

# Panel Regarding Sea-Level Rise



## *Public Policy Forum*

March 10, 2010

**Donald F. Boesch**



University of Maryland

CENTER FOR ENVIRONMENTAL SCIENCE



# Sea-Level Rise Panel



- **Don Boesch** – Univ. Maryland Center for Environmental Science
- **Craig Fulthorpe** – University of Texas Institute for Geophysics
- **Tim McGee** – RADM US Navy (retired)
- **Dave Jansen** – House Natural Resources Committee Staff

# Gauges Measure Relative Sea-Level

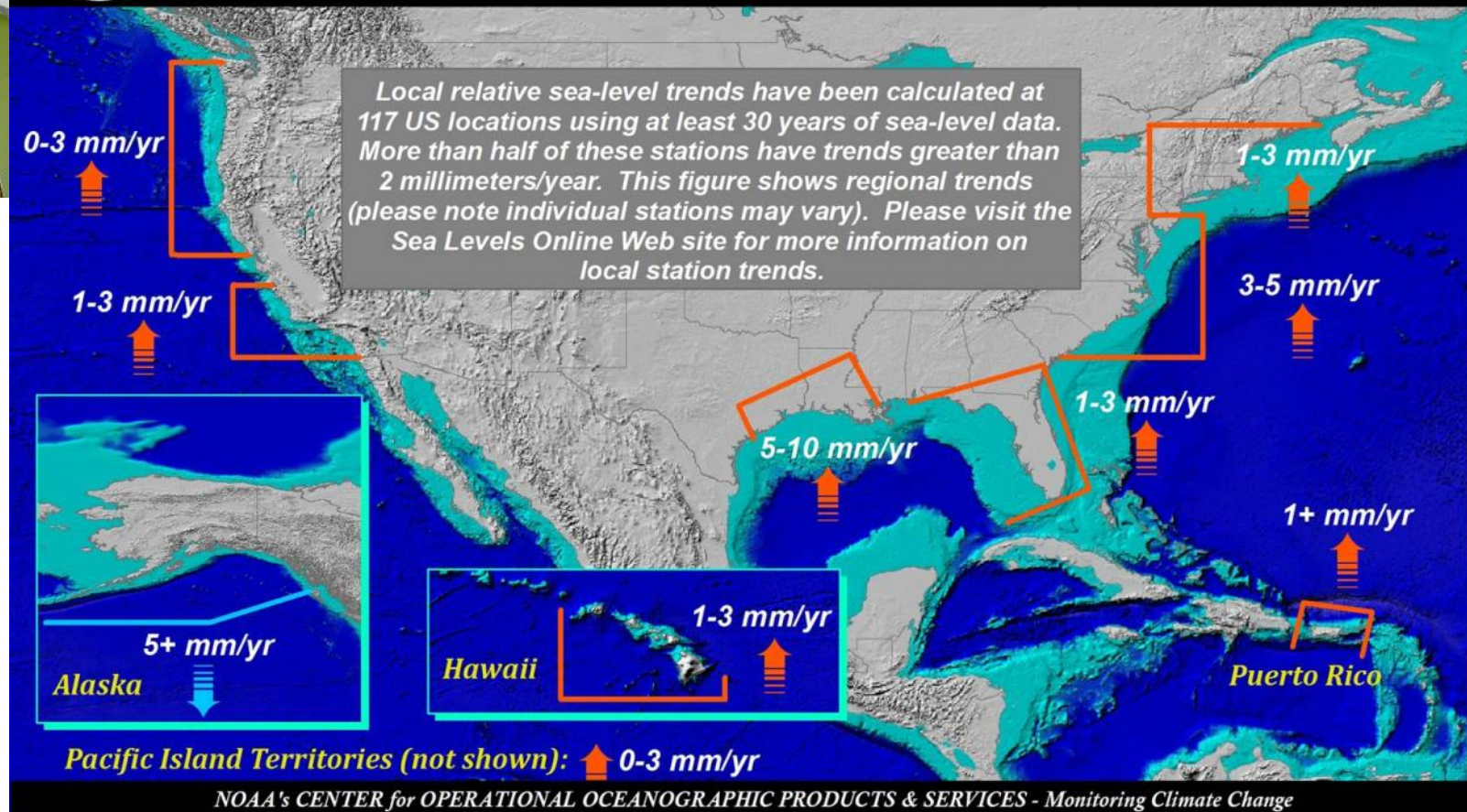


Measured by tide gauges

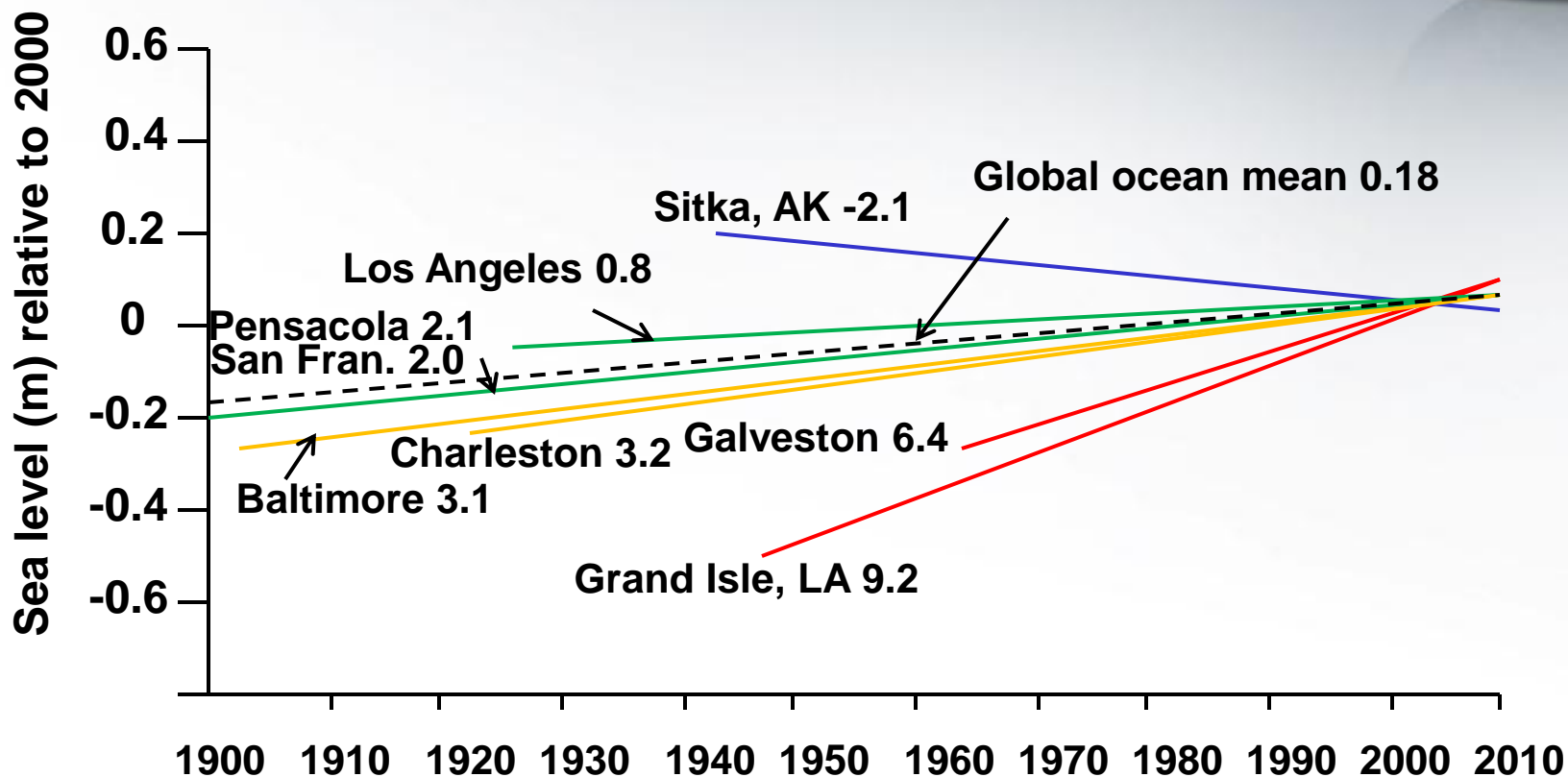


## LONG TERM RELATIVE SEA LEVEL TRENDS FOR THE UNITED STATES

*NOAA Sea Levels Online: [www.tidesandcurrents.noaa.gov/sltrends/sltrends.html](http://www.tidesandcurrents.noaa.gov/sltrends/sltrends.html)*

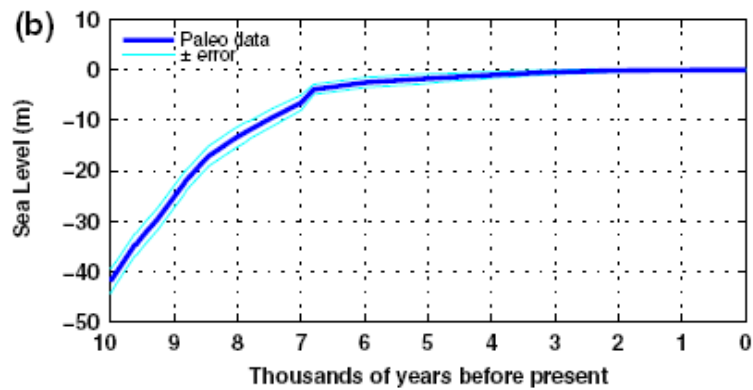


# Relative Sea-Level Trends

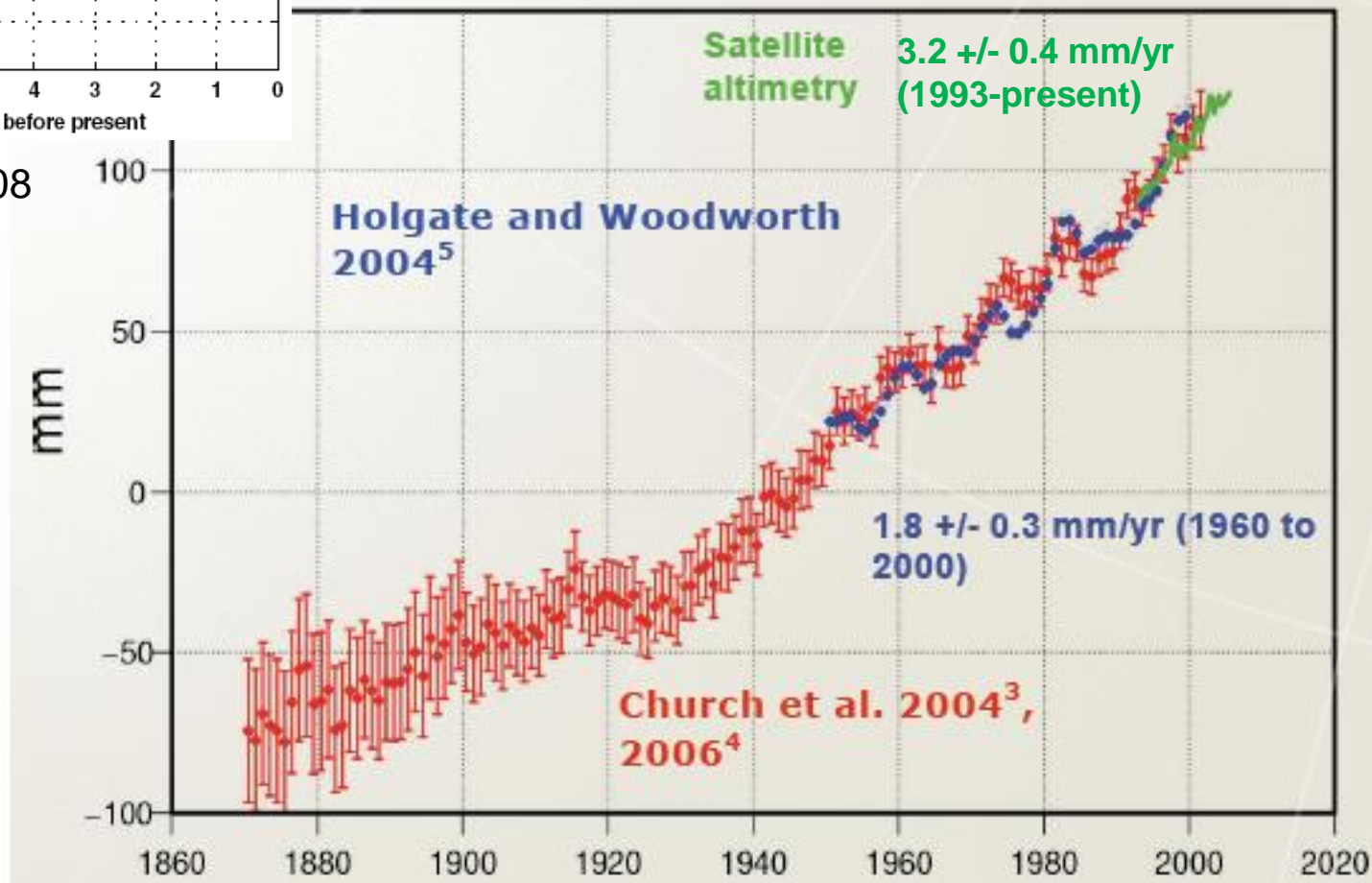


*Sea level rise rates over the periods of record indicated in mm/yr*

# Post 19<sup>th</sup> Century Sea-Level Rise



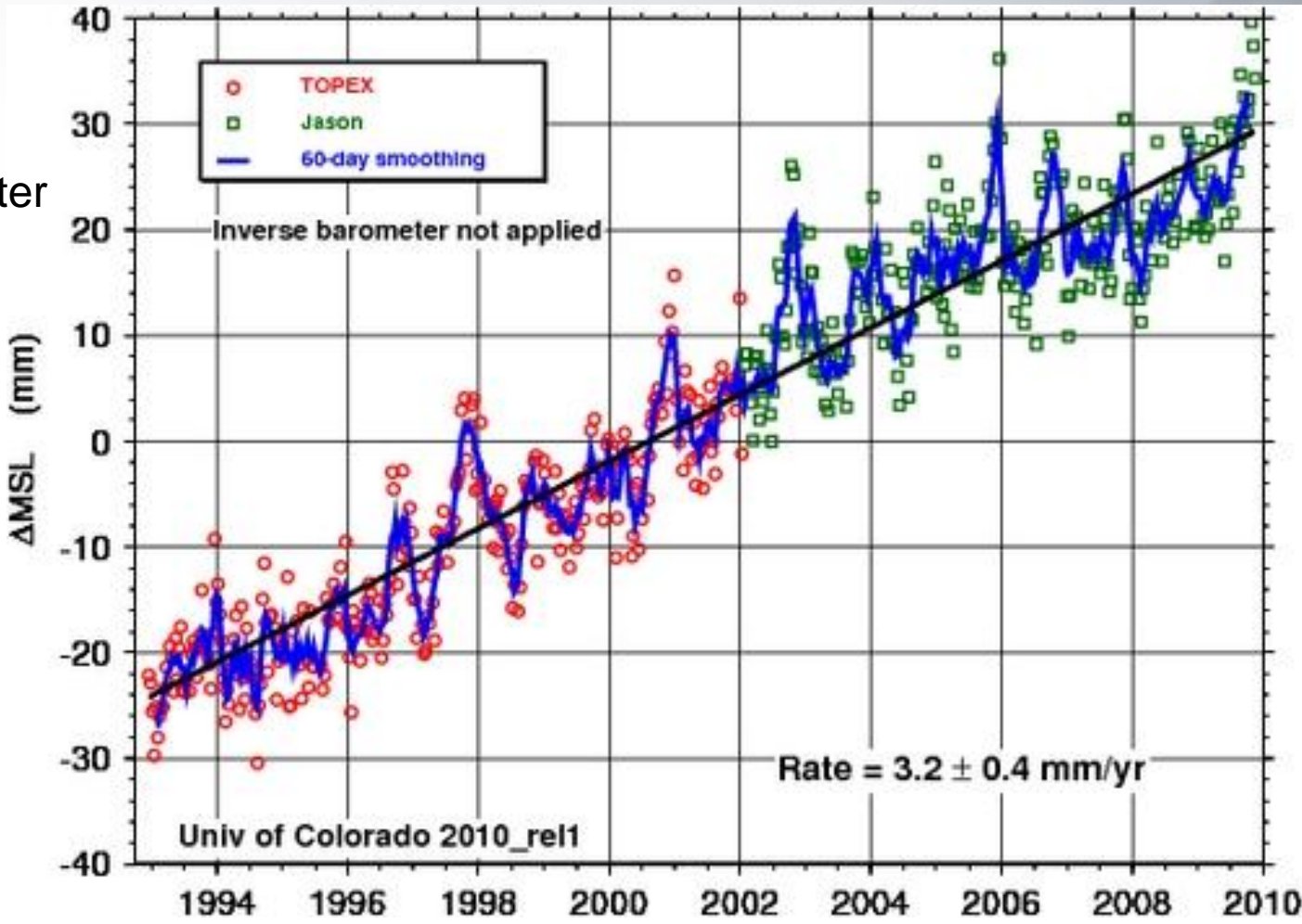
Church et al. 2008



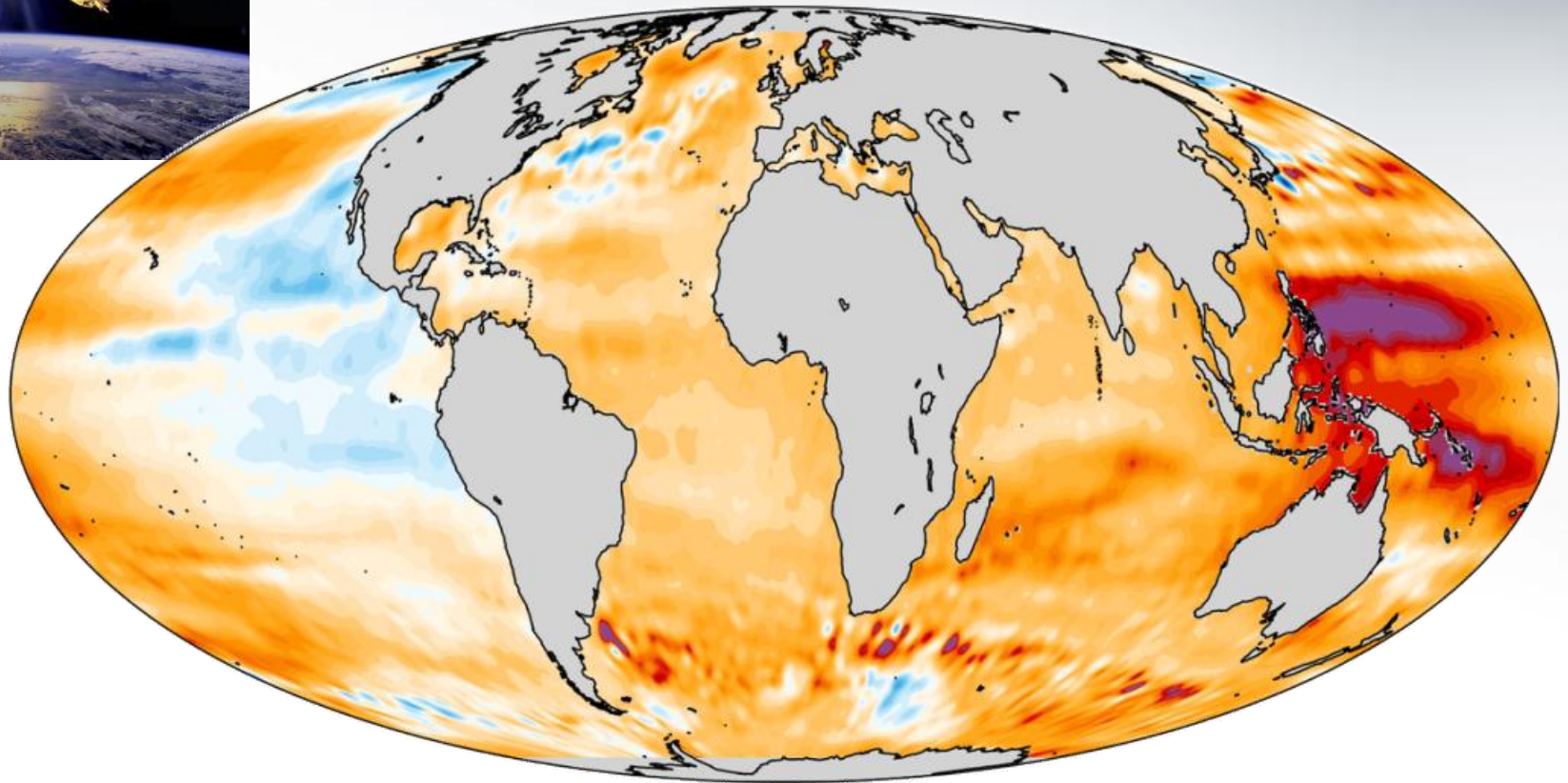
# Global Sea-Level Rise



Satellite altimeter



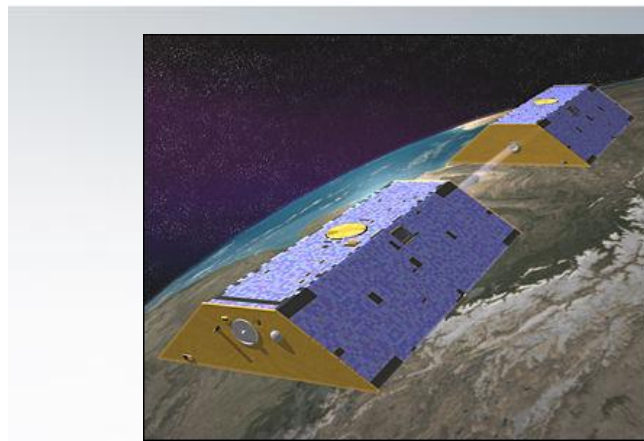
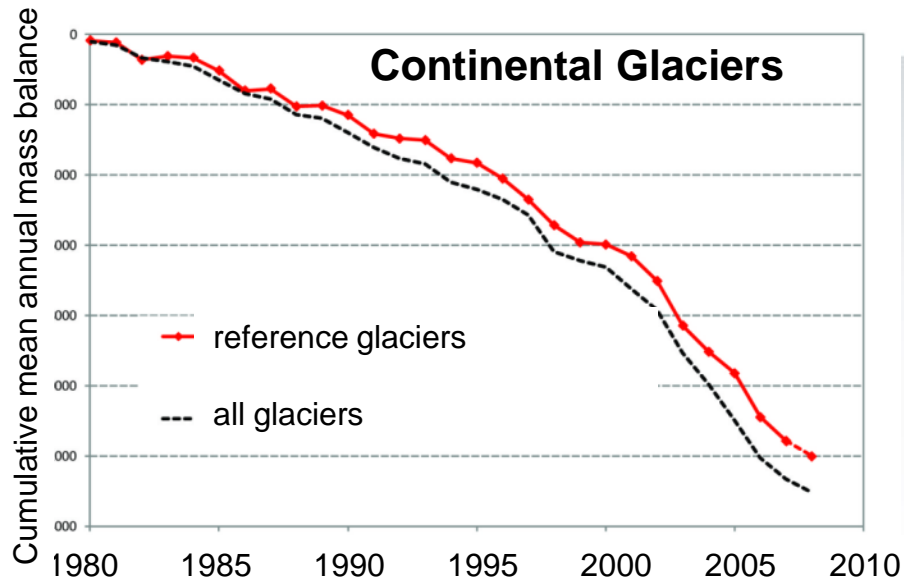
# Sea-Level Rise Is Not Uniform



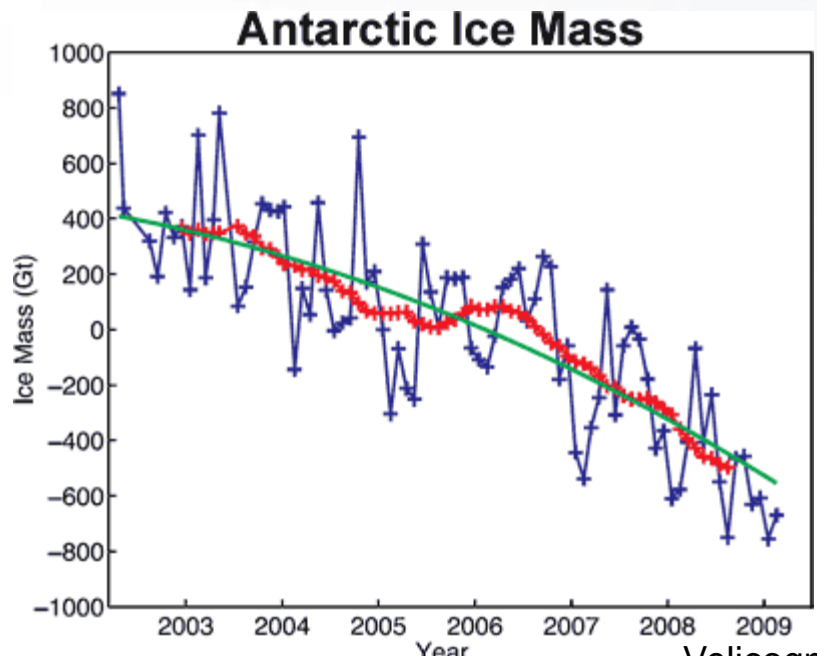
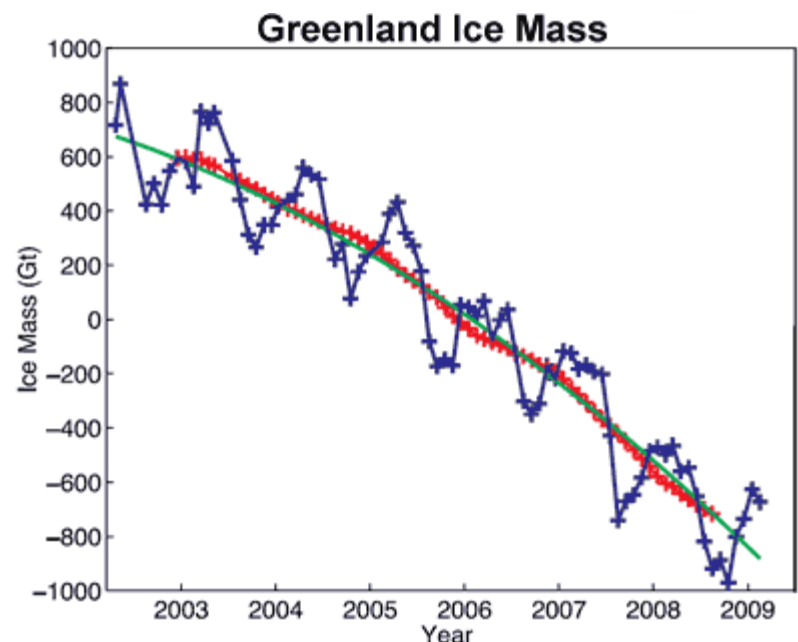
Sea Level Trends 1993-01/2010-01 (mm/year)



# Accelerated Loss of Land Ice



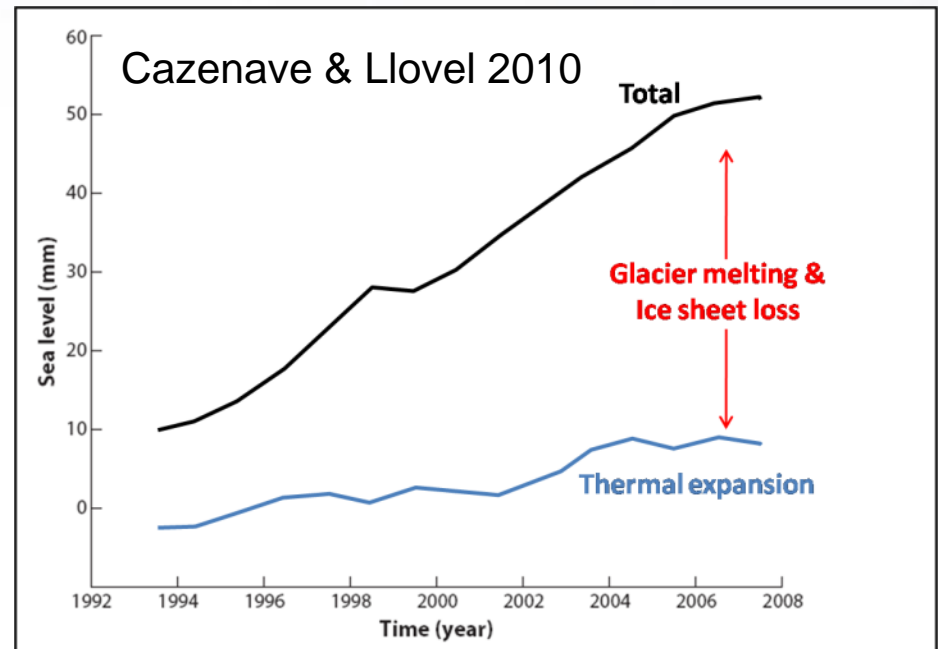
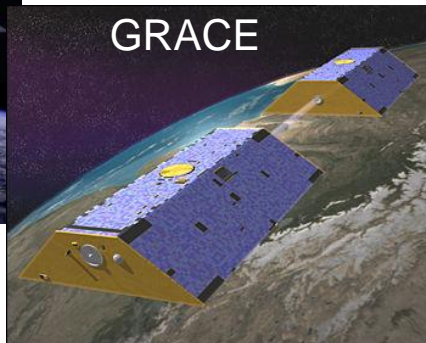
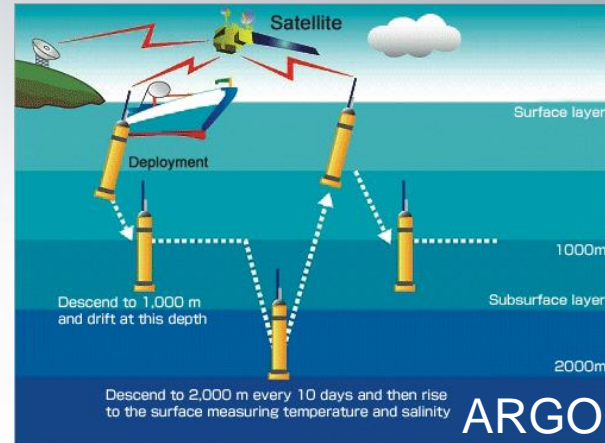
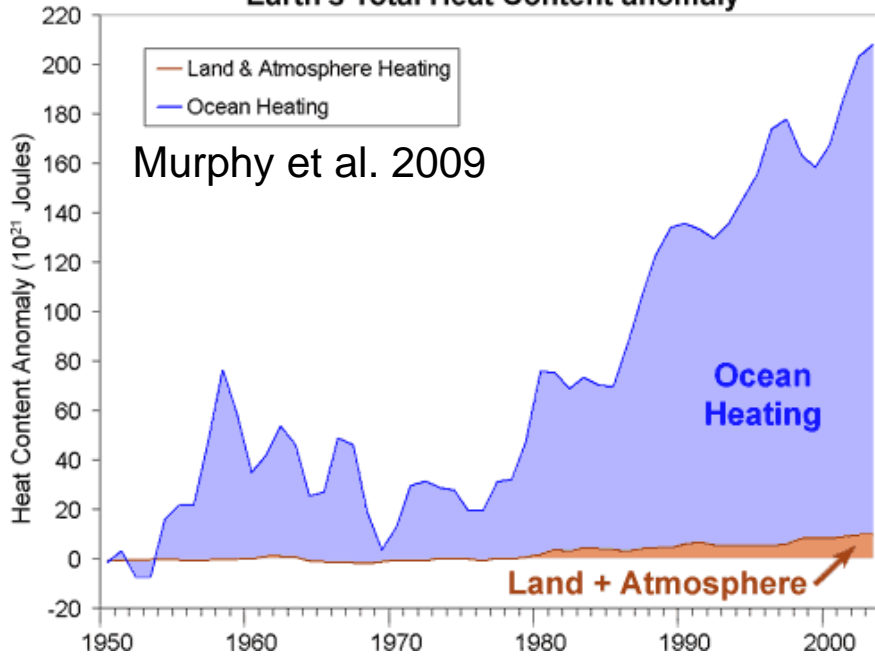
GRACE  
gravity field  
measurements



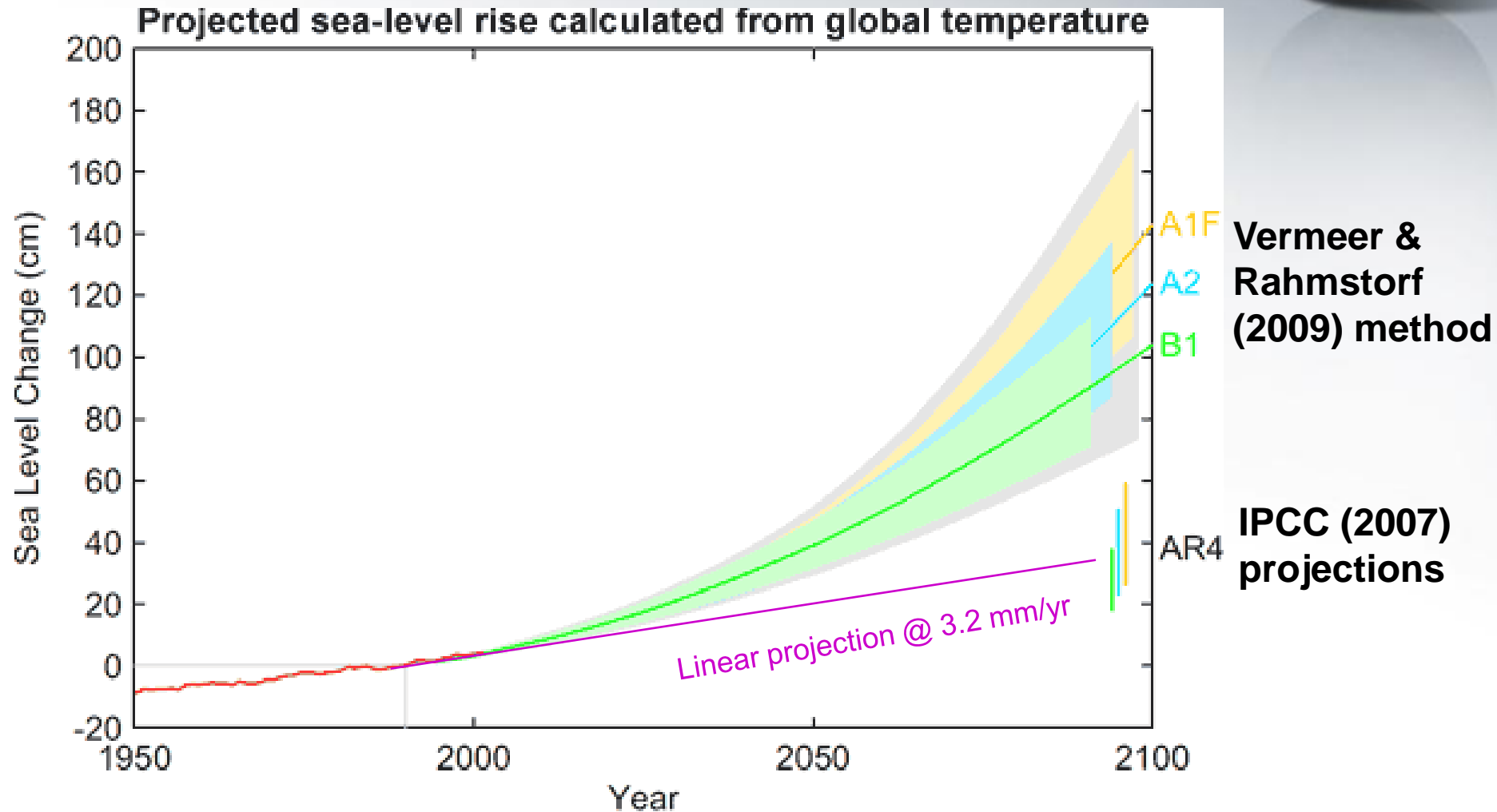
# Closing the SLR Budget



Earth's Total Heat Content anomaly



# Semi-Empirical Projection of SLR

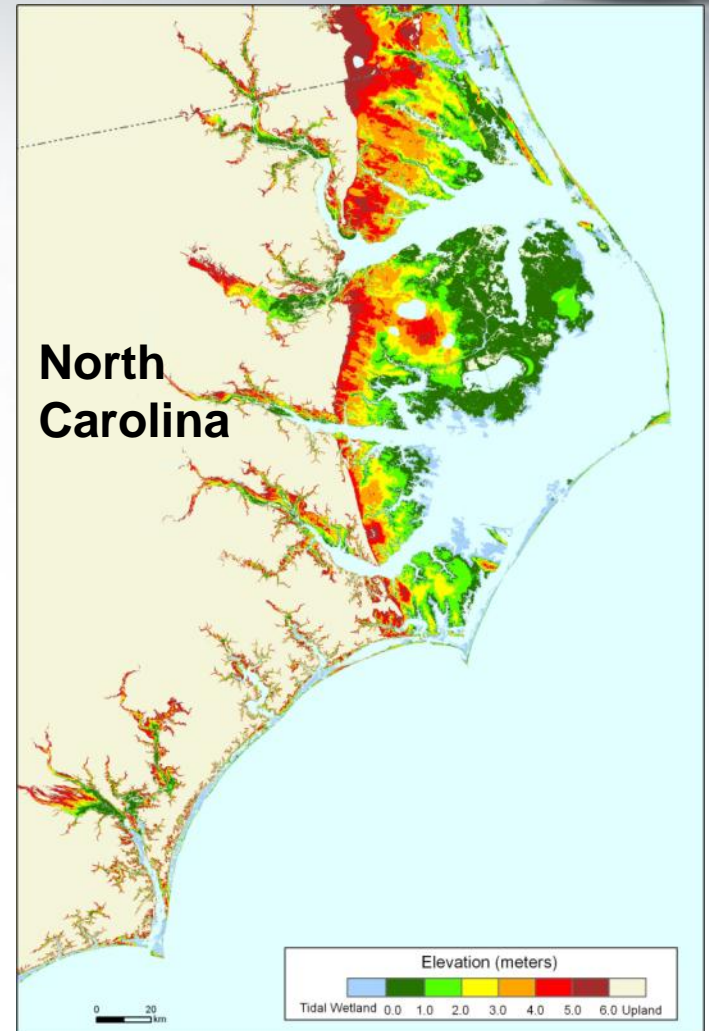
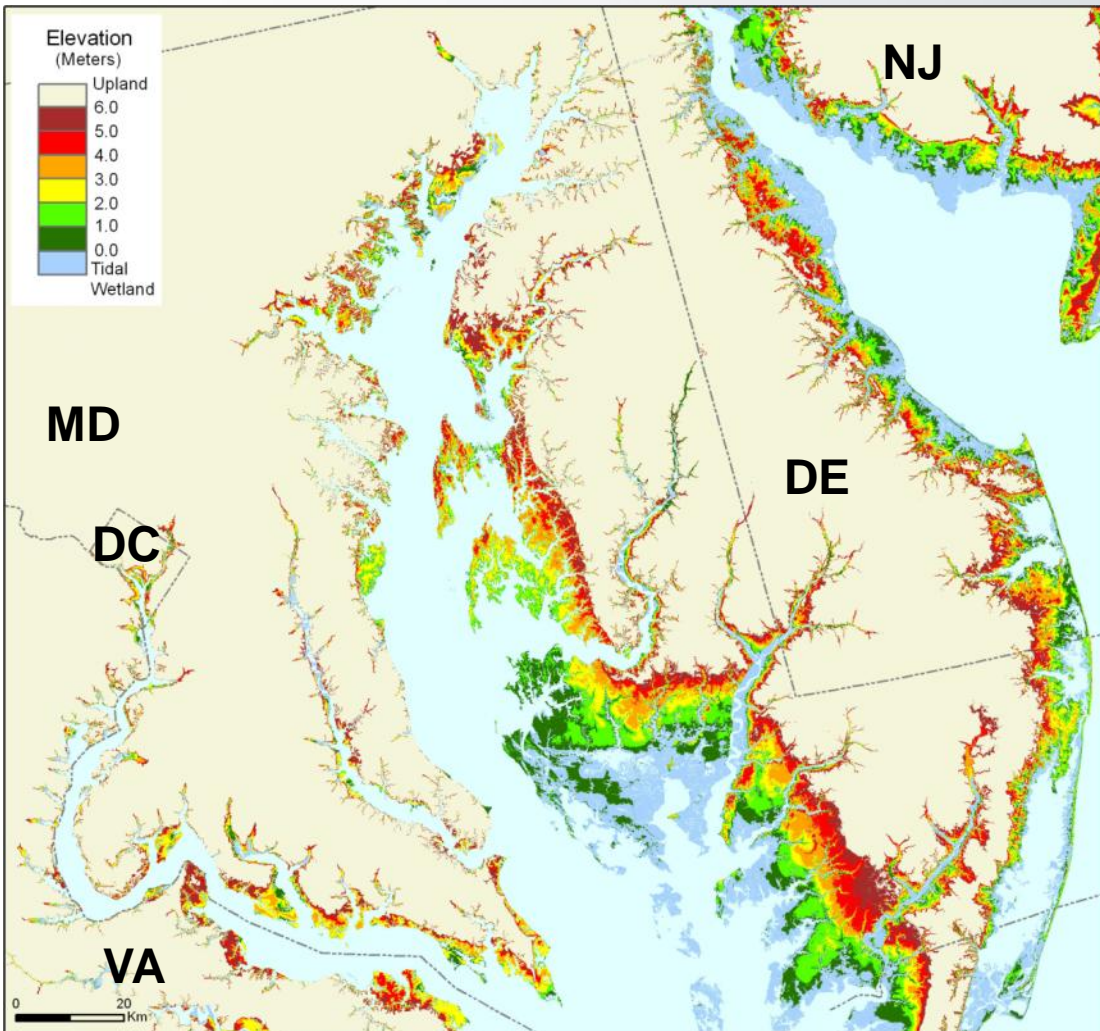


# New Findings Since IPCC AR4



- Altimeter trends ( $>3$  mm/yr) vary with climate but continue.
- Contribution of polar ice sheets and glaciers is increasing.
- Regional variability due to non-uniform thermal expansion.
- Kinematic constraints on polar glaciers likely constrain SLR to 2 m during this century, more likely around 0.8 m.
- Submarine melting important in ice sheet mass loss.
- Empirical models based on temperature projections suggest 20<sup>th</sup> century SLR at least twice that of IPCC.
- 6 m or more of SLR over several centuries likely to be locked in as a result of 21<sup>st</sup> century warming.

# Vulnerable Coastal Landscapes



# Some Critical Needs



- ❁ Sustained ocean observing system, particularly in areas influencing ice sheets.
- ❁ Models capable of reliable projections of land-ice melting and thermal expansion.
- ❁ Coastal system models capable of projecting inundation, tidal exchange, storm surge, estuarine ecosystem dynamics, and wetland and landform responses.
- ❁ Socioeconomic decision-making tools to inform adaptation decisions.

“Science is a way of trying not to fool yourself.”

Richard Feynman

✿ boesch@umces.edu

✿ [www.umces.edu/president/](http://www.umces.edu/president/)



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