

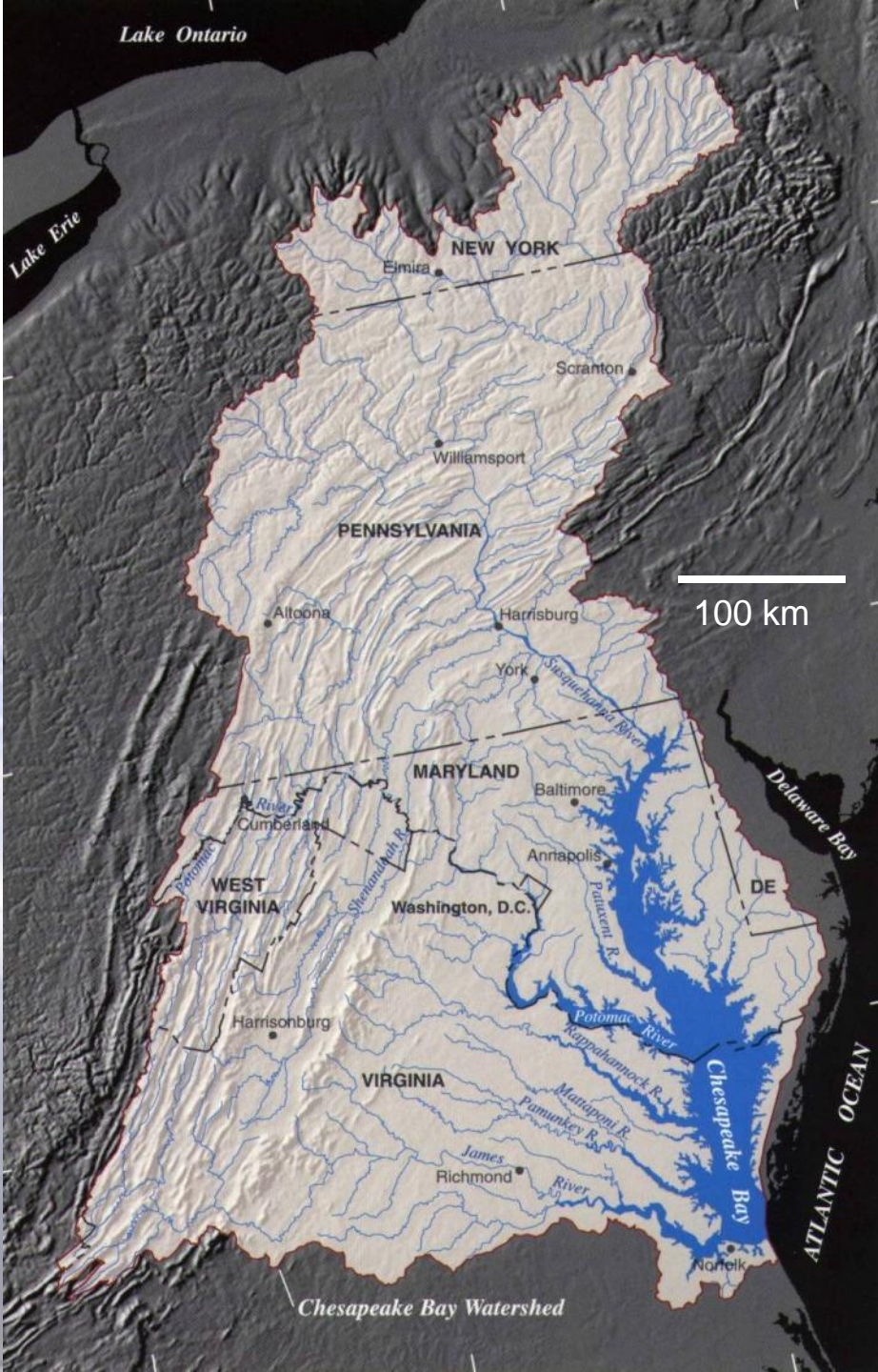
Incorporating Climate Change Adaptation into Chesapeake Bay Ecosystem Restoration

*National Conference on Ecosystem Restoration
Greater Chicago, Illinois
July 30, 2013*

Donald F. Boesch



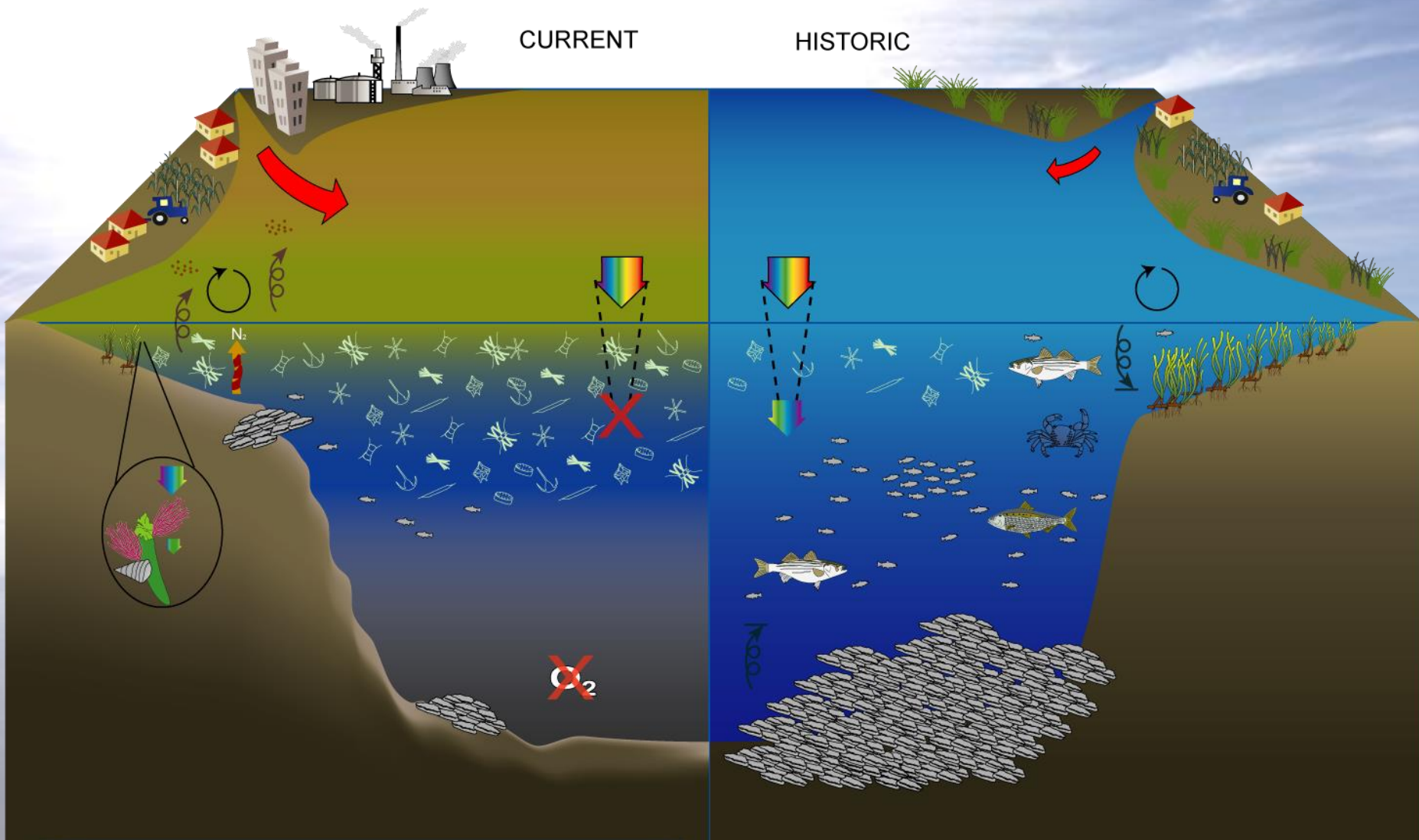
University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE



Chesapeake Bay

Maximum depth	53 m
Average depth	7 m
Total shoreline	7,400 km
Volume	$6.8 \times 10^7 \text{ m}^3$
Catchment area	$165,000 \text{ km}^2$
Length	322 km
Average discharge	$2,500 \text{ m}^3/\text{sec}$
Mean tidal range	0.8 to 0.4 m
Residence time	$\sim 6 \text{ mo}$
Age	$>10,000 \text{ y}$
Tributaries	150

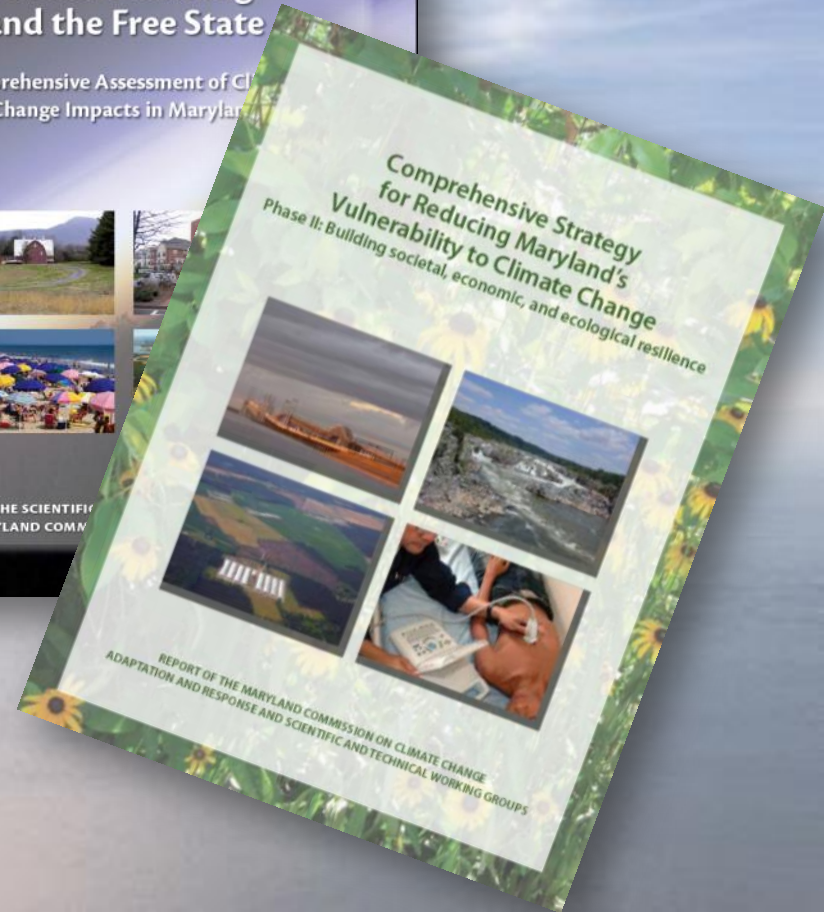
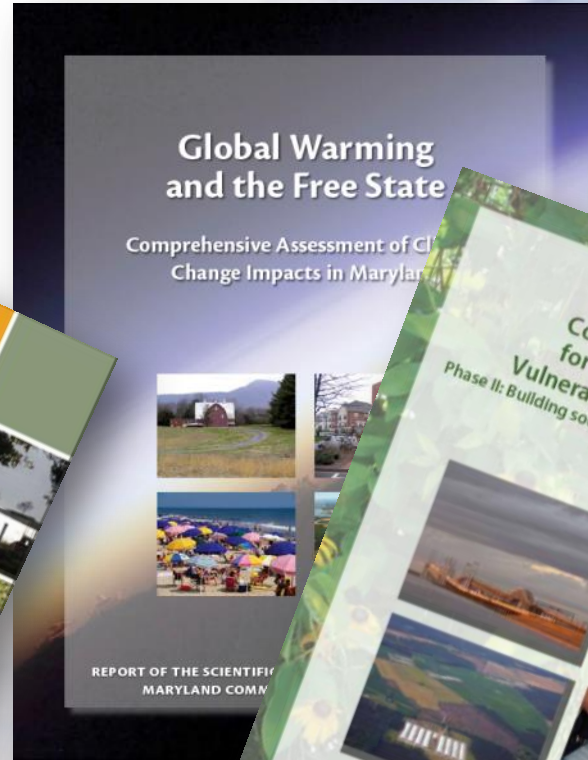
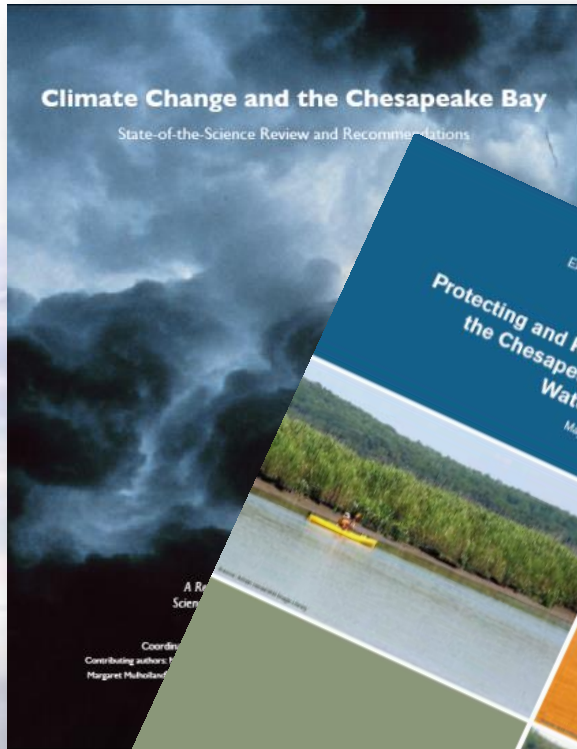
Reversing Eutrophication



What Does Climate Change Change?



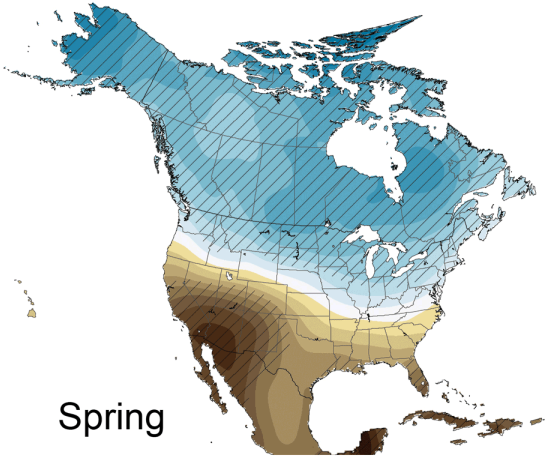
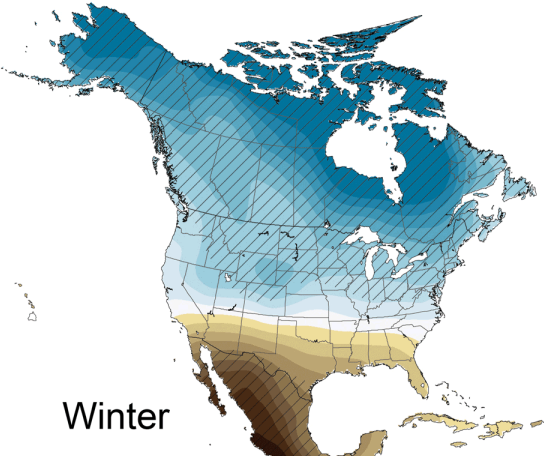
Climate Change Reports



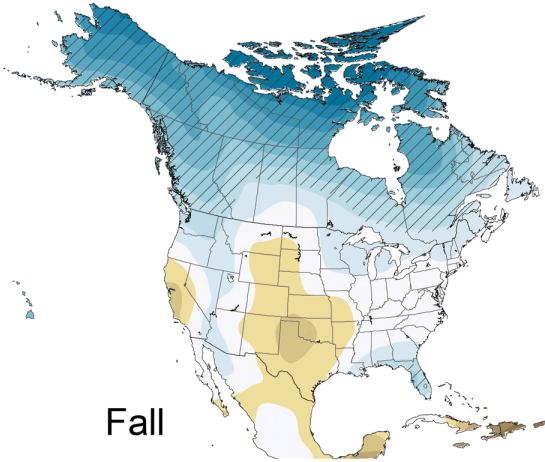
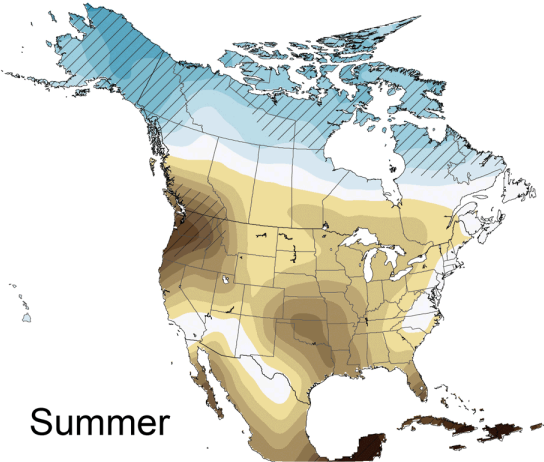
Likely Impacts on Chesapeake Ecosystem

- Submergence of estuarine wetlands
- Increased salinity variability
- Increase in harmful algae
- Increase in hypoxia
- Reduction of eelgrass
- Substantially altered interactions among trophic levels

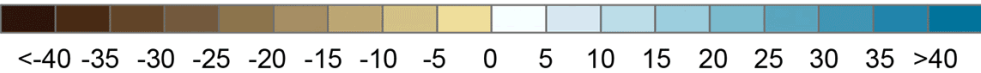
Projecting Changes in Precipitation



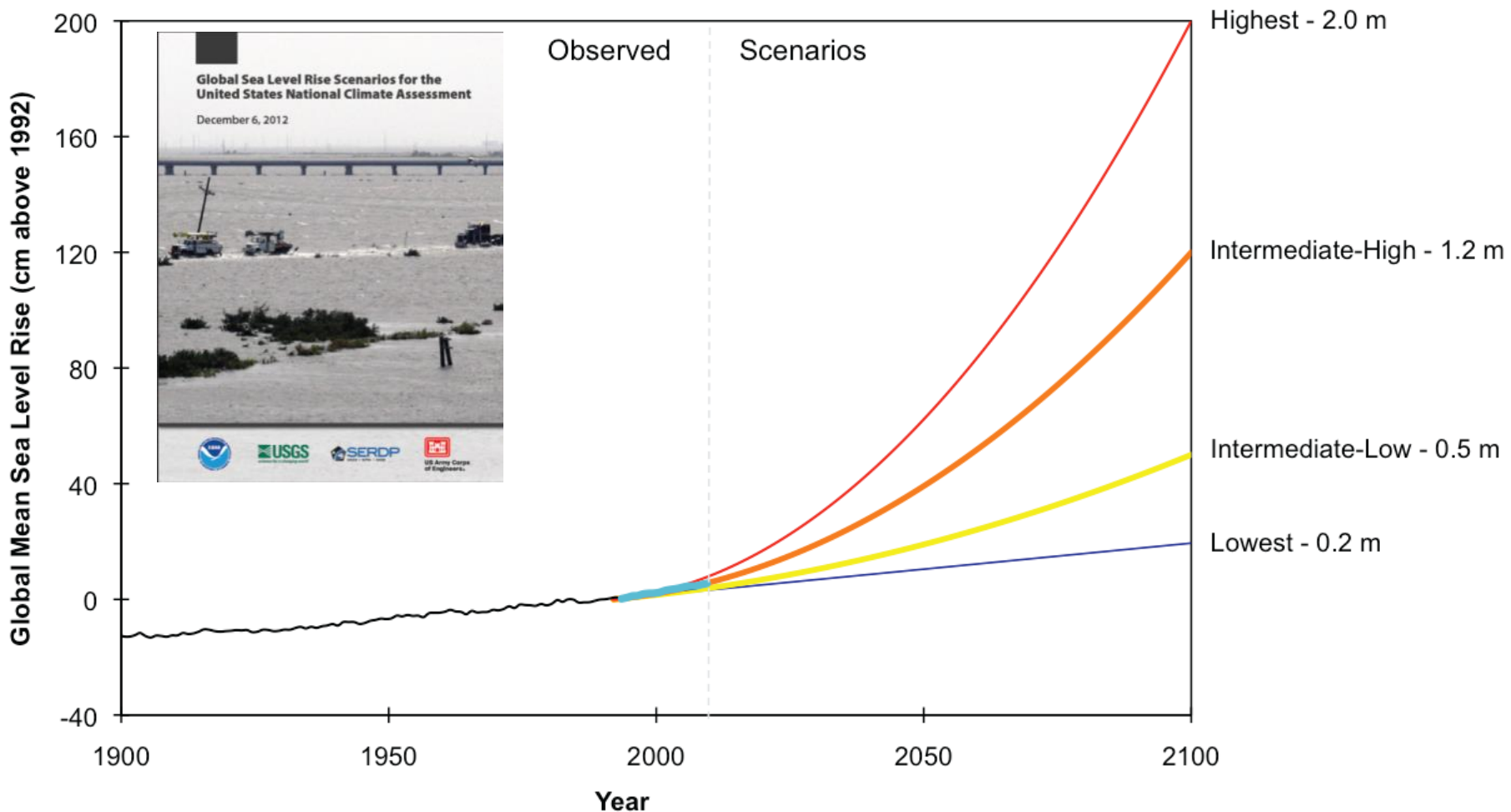
by 2080-90s




Percent Change



National Climate Assessment Sea-Level Rise Scenarios



Updating Sea-Level Rise Projections

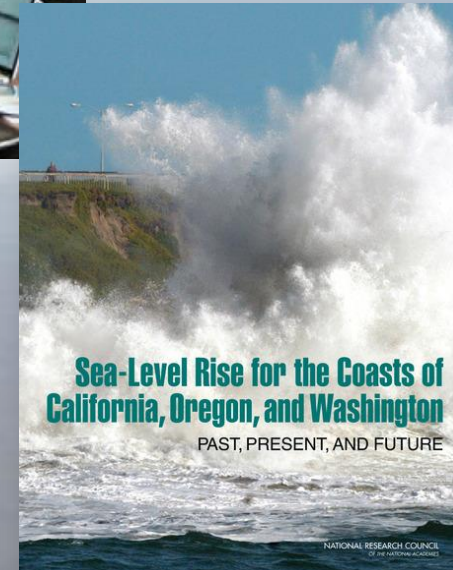


Updating Maryland's
**Sea-level Rise
Projections**

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*Scientific and Technical Working Group
Maryland Climate Change Commission*

June 26, 2013



Multiple Ways to Estimate Vertical Land Movement



Releveling of land surveys



Models of glacial isostatic adjustment and other crust movements



Repeated elevation measurements using Global Positioning System



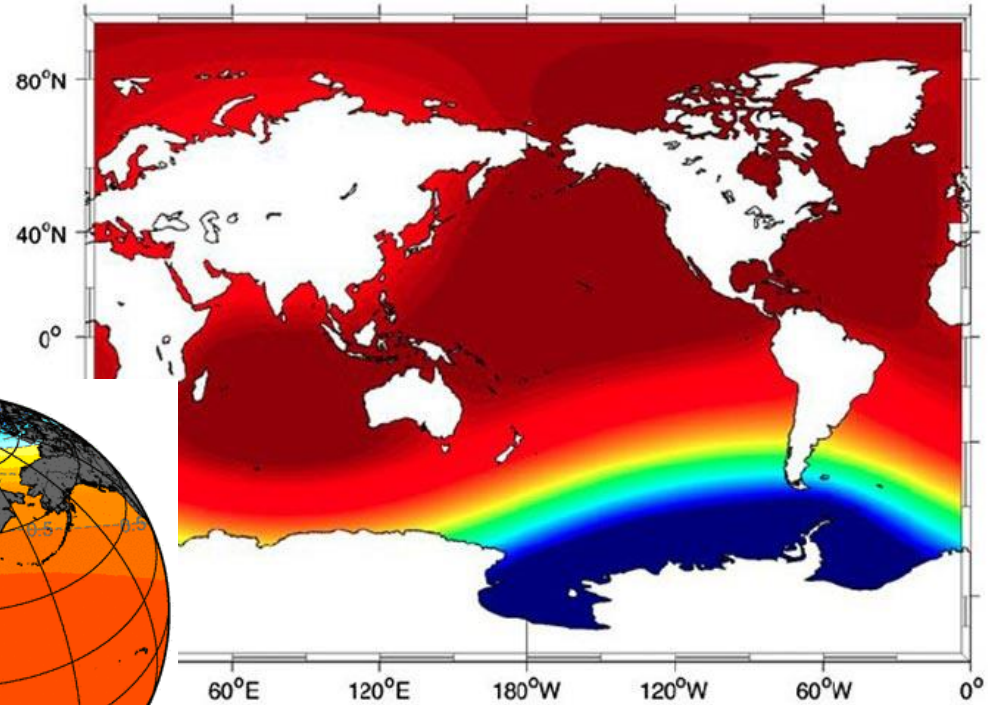
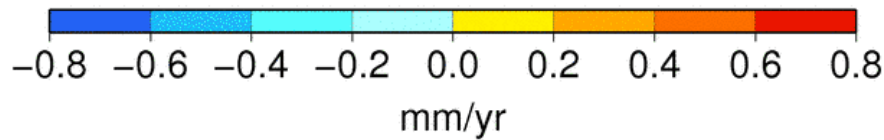
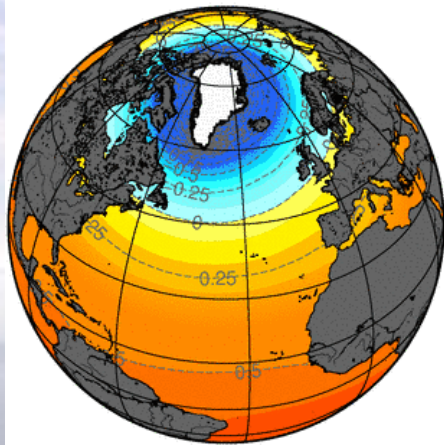
Subtraction of assumed sea-level rise from tide gauge records



Geological interpretation of sediment record using microfossils and dating techniques

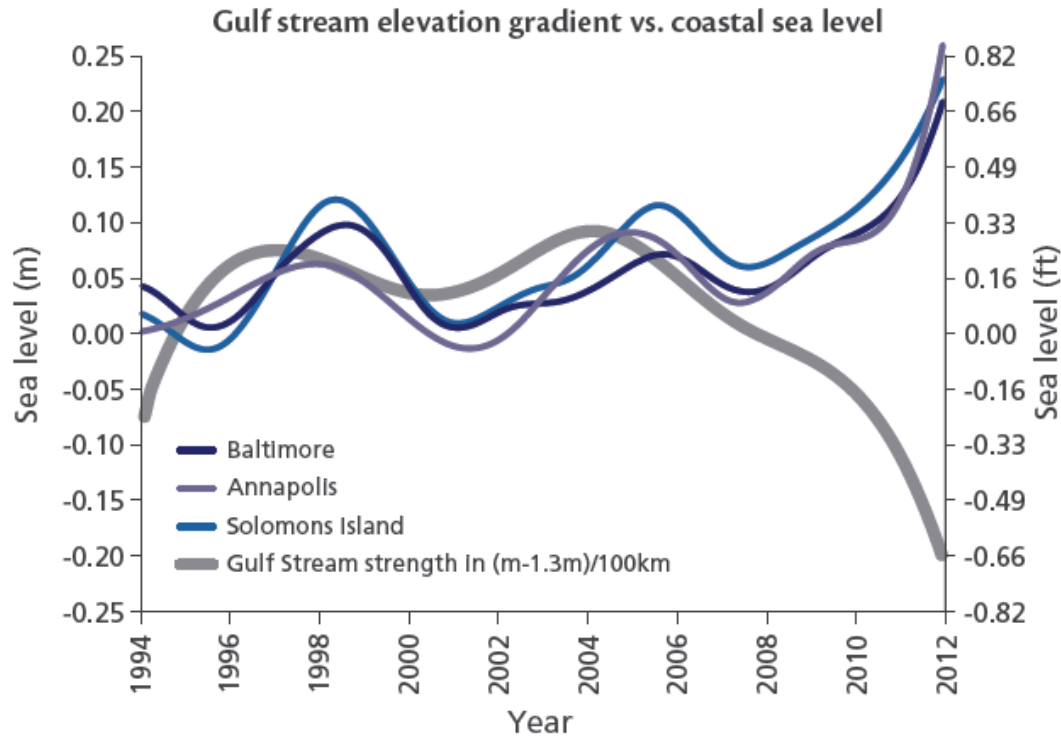
Ice Sheet “Fingerprints”

Greenland

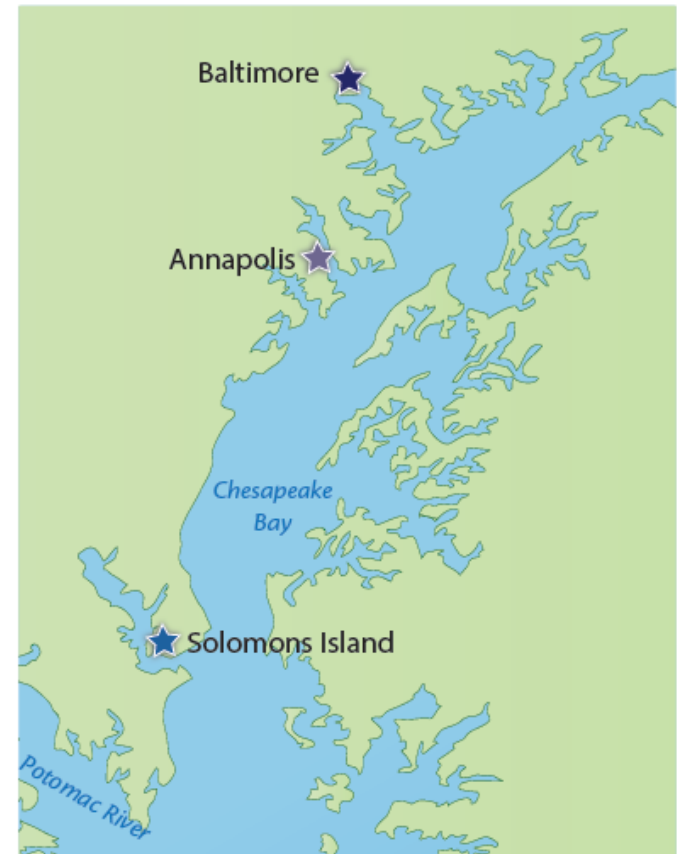


West Antarctica

Ocean Dynamics



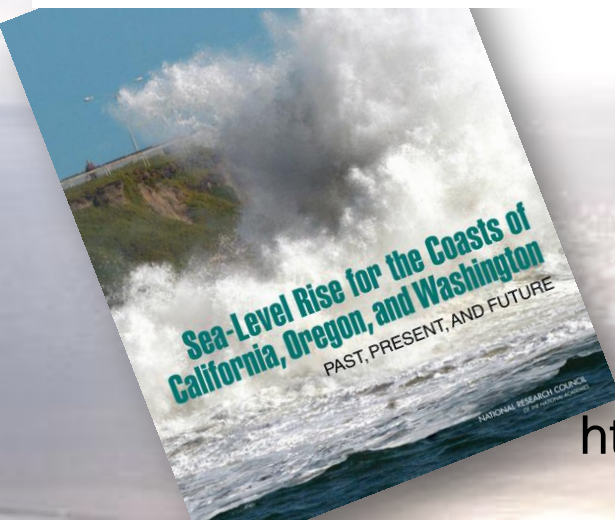
At Maryland tide gauge stations (colored lines) low frequency modes of relative sea level, including decadal oscillations and sea-level rise, closely mirror changes in the Gulf Stream strength derived from satellite altimeter data (gray line).²⁶



Bringing Components Together

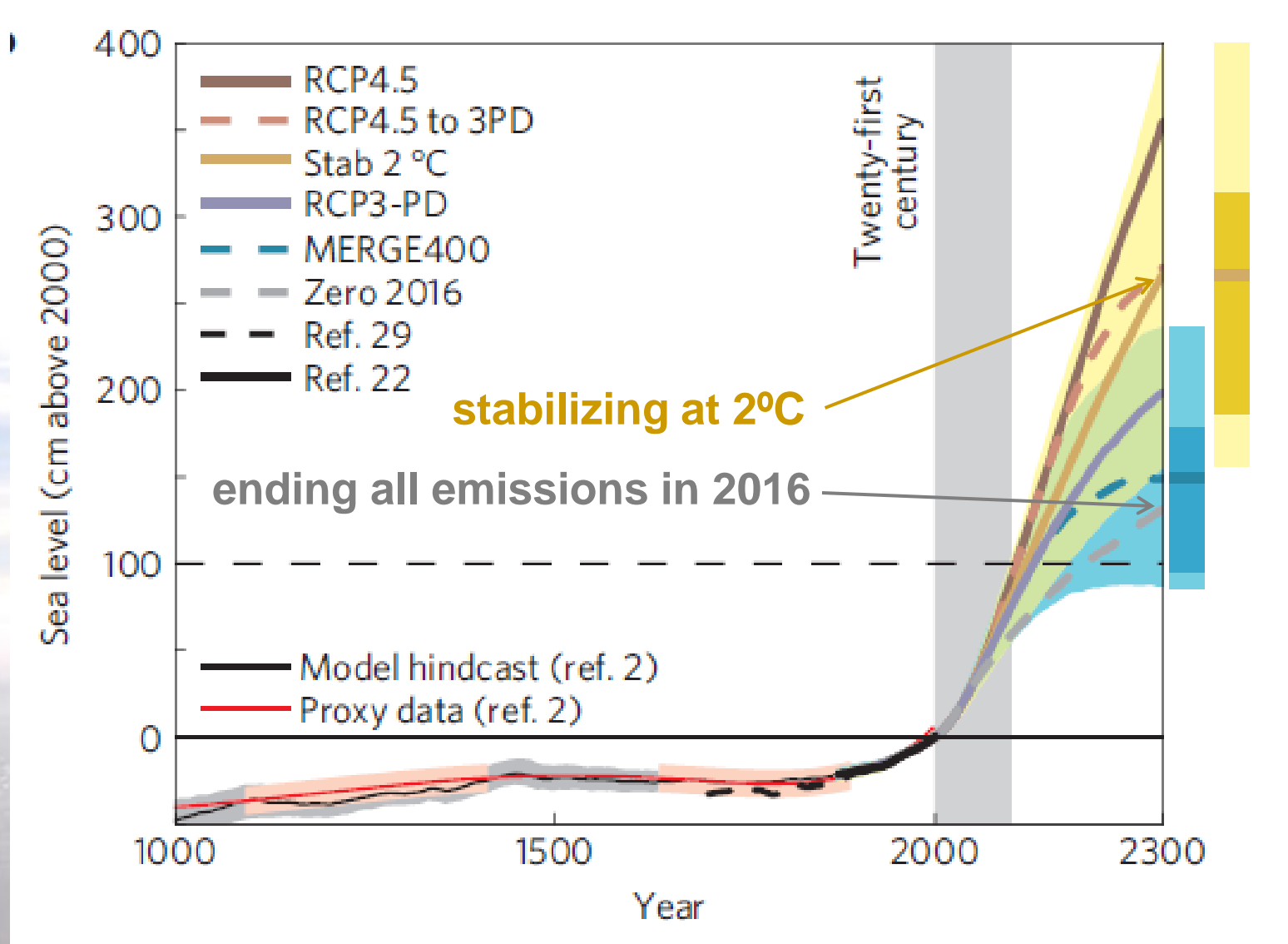
Maryland Relative Sea-level Rise	Thermal (m)	Glaciers (m)	Greenland (m)	Antarctica (m)	Dynamic (m)	VLM (m)	Relative SLR	
							meters	feet
2050 best	0.10	0.05	0.03	0.09	0.09	0.075	0.4	1.4
2050 low	0.04	0.05	0.02	0.04	0.07	0.065	0.3	0.9
2050 high	0.19	0.06	0.05	0.16	0.10	0.085	0.7	2.1
2100 best	0.24	0.13	0.10	0.30	0.17	0.15	1.1	3.7
2100 low	0.10	0.12	0.08	0.10	0.13	0.13	0.7	2.1
2100 high	0.46	0.17	0.17	0.58	0.19	0.17	1.7	5.7
Land ice change fingerprint scale factors		0.9	0.5	1.25				

www.umces.edu/sea-level



http://www.nap.edu/catalog.php?record_id=13389

Long-Term Response of Sea Level



Questions?



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