Climate Change and the U.S. Navy

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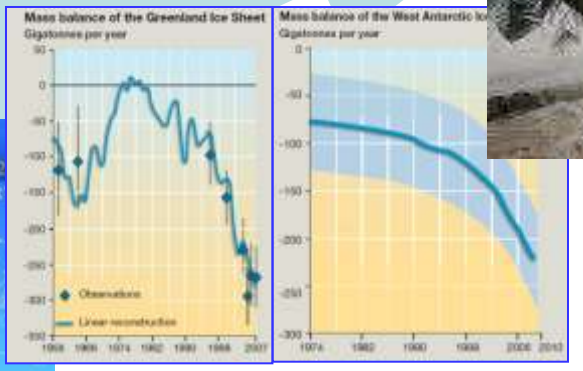
UNCLASSIFIED

Sea Level Rise Update

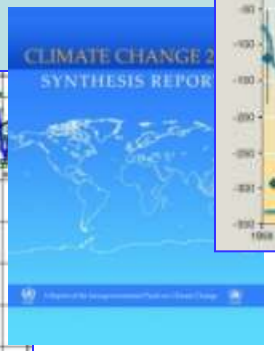
21st Century Sea Level Rise

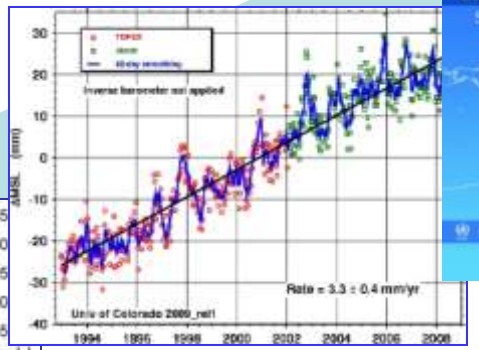
Accelerating Ice Sheet Mass Loss



The Copenhagen Diagnosis, 2009

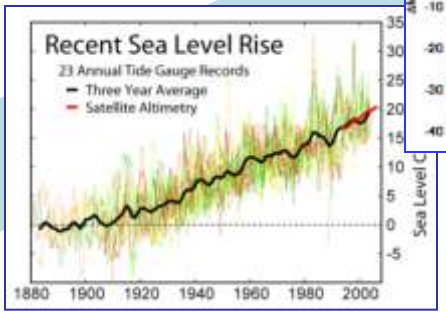
Satellite Observations





University of Colorado, Boulder, 2009

Tide Stations



Douglas, 1997

Observation: ~2mm/yr	*Observation: ~3.1mm/yr*	*Projection: ~2-6mm/yr*	*Observation: >50 Gt/yr*	*Projection: 10-20mm/yr?*
1870-1992	**1993-2006**	**2007 IPCC AR4**	**2009**	**2010-2100**

US Naval Academy in Annapolis, MD

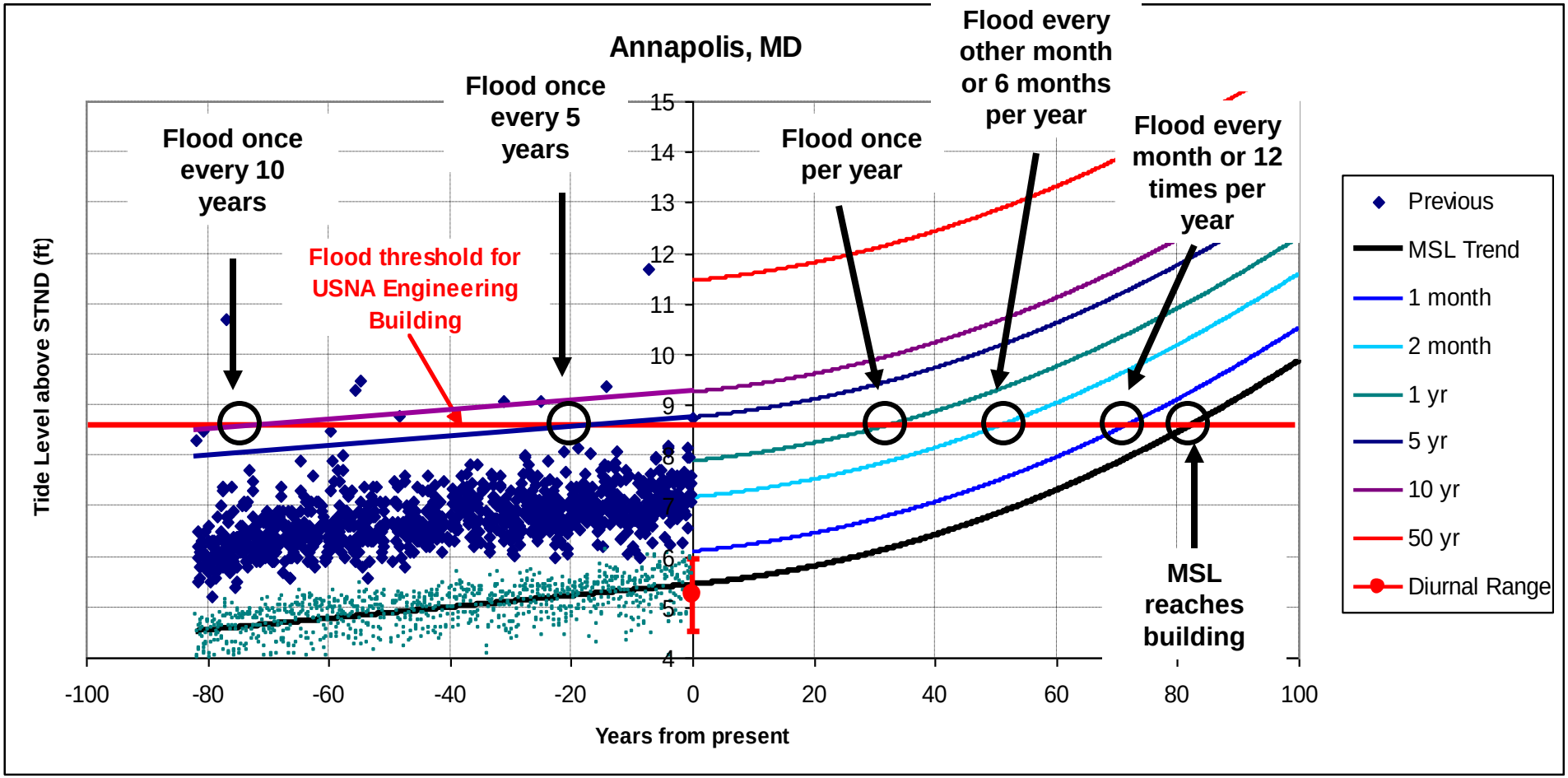
Storm tide from Hurricane Isabel

Sept 2003

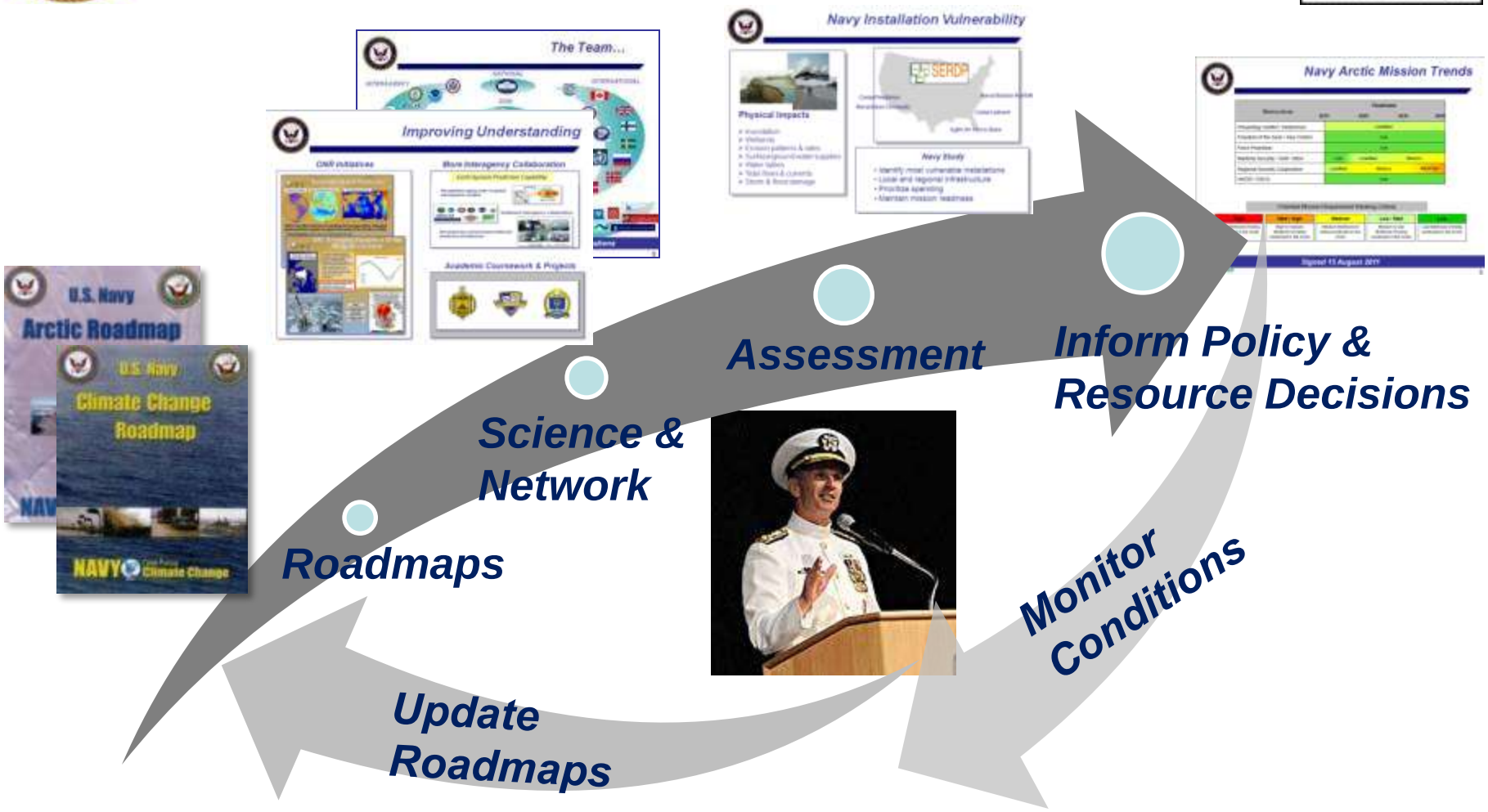
What will a future flood look like with additional sea level rise?

Coastal Concerns

Average Frequency of Flooding



U.S. Navy Task Force Climate Change



Science-based approach, cooperative partnerships, risk assessments

Navy Sea Level Rise Concerns

Physical Impacts

- Inundation
- Wetlands
- Erosion patterns & rates
- Surface/ground water supplies
- Water tables
- Tidal flows & currents
- Storm & flood damage

Challenges

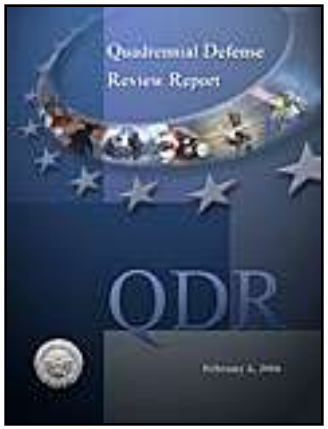
- Infrastructure
- Mission capabilities
- Training & testing lands
- Transportation means/facilities

Opportunities

- Adaptation partnerships
- Recapitalization incentive

Directly impacts readiness, strategic access, & influence

Navy Installation Vulnerability



2010 QDR

"Climate change, energy security, and economic security are inextricably linked"

"…the Department must complete a comprehensive assessment of all installations to assess the potential impacts of climate change on its missions and adapt as required."

US Army Corps of Engineers

EC 1165-2-211 "Incorporating Sea-Level Change Considerations in Civil Works Programs"

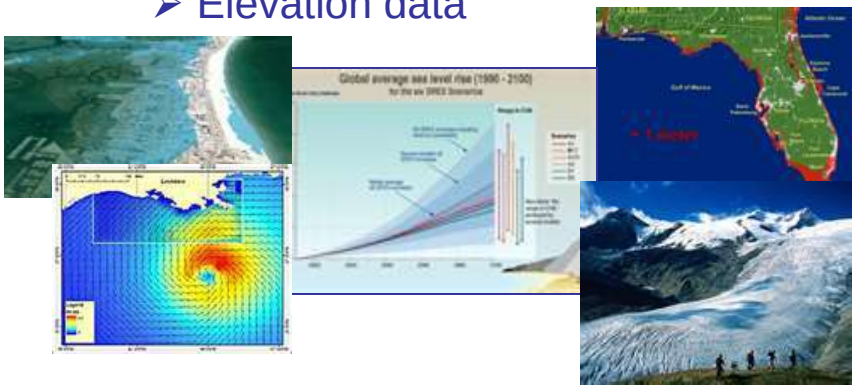
Engineering Technical Letter on Procedures to Evaluate Sea Level Change Impacts, Responses, and Adaptation

Enabled & informed by sound science

Science Needs

Sea Level Rise

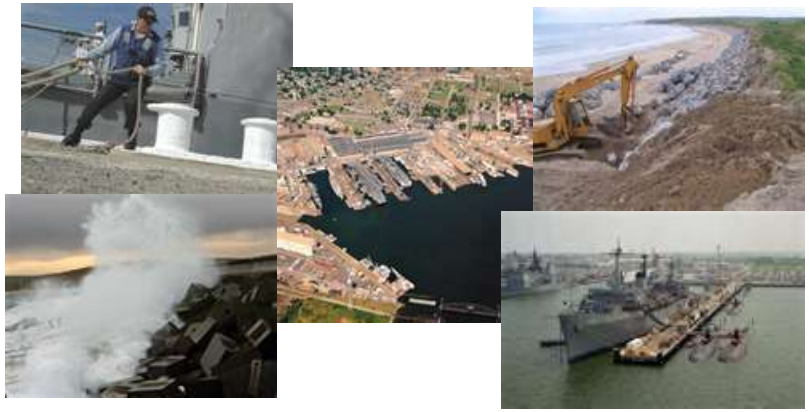
- Thermal expansion
- Ice sheet mass loss
- Glacier melt
- River runoff
- Subsidence/uplift
- Local currents
- Atmospheric pressure
- Elevation data



Local to global spatial scales, hourly to millennial temporal scales

Adaptation

- In-water structures
- Infrastructure protection
- Water supply protection
- Erosion control
- Environmental protection



Environmental planning & civil/ocean engineering

Quantify & reduce uncertainties to optimize investment decisions