Climate Change in the Mid-Atlantic Region

Raymond Najjar
Professor of Oceanography
Department of Meteorology and Atmospheric Science
The Pennsylvania State University
rgn1@psu.edu

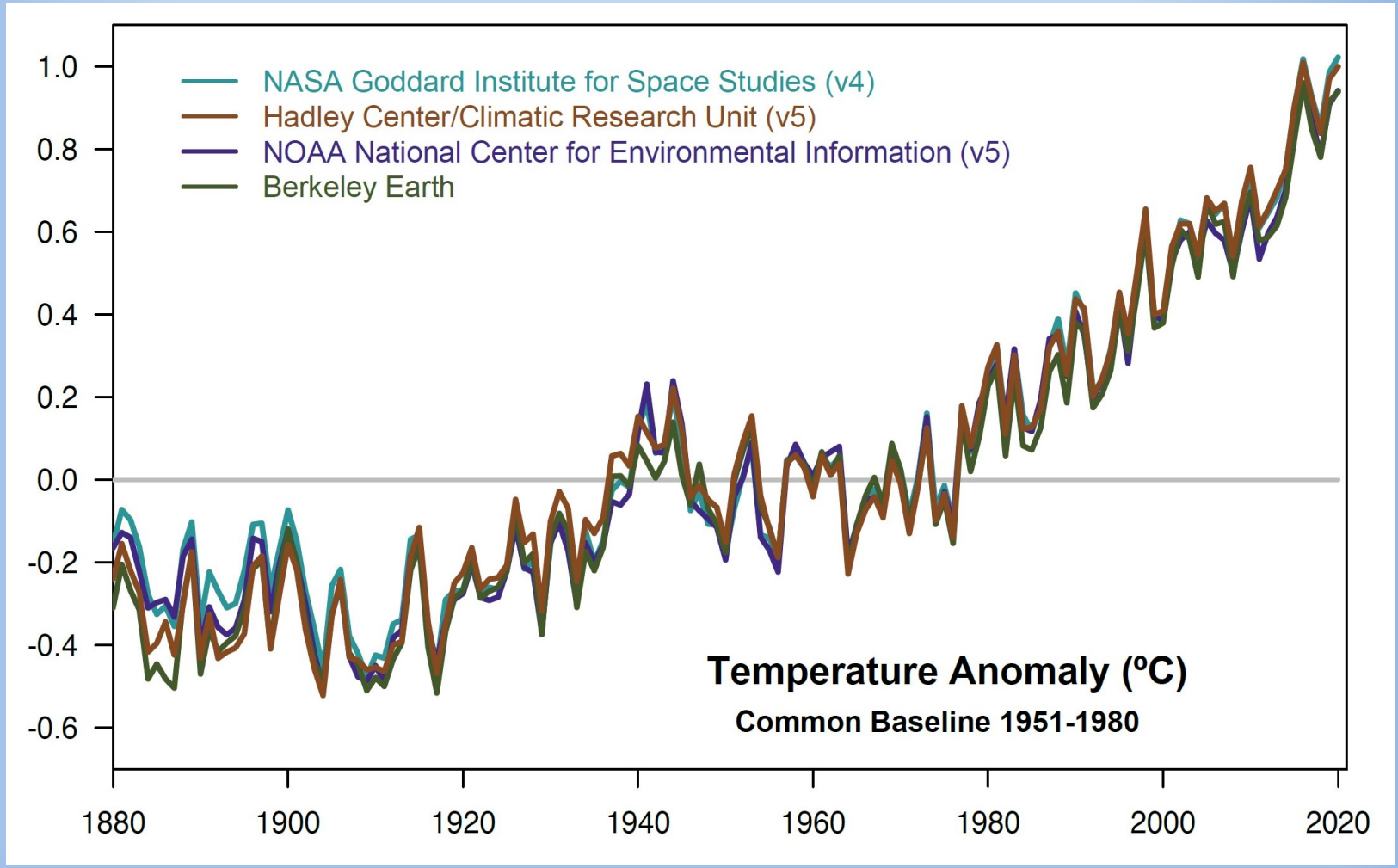
Mid-Atlantic Partnership Conference
January 15, 2021

Outline

- Global climate change
- Climate change in the Mid-Atlantic Region
- Future scenarios

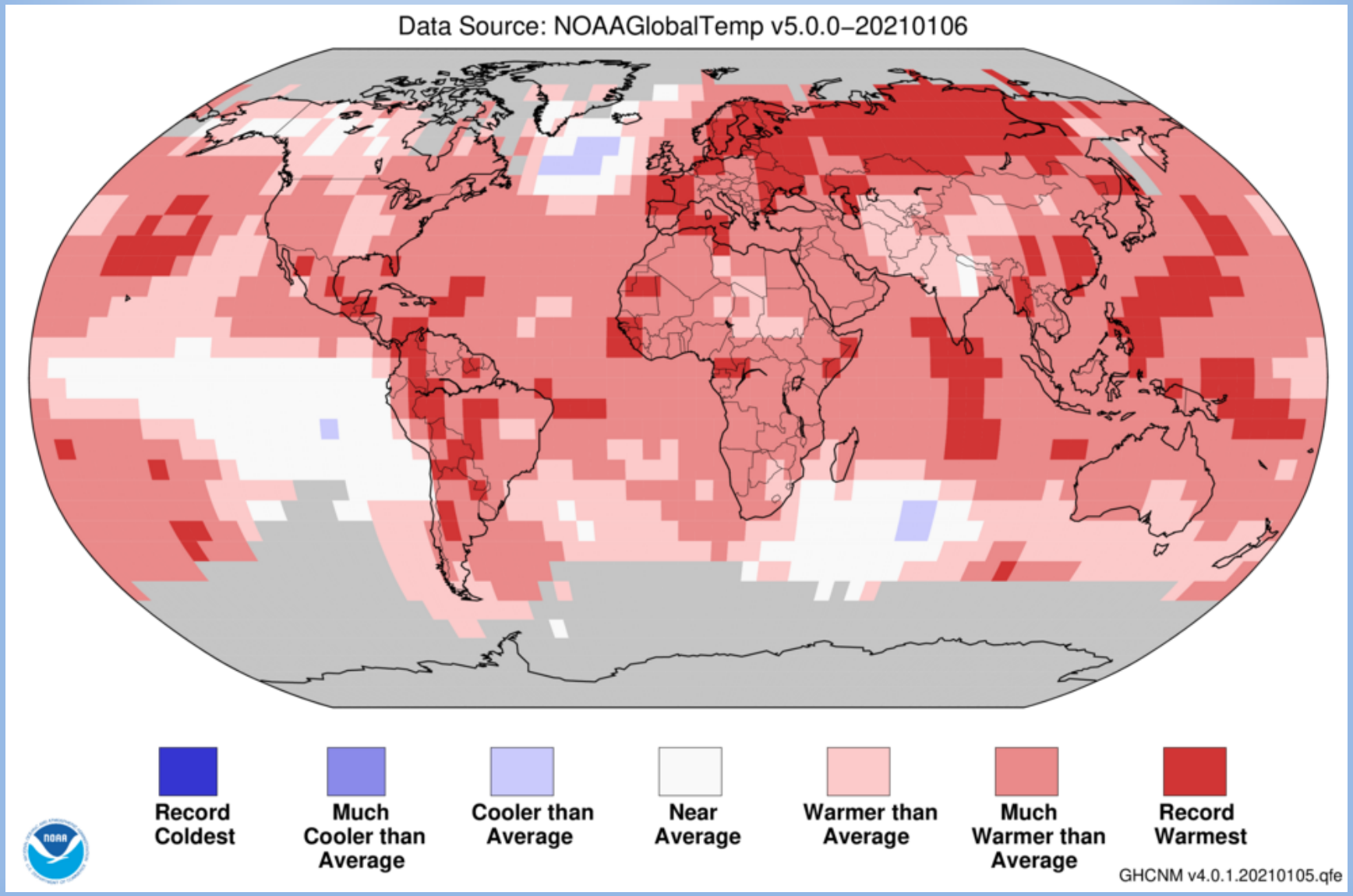
Global climate change

2020 was a statistical tie with 2016 as Earth's warmest year on record

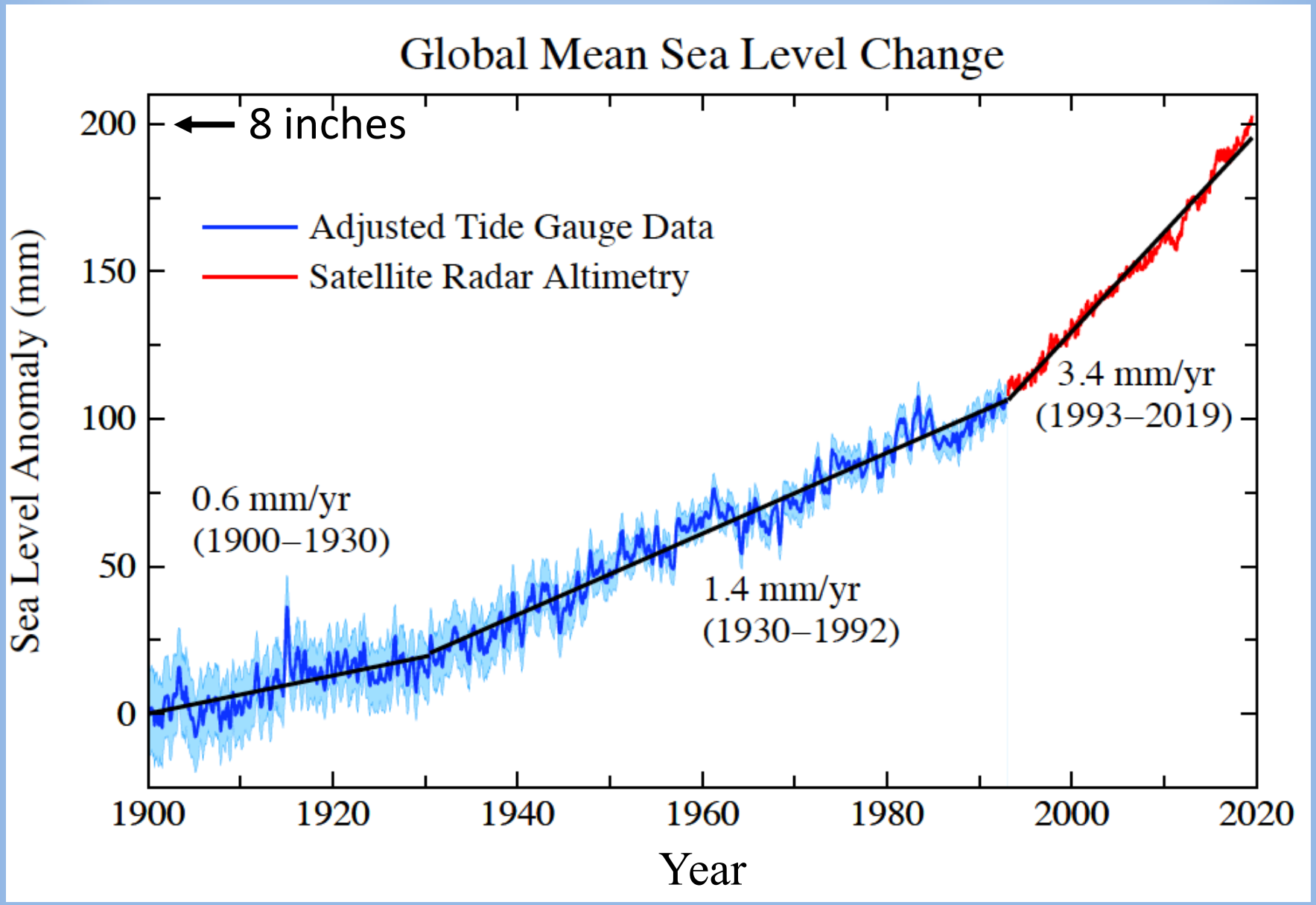


Credits: NASA GISS/Gavin Schmidt

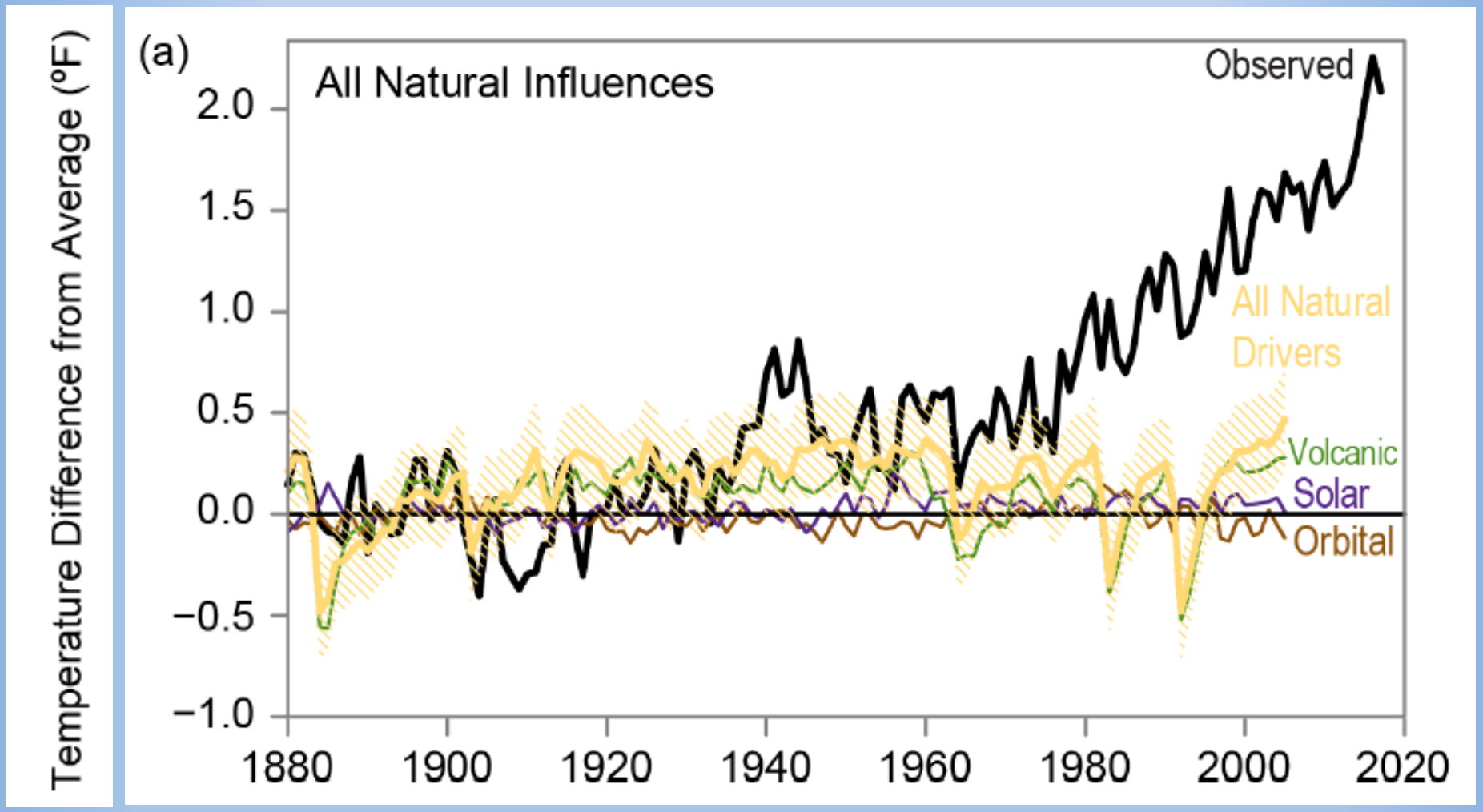
In 2020, most places were much warmer than average and many had record warming



Sea level is accelerating

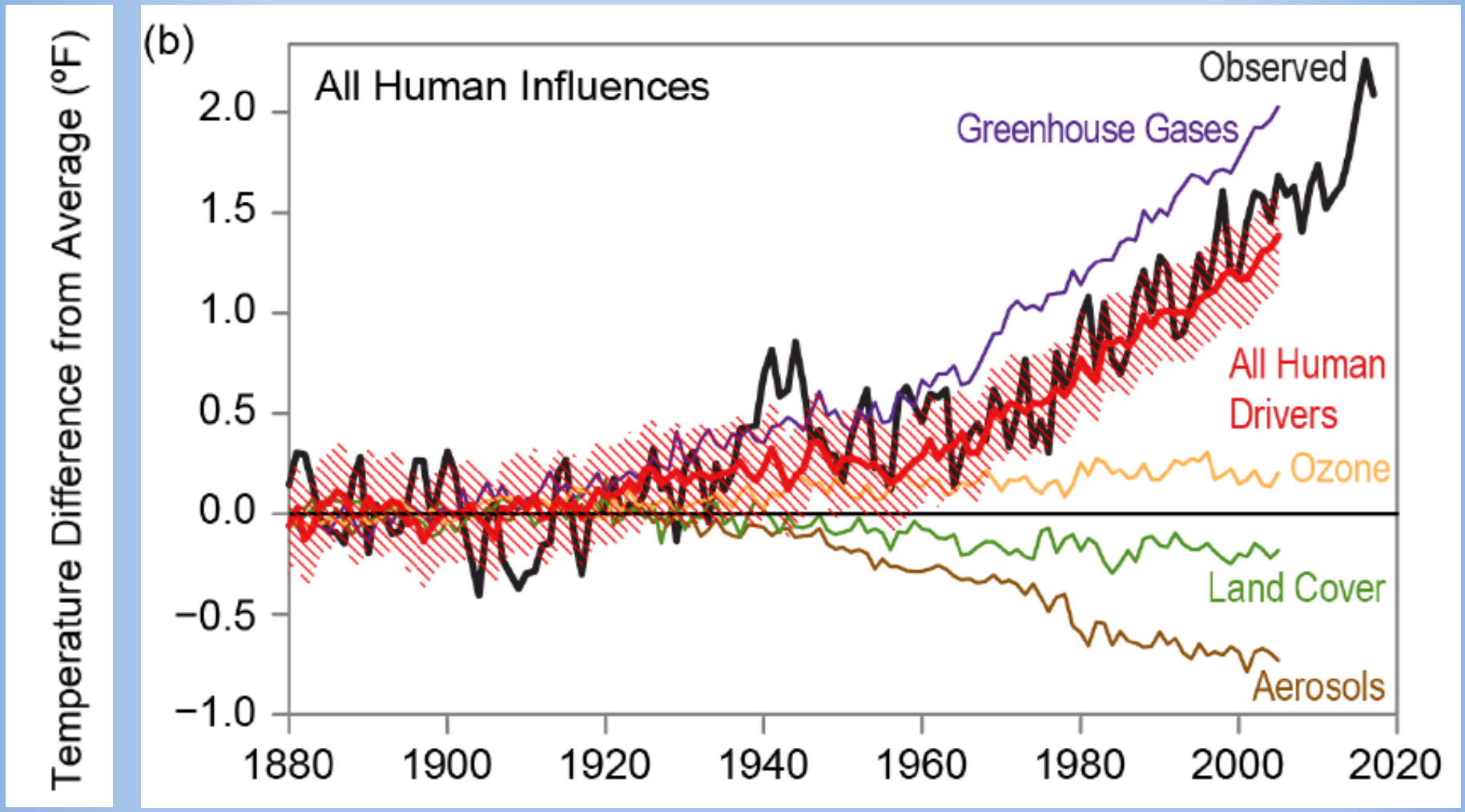


We cannot explain observed warming with natural drivers …



Fourth National Climate Assessment, Hayhoe et al. (2018)

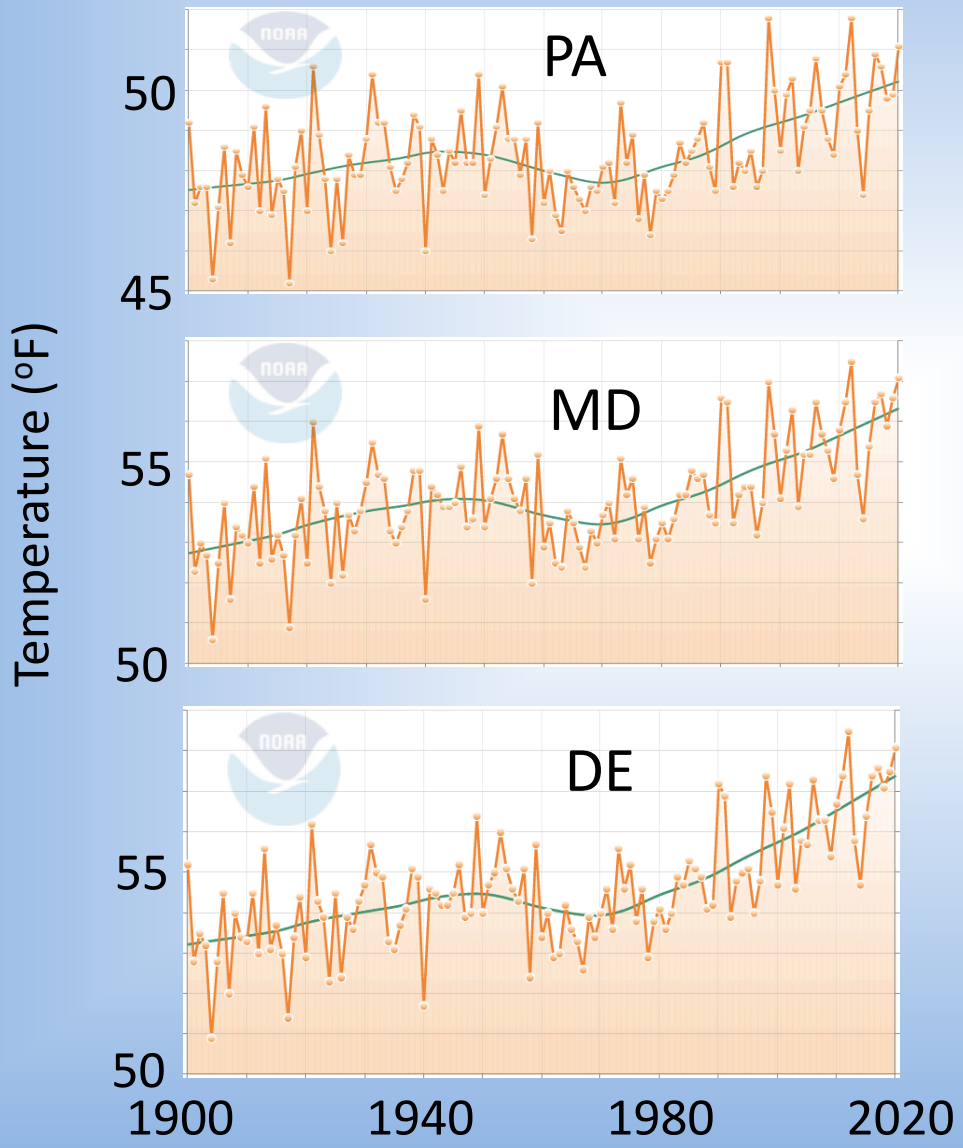
… but we can with human drivers



Fourth National Climate Assessment, Hayhoe et al. (2018)

Climate change in the Mid-Atlantic Region

The Mid-Atlantic Region has followed or exceeded the global warming trend



1990–2020 trends
(°F per decade)

Globe	0.4
PA	0.4
MD	0.5
DE	0.7

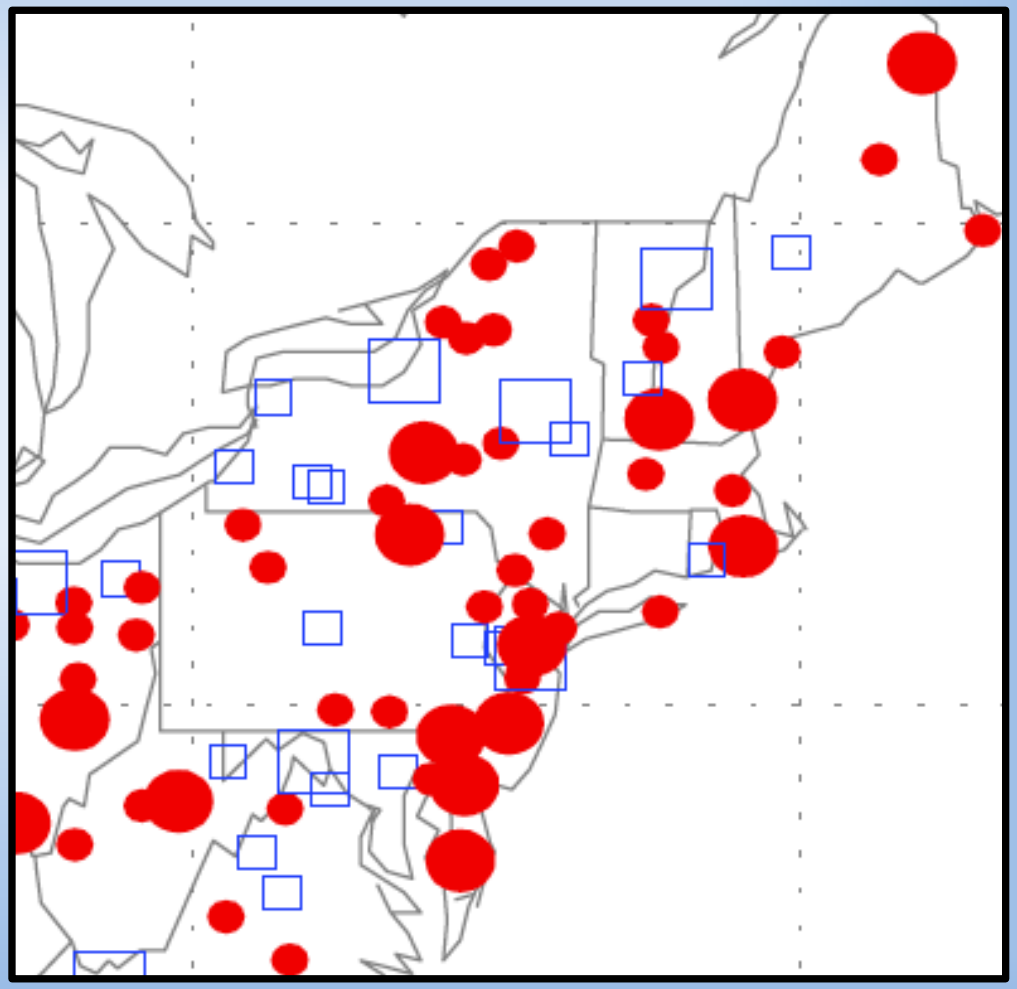
Source: NOAA
Climate at a Glance

The ratio of snow to total precipitation is mostly decreasing in the Northeast US

1949–2005 trend

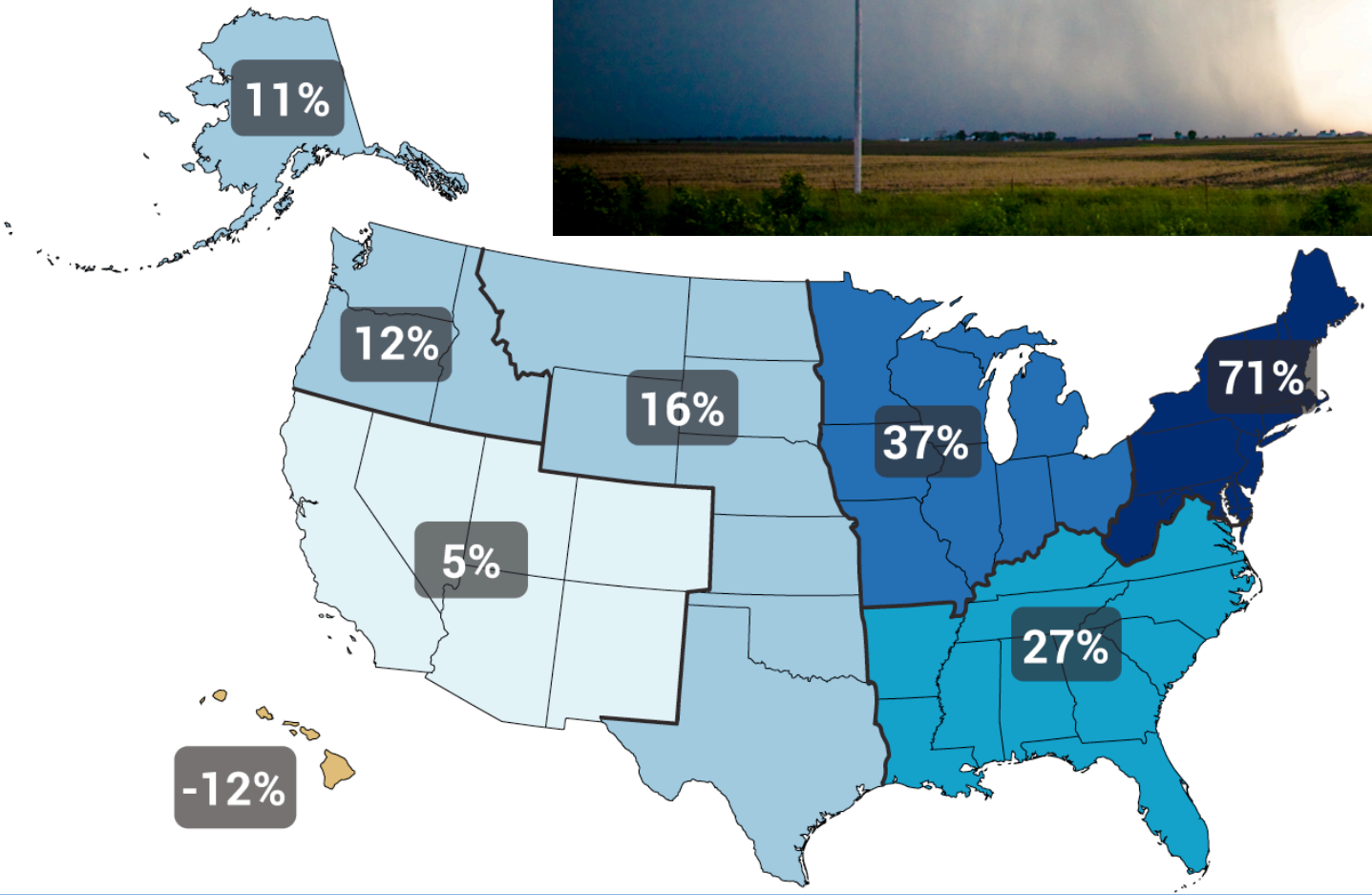
Decreasing

Increasing



Feng and Hu (2007)

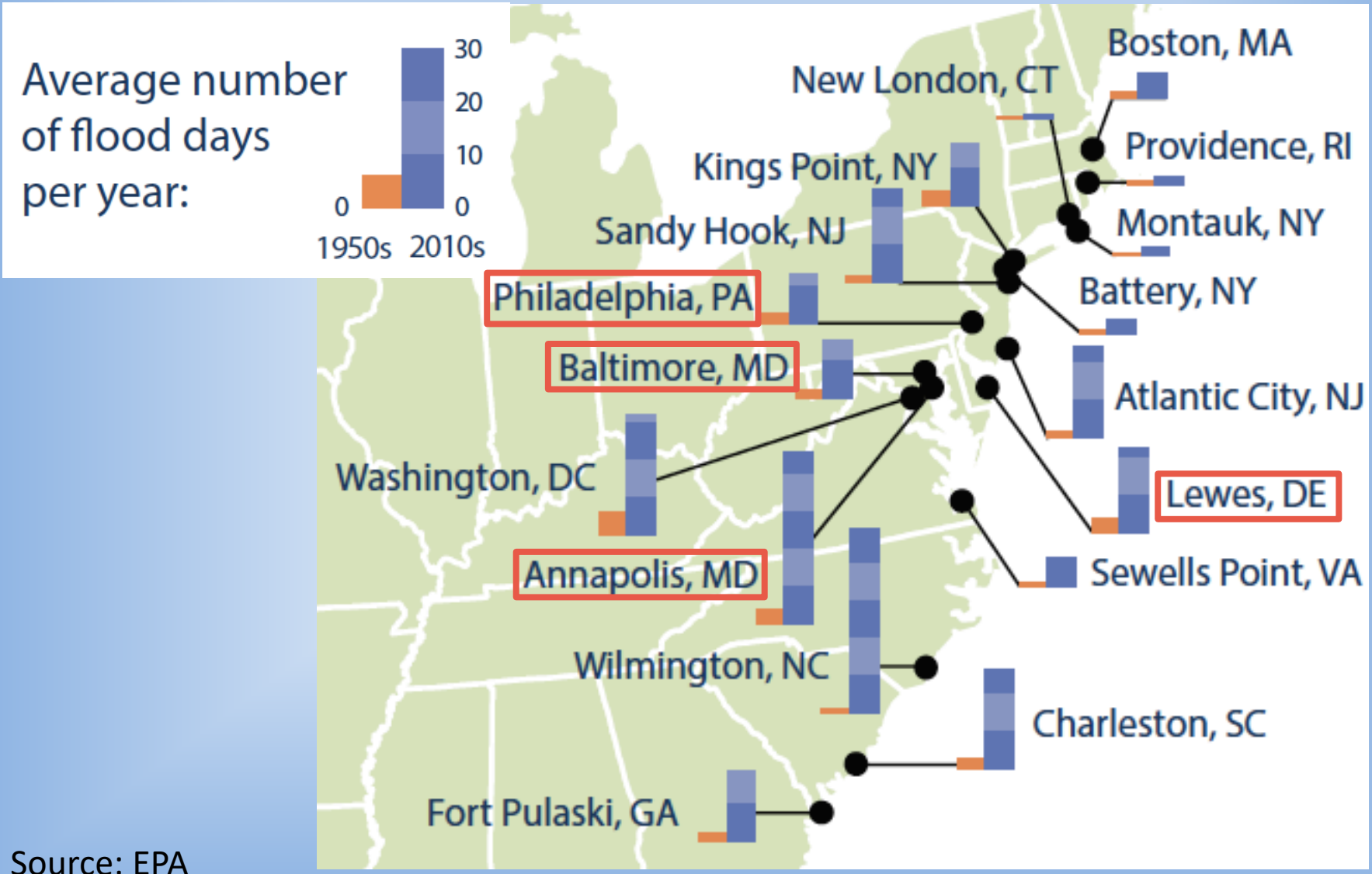
Heavy precipitation is increasing



Change in top 1% of rainiest days from 1958 to 2012

Walsh et al. (2014)

Coastal flooding has dramatically increased in the Mid-Atlantic Region as a result of sea-level rise

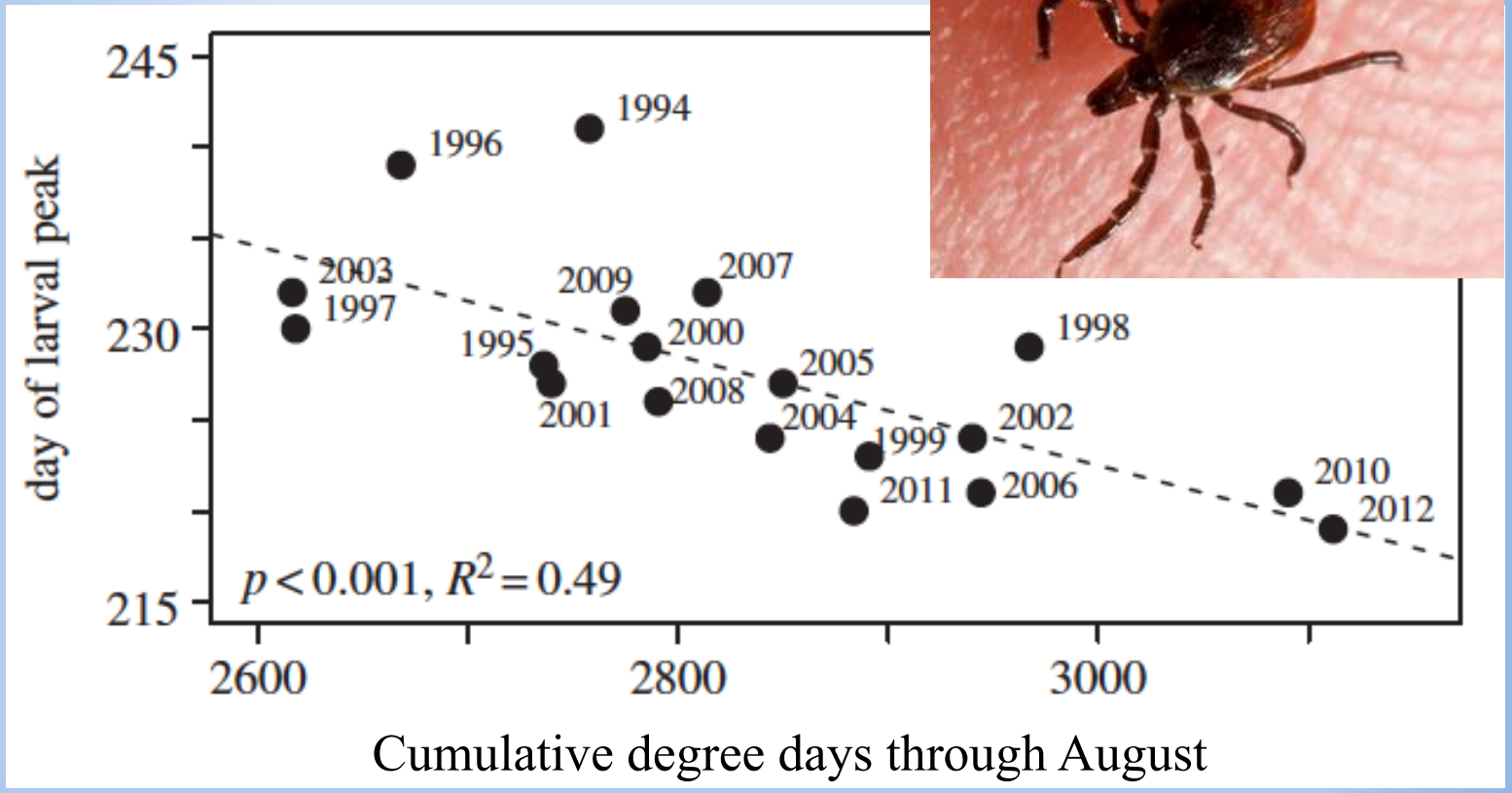


Source: EPA

Nuisance Flooding During a Spring High Tide in Maryland

Photo by Wanda Diane Cole

In Millbrook, NY, warming has led to an earlier larval peak of the blacklegged (deer) tick, the major Lyme disease transmitter



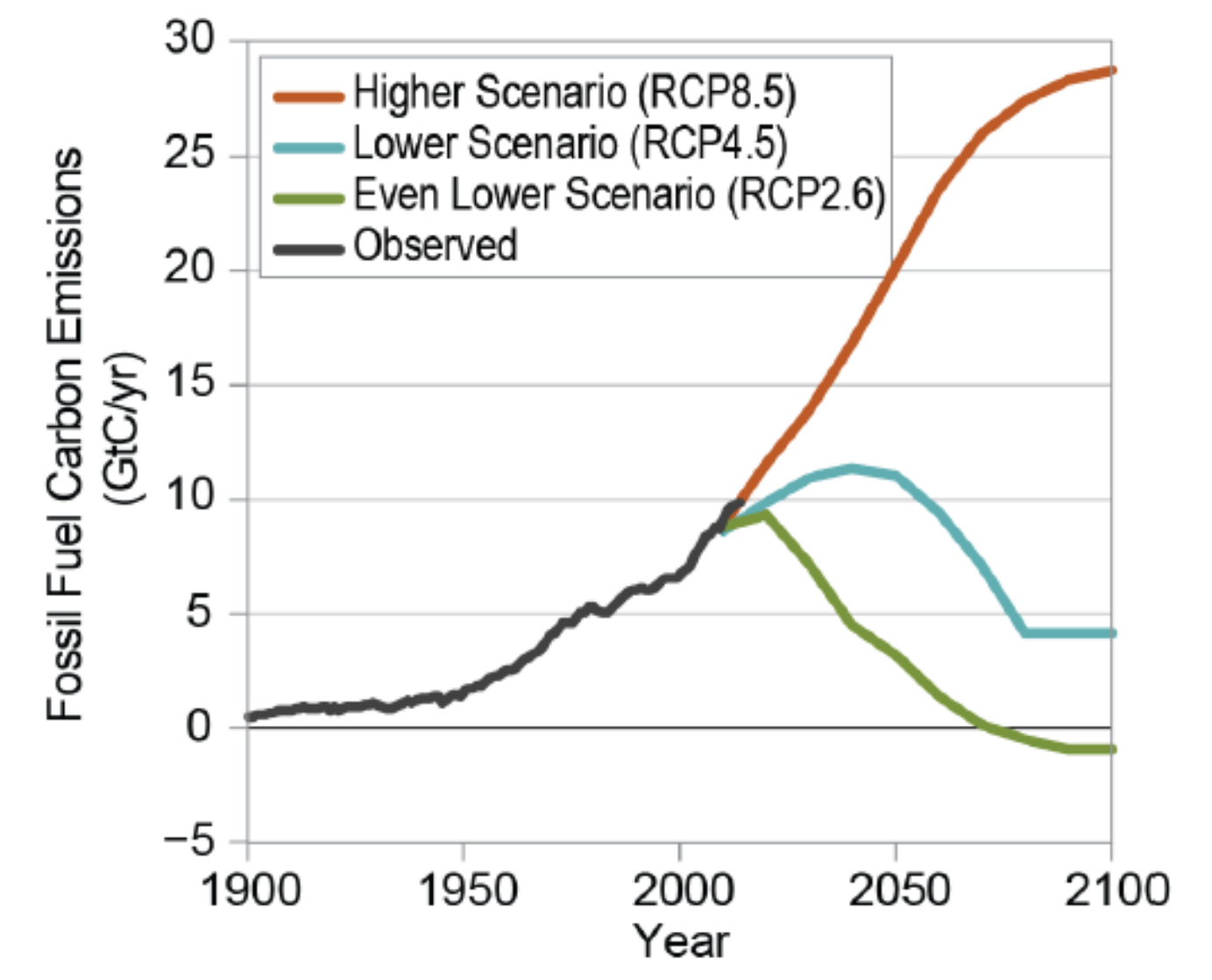
Earlier larval peak

Warmer years

Levi et al. (2015)

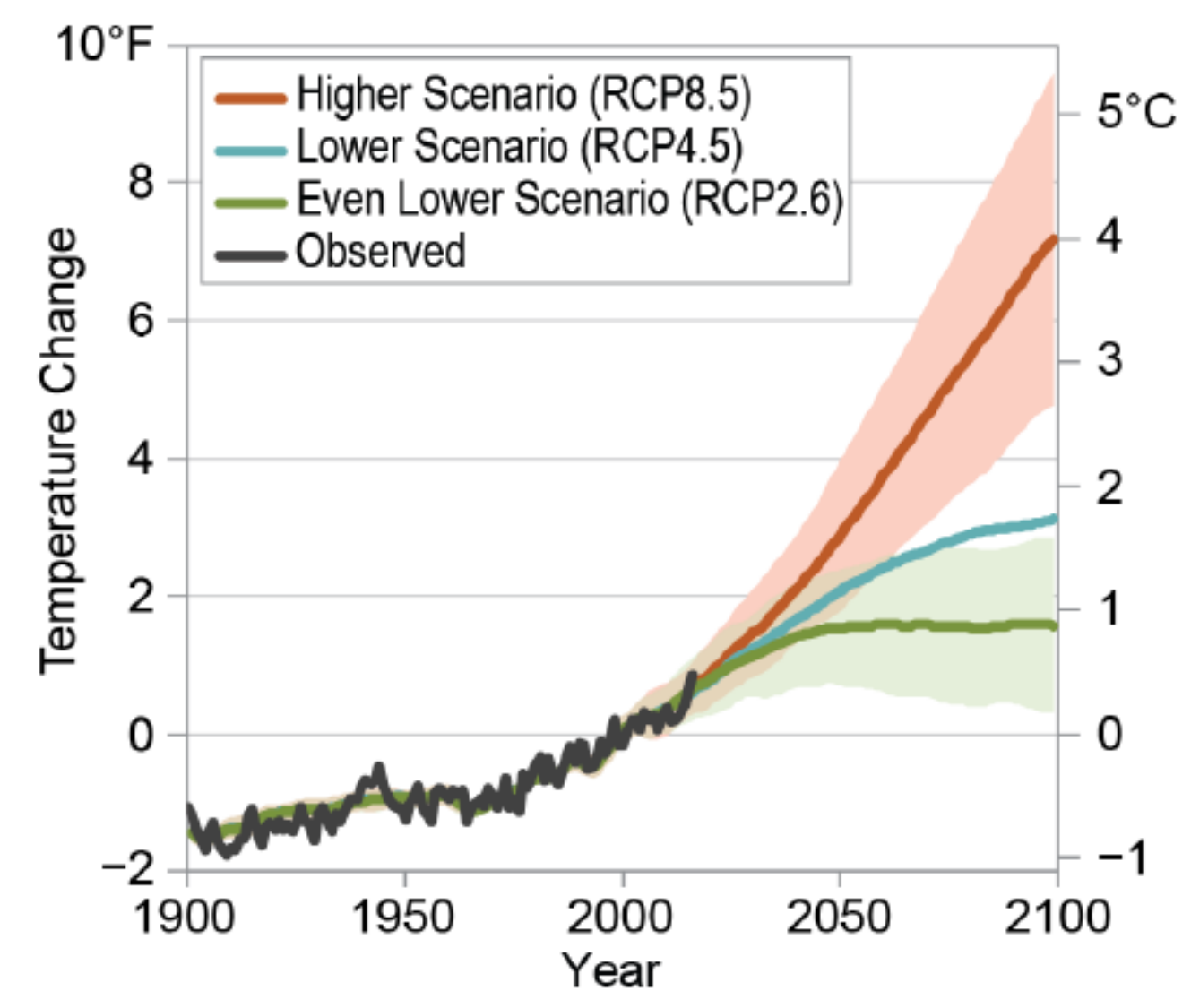
Future climate scenarios

Three possible emissions futures …



Fourth National Climate Assessment, Wuebbles et al. (2017)

… lead to very different climate futures

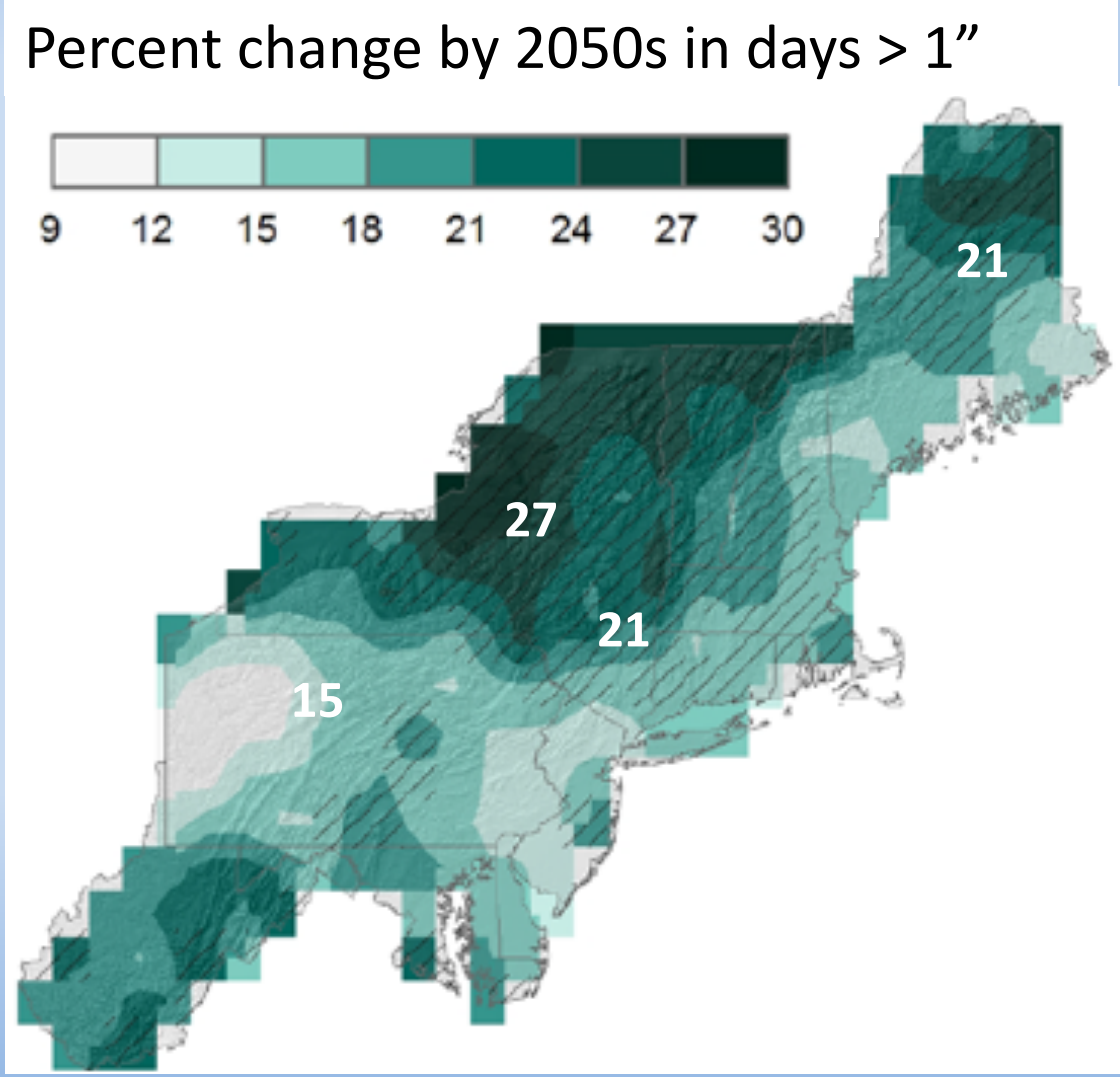


Fourth National Climate Assessment, Wuebbles et al. (2017)

http://psiee.psu.edu/climate-impacts

Summers in Pennsylvania will feel like those of the Southeast US by mid-century if heat trapping emissions trends continue

Expect heavy downpours to continue to increase



Kunkel et al. (2013)

Take-home messages

1. The world has warmed because of human activity (greenhouse gas emissions)
2. The Mid-Atlantic region has followed or exceeded the global warming trend
3. Human-induced climate change will continue to occur regardless of emissions scenario; further adaptation is necessary
4. The climate of the mid century and beyond is very sensitive to the emissions scenario; emissions reductions are imperative