Climate Change and the Coast

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The Oregon Climate Change Research Inst. (OCCRI)

- Created in 2007
- Foster research within OUS
- Serve as data clearinghouse
- Outreach to non-research community
Upcoming Reports

• Oregon Climate Assessment Report (OCAR)
  – Science report
  – Social, physical, biological sciences
  – Faculty lead authors and 70+ contributors

• Oregon Adaptation Framework
  – Policy report

• Both to be released 30Nov2010
Outline

• Introduction
• Sea level
• Wave height and storminess
• Temperature and precipitation
• Ocean chemistry
• Summary/Take Home
Introduction
Updated from Karl and Trenberth 2003

Global temperature and carbon dioxide 1860-2009

Temperature anomaly °C

Year

Temperature

CO₂

CO₂ anomaly ppmv
Global Temperature Anomalies
from 1890-1919 average

Observations
Models with natural effects (volcanoes and solar) only
Models with human and natural effects

°C

1900 1920 1940 1960 1980 2000

Meehl et al 2004
Sea level
After IPCC AR4 FAQ5.1, Figure 1
Global Average = \(~1.8\) mm/year

Source: NOAA
Discussion

- Thermal expansion + melting ice
- Local variability due to geology
- Loss of land/wetlands
- Change(s) in salinity
- Threaten coastal water supplies
Wave height and storminess
SWH (m)

Date


- Annual Mean = 0.015 ± 0.01 m/yr ($r^2 = 0.33$)
- Winter Average = 0.023 ± 0.014 m/yr ($r^2 = 0.36$)
- Avg. 5 largest = 0.071 ± 0.054 m/yr ($r^2 = 0.25$)
- Annual Max. = 0.095 ± 0.073 m/yr ($r^2 = 0.25$)

Ruggiero et al 2010
Discussion

• Climate controls not firmly established
• Impacts could exceed those of SLR

• Loss of land/wetlands
• Change(s) in salinity
• Threaten coastal water supplies
Temperature and precipitation
PNW Projected Seasonal Temperature Increase

Mote and Salathe’ 2010
PNW Projected Seasonal Temperature Increase
PNW Projected Seasonal Precipitation Change
PNW Projected Seasonal Precipitation Change
Discussion

- All models suggest warmer 21C
- SRES divergence greatest after mid-century
- Precip projections not consistent; drier summers, wetter rest of year?

- Changes in ecology (e.g. species composition)
Ocean chemistry
Ocean Acidification
of the North American Continental Shelf

NACP Coastal Survey Cruise:
11 May - 14 June 2007

On transect lines 5 and 6 the corrosive water reaches all the way to the surface in the inshore waters near the coast.

Data Source: Richard Feely, NOAA
Discussion

• CO2 emissions changing oceanic chemistry
• pH is falling

• Suggests negative impact(s) on calcifiers
• Potential effects on ecology, food webs (high uncertainty)
Summary

• Sea level rising
  – Loss of wetlands, change salinity, etc.

• Increased wave height and storminess
  – Loss of wetlands, change salinity, etc.

• Temp = increase; Precip = ?
  – Change ecology (e.g. species composition)

• Ocean acidification
  – Change marine ecology
Take Home

- Multiple processes at work
- Significant uncertainties exist
  - Process uncertainties
  - “Sociological” uncertainties
- Adaptation strategies => robust and resilient
Oregon Climate Change Research Institute