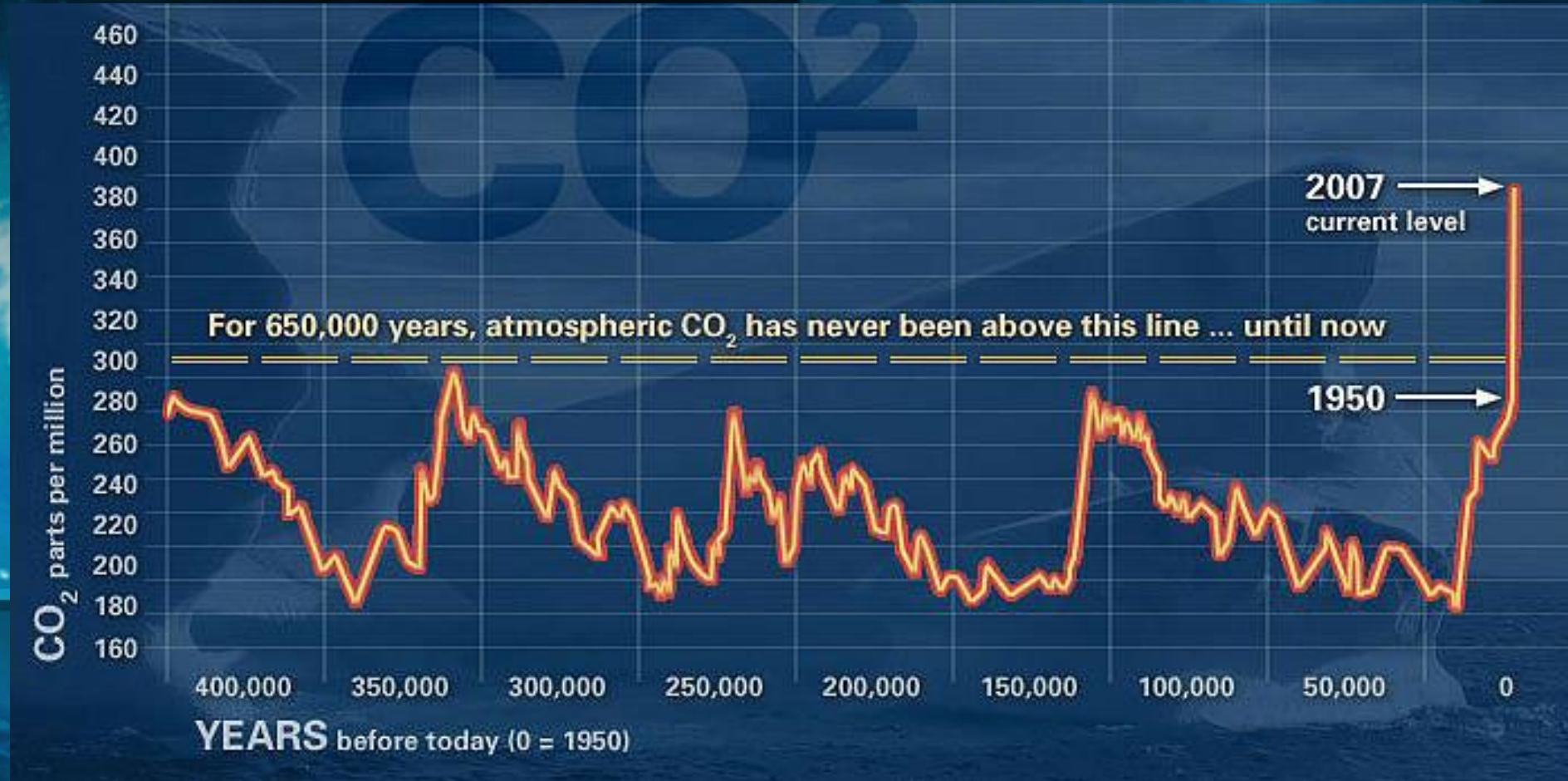


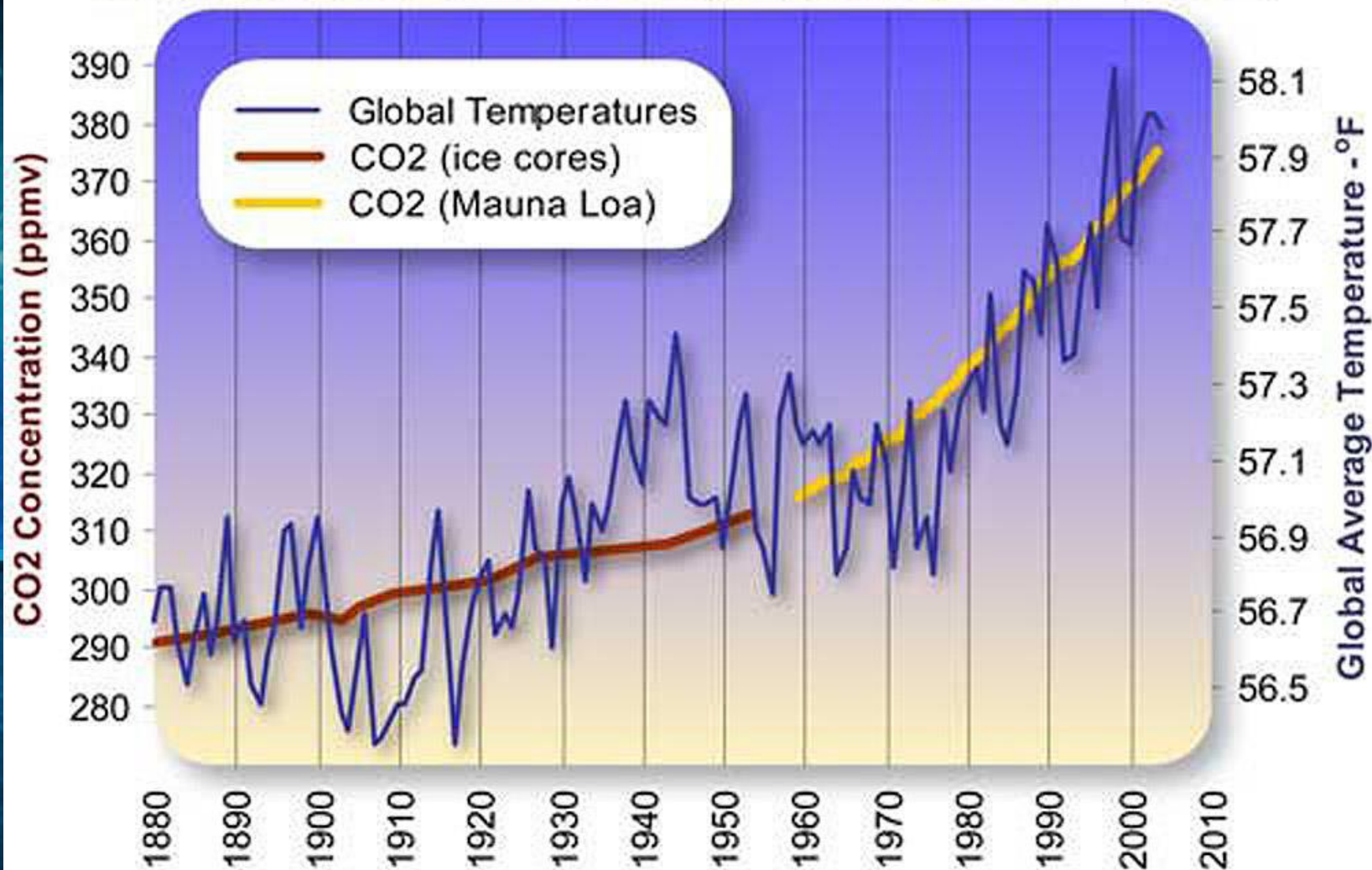
# Climate Change and the Oceans: Why You Should Care

Ellen Prager, PhD  
President, Earth2Ocean, Inc.  
Science Advisor, Aquarius Reef Base/UNCW

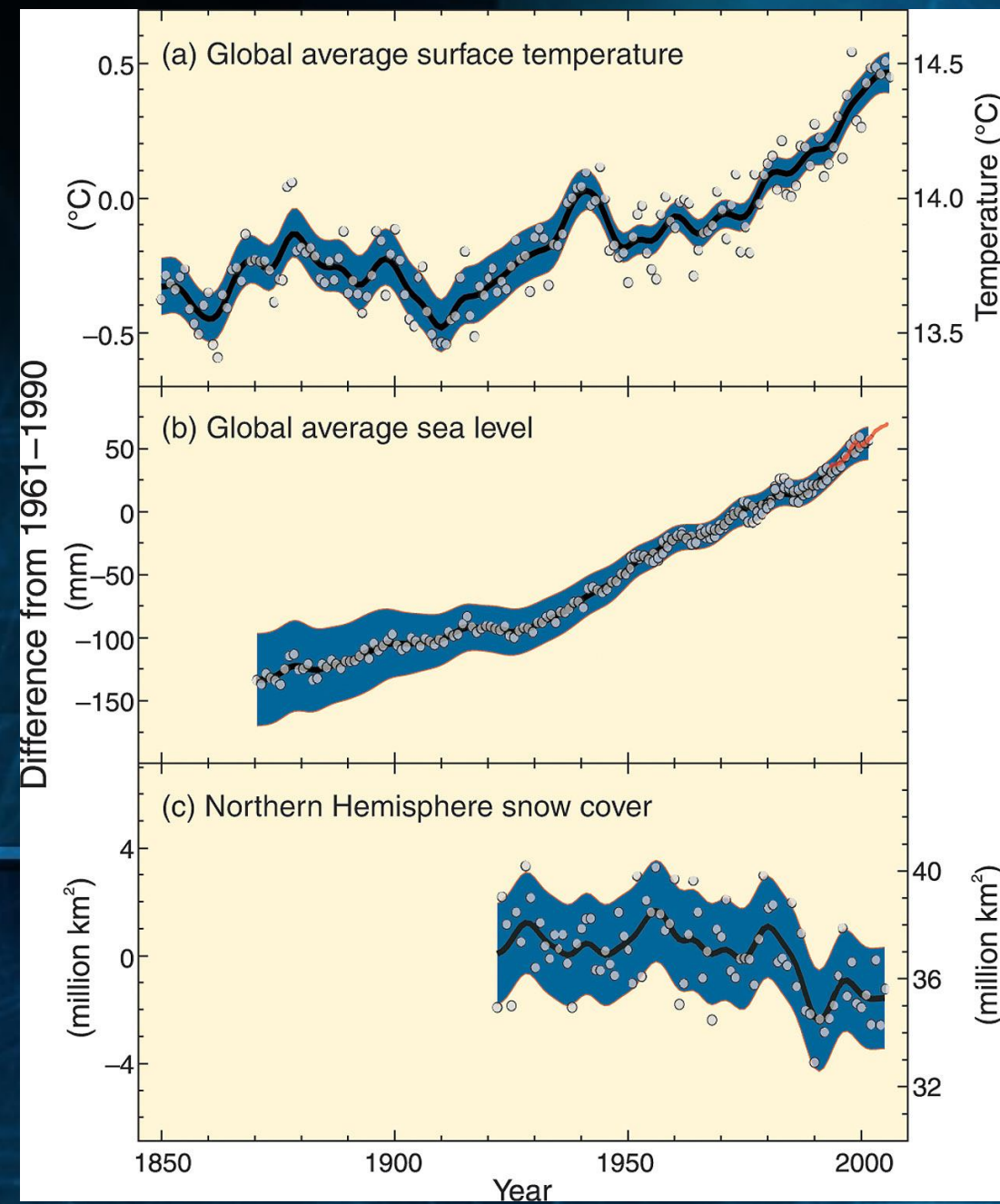
# CO<sub>2</sub> Concentration



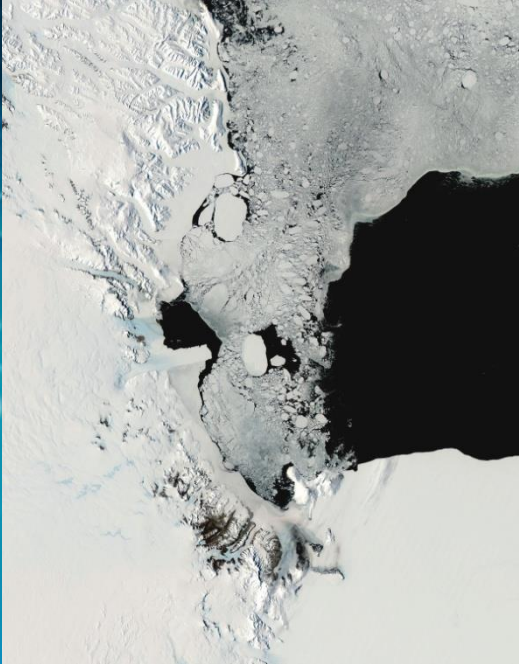
## Global Average Temperature and Carbon Dioxide Concentrations, 1880 - 2004



# Climate Change Impacts



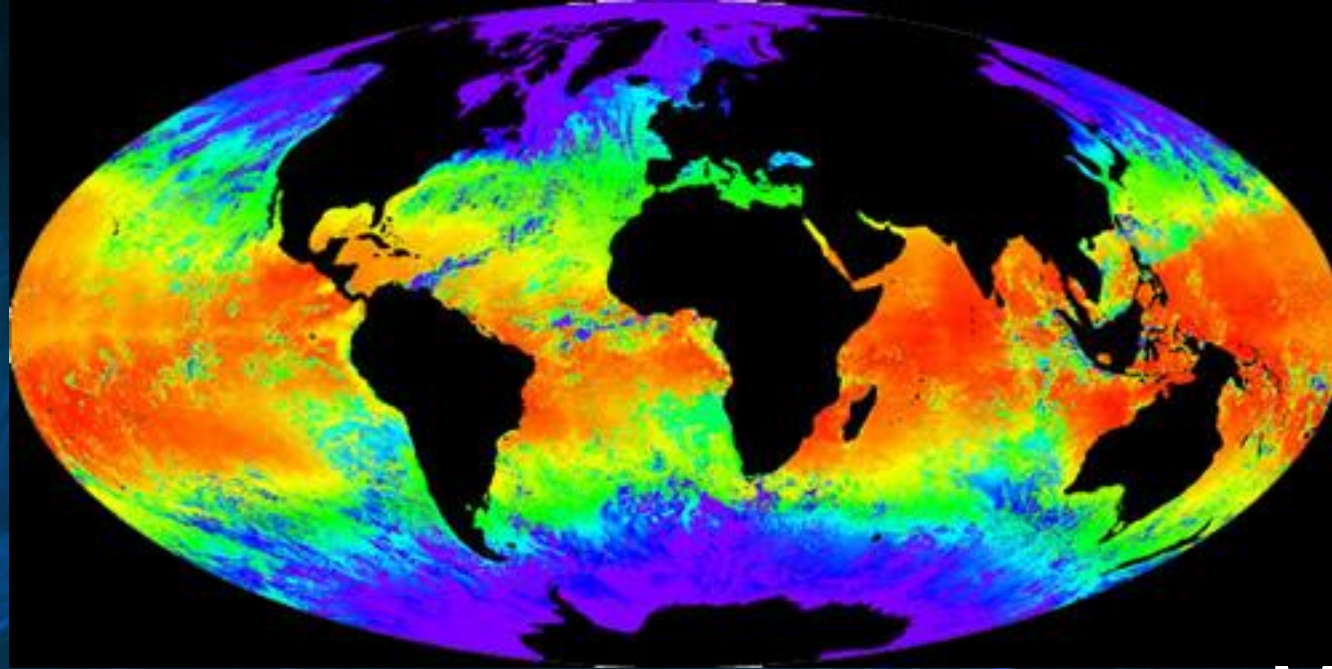
# Ocean Impacts



- Seawater Temperature
- Ocean Chemistry
- Sea Level Rise
- Air-Sea Interactions (Hurricanes)
- Marine Life



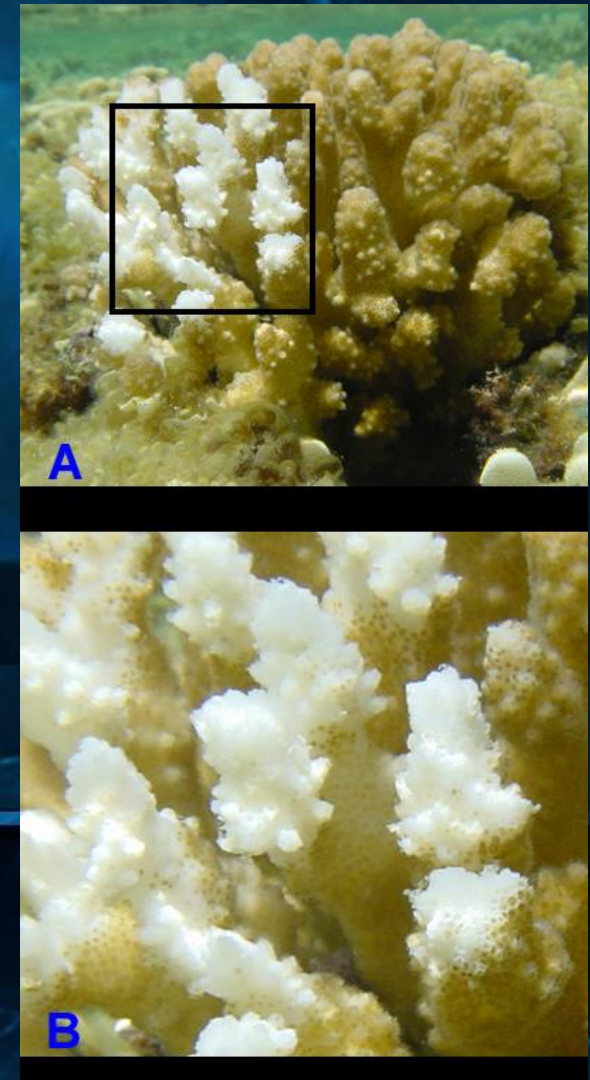
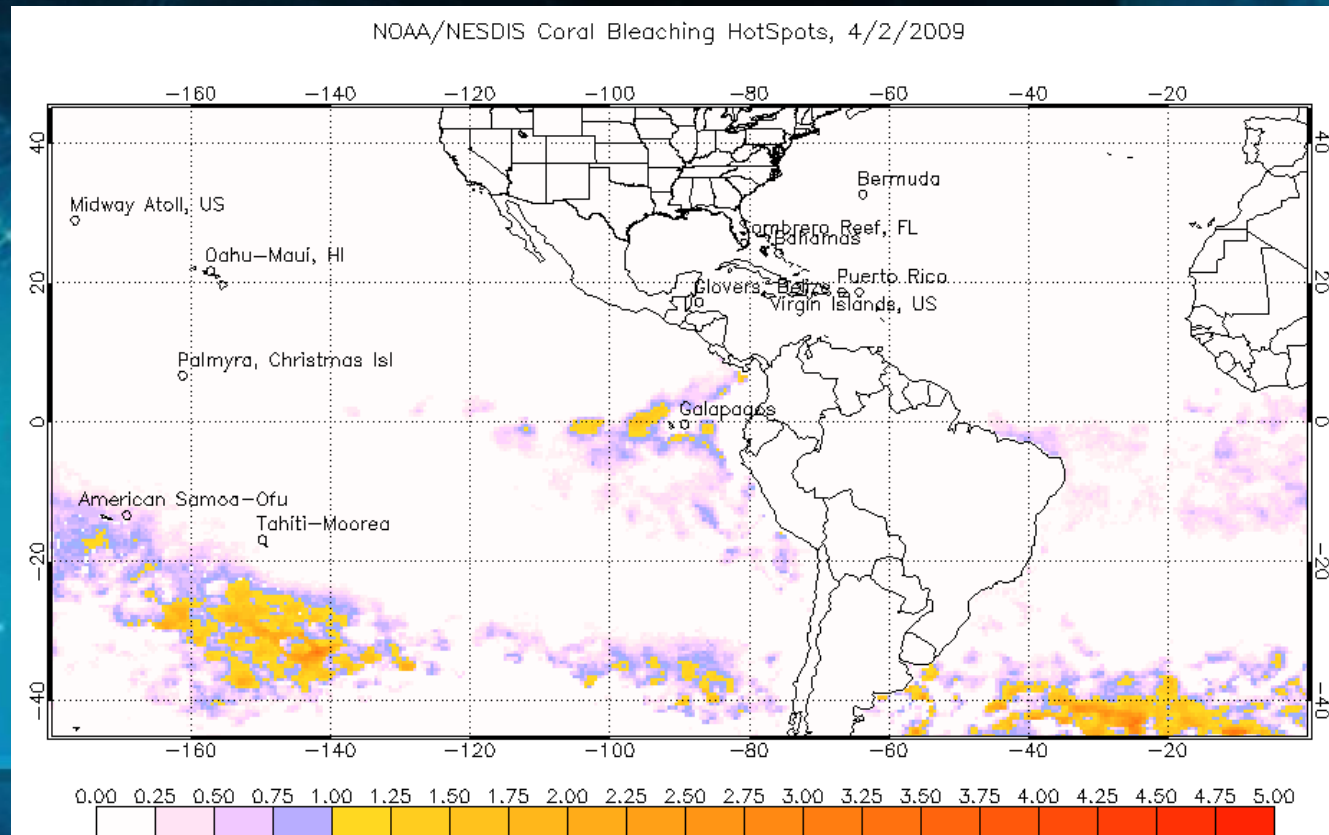
# Sea Surface Temperatures



MODIS, NASA

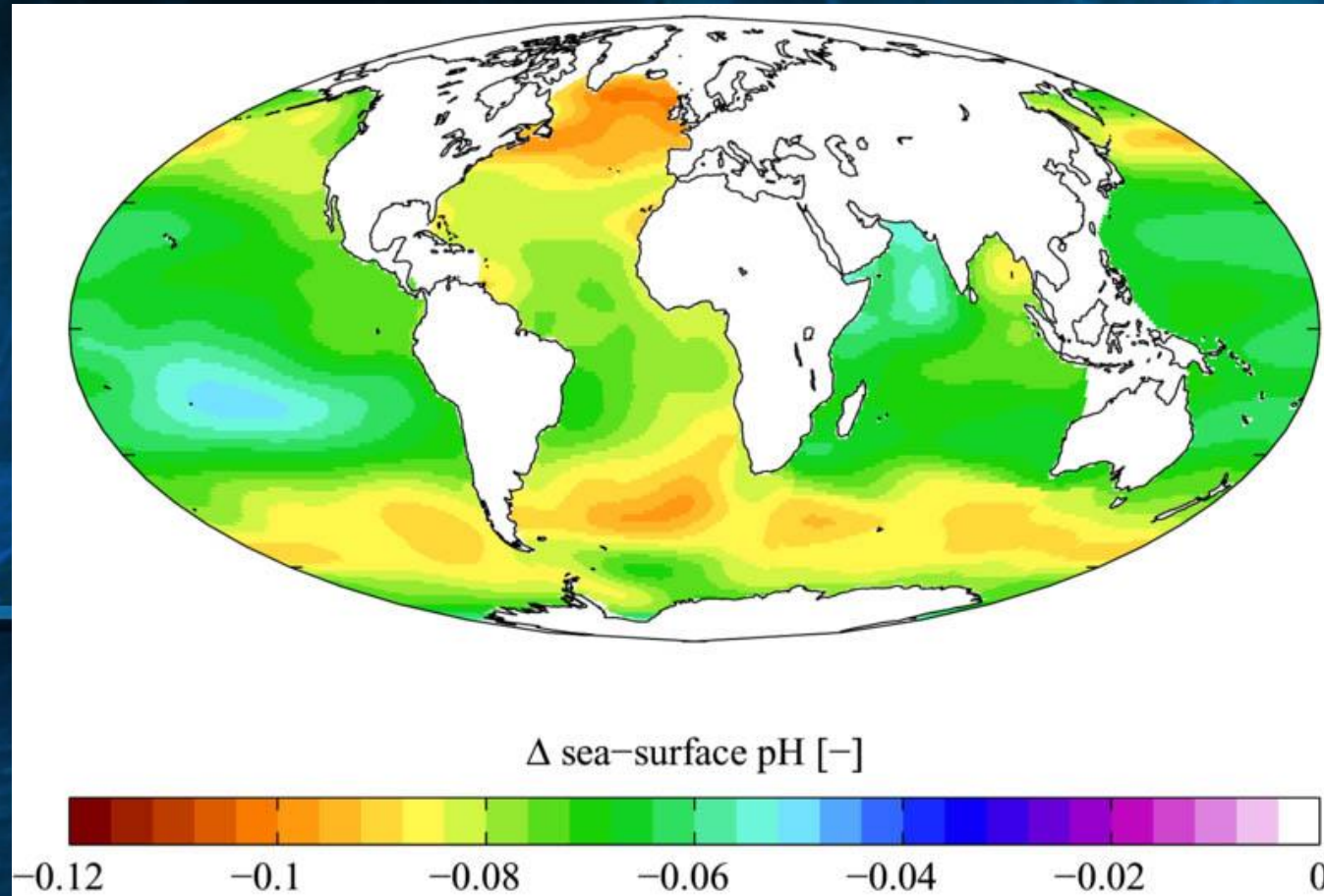
- Change in natural range of organisms
- Shutdown of upwelling systems
- Increase in dead zones

# Coral Reefs



- Potential areas of thermal stress for corals
- Disease susceptibility

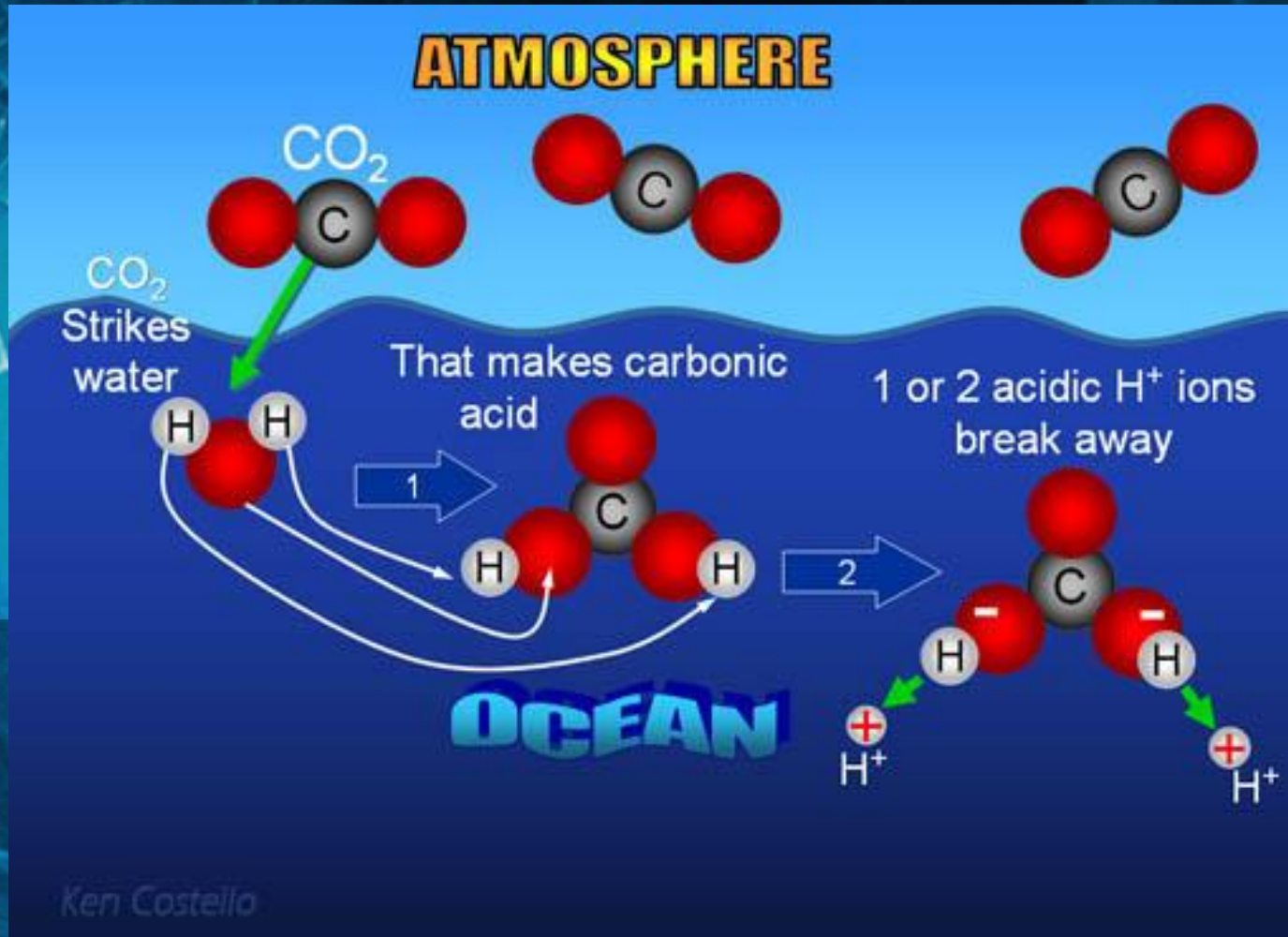
# Sea Surface pH Change (pre-industrial to 1990s)



*Pacific Science Association, 2007*



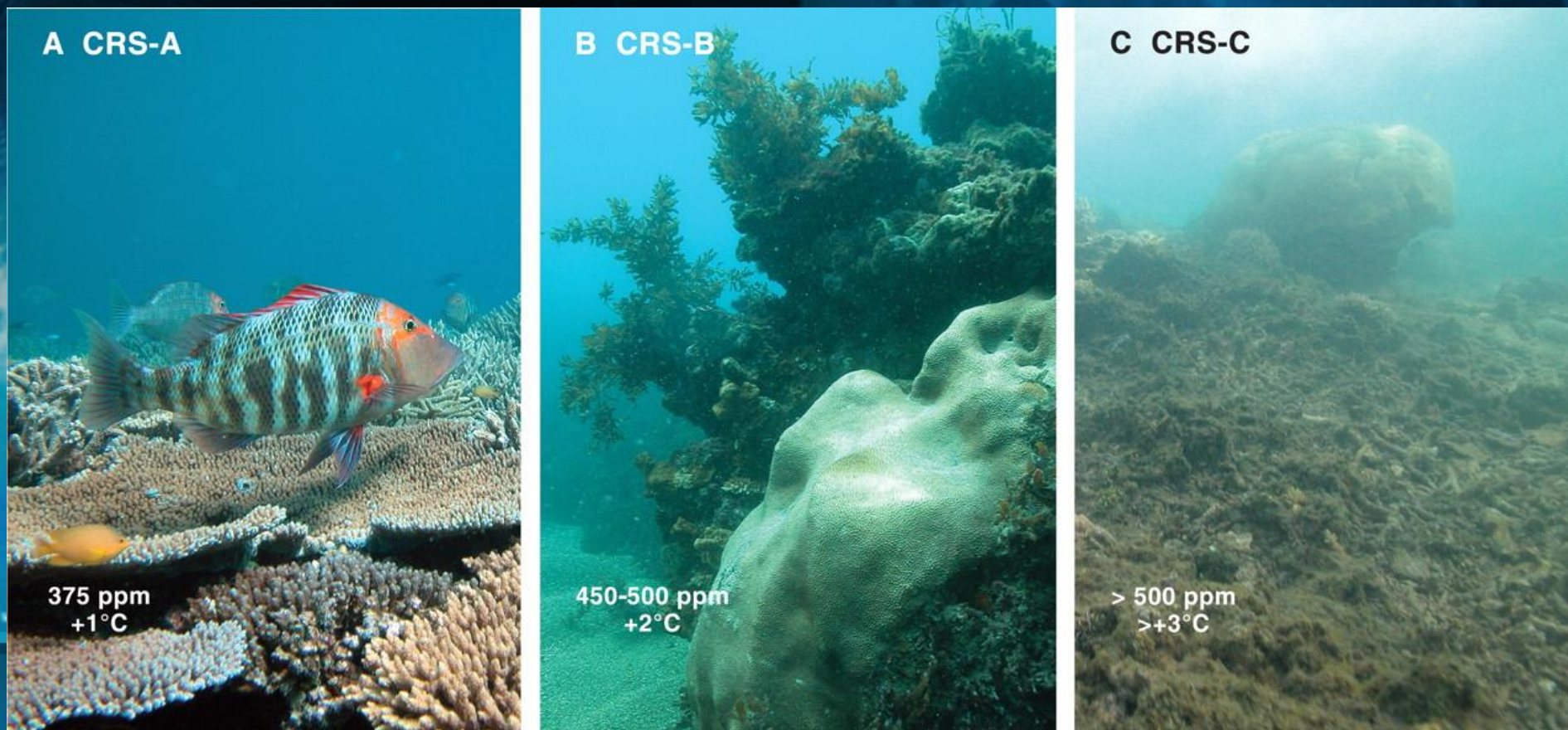
# Ocean Acidification



- Less  $\text{CO}_3$  available to make  $\text{CaCO}_3$
- Lower saturation of  $\text{CaCO}_3$
- May cause dissolution of  $\text{CaCO}_3$

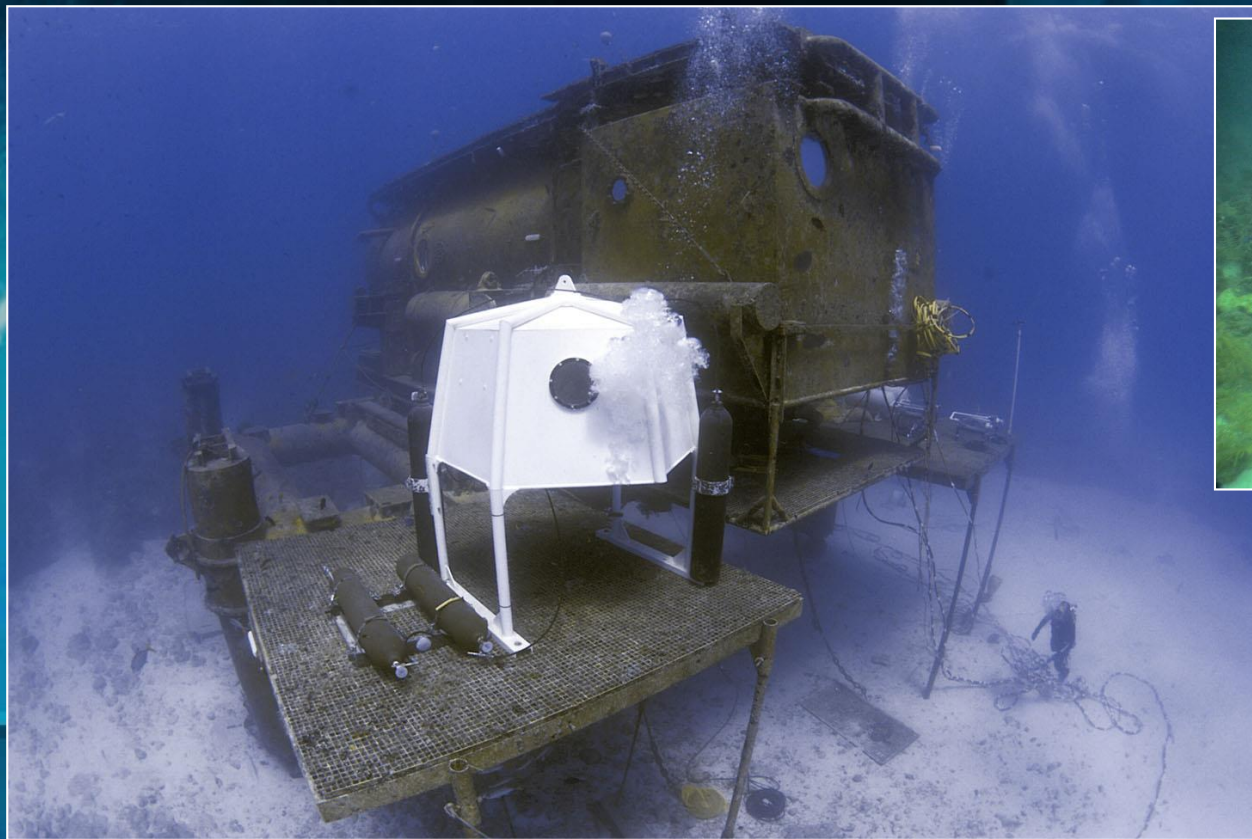


# Scenario for Great Barrier Reef



O. Hoegh-Guldberg et al., Science (2007)

# Aquarius Reef Base, Key Largo, FL



Technology testbed:  
Prototype underwater mass spectrometer

# Why You Should Care

- Food: Important Source of Protein
- Human Health
- Jobs
- Economic Revenue
- Social and Political Stability
- Tourism, Recreation, and Quality of Life
- Culture and Tradition
- Life Support for the Planet

# Fish Are Food and Big Business



- An important source of protein for billions
- U.S. Consumers spend more than \$50 billion on seafood each year



- Worldwide 520 million employed by commercial fishing and aquaculture



- Lack of fishing can lead to social and political instability (Somali pirates), loss of traditional cultures and generational way of life

# Coral Reefs: Need Bailout \$\$\$

- \$375 Billion worldwide in annual economic revenue!!!!!!
- Fisheries
- Protection from waves and storms
- Millions of jobs

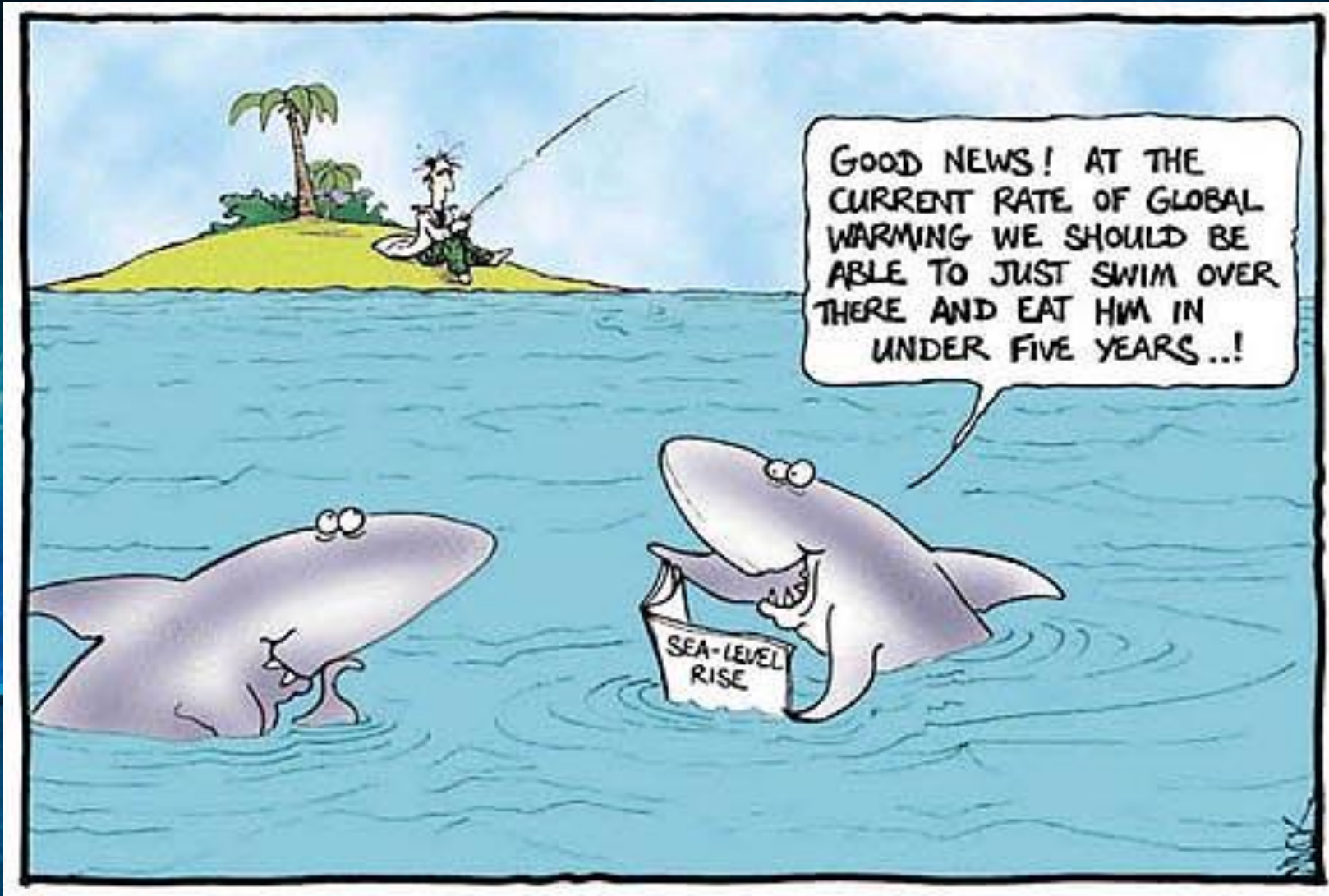


# Human Health

- Drugs from the sea -  
Bryostatin (marine invertebrate), Discodermolide (sponge), and Ecteinascindin (sea squirt)
- Molecular Probes
- Bioremediation
- Marine Models
- Marine Hazards
- Disease

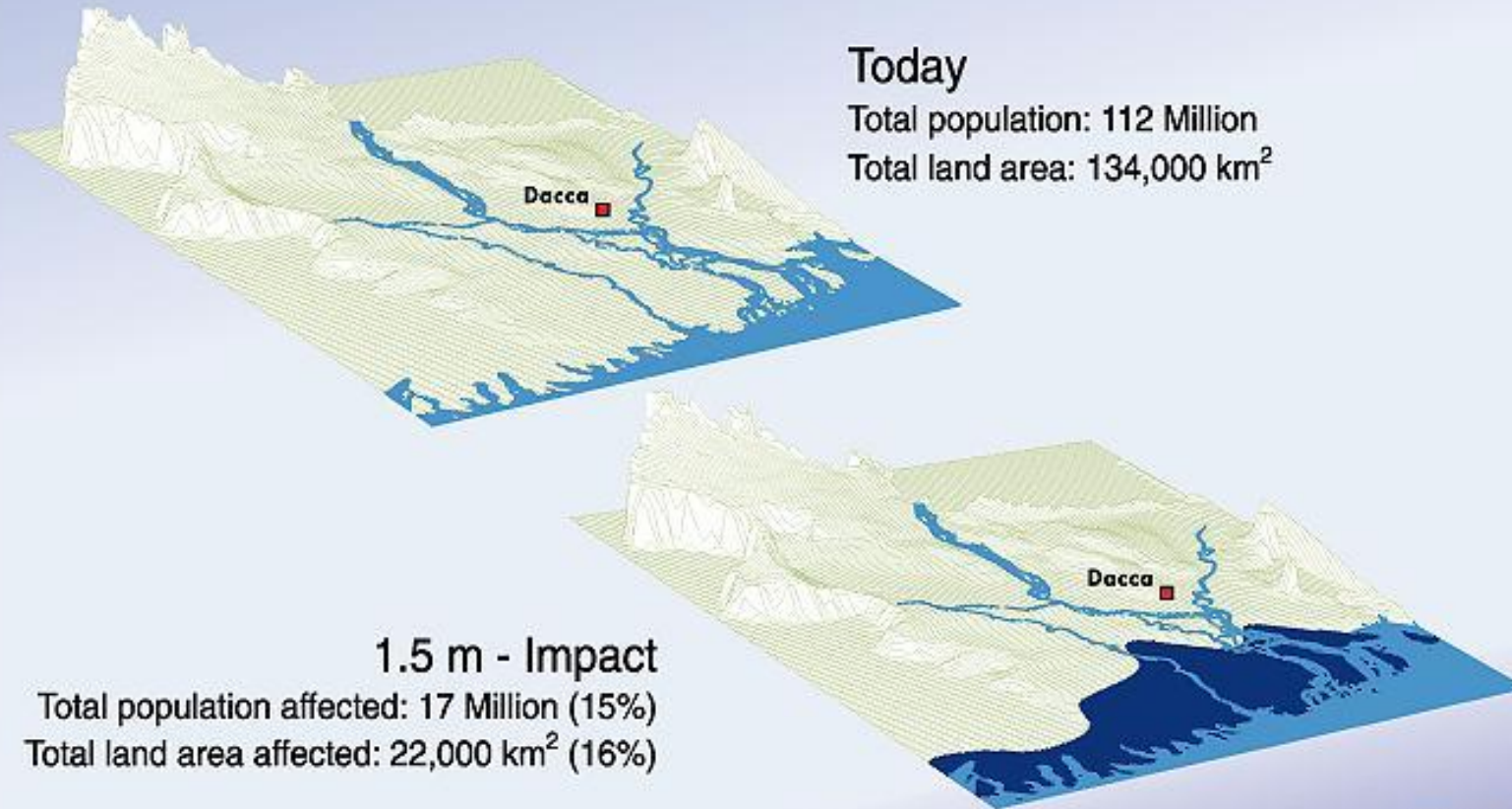






# Flooding and Storm Damage

## Potential impact of sea-level rise on Bangladesh



Coastal  
Populations

Low lying coasts

Island nations

# Finding Solutions

- *Investment*
- *Political will*
- *Public engagement*
- *Consider social aspects of problems*
- *Better decision making based on science*
- *Improved and adaptive management*
- *Management of people, not nature*