“*A Climate Conversation*” webinar will begin shortly

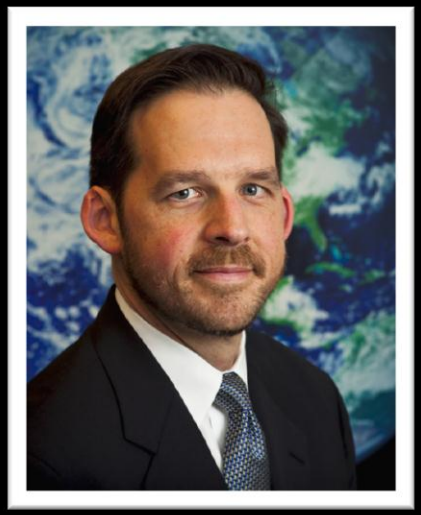
To avoid interference, please move cell phones and pagers away from your conference phone line

We welcome your questions and comments during the conversation via WebEx chat, and will open the conversation for all following the slide presentation.

Dial In #:

1-415-655-0001

Opening Remarks



Lawrence Friedl
Director, Applied Sciences Program,
Earth Science Division
National Aeronautics and Space
Administration (NASA)

A Climate Conversation:

The Decision-Maker

Olga Dominguez

Associate Administrator for Strategic Infrastructure

NASA's Strategic Sustainability Officer

A Climate Conversation:

The Scientist

Goddard Institute for Space Studies

NASA

COLUMBIA UNIVERSITY

Dan Bader

Research Analyst

NASA Goddard Institute for Space Studies

Trucks Carrying Hurricane Relief Supplies Await Distribution Instructions at NASA's Stennis Space Center

Olga Dominguez

AA for Strategic Infrastructure

NASA's Strategic Sustainability Officer

Responding to Climate Risks

Mitigate to reduce our impact on natural systems…

…and ***adapt*** where we nevertheless expect impacts.

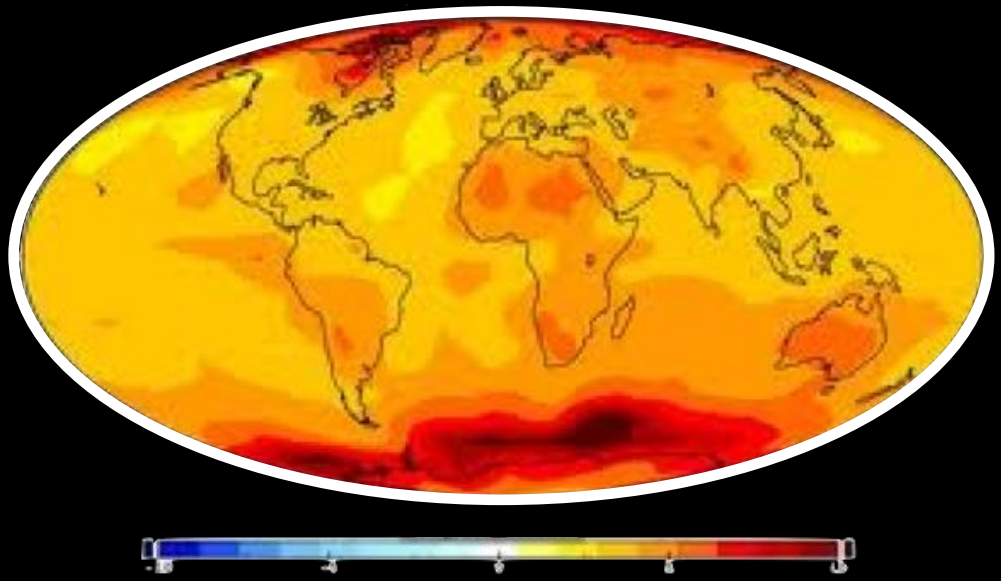
Question

Distinction between weather and climate?

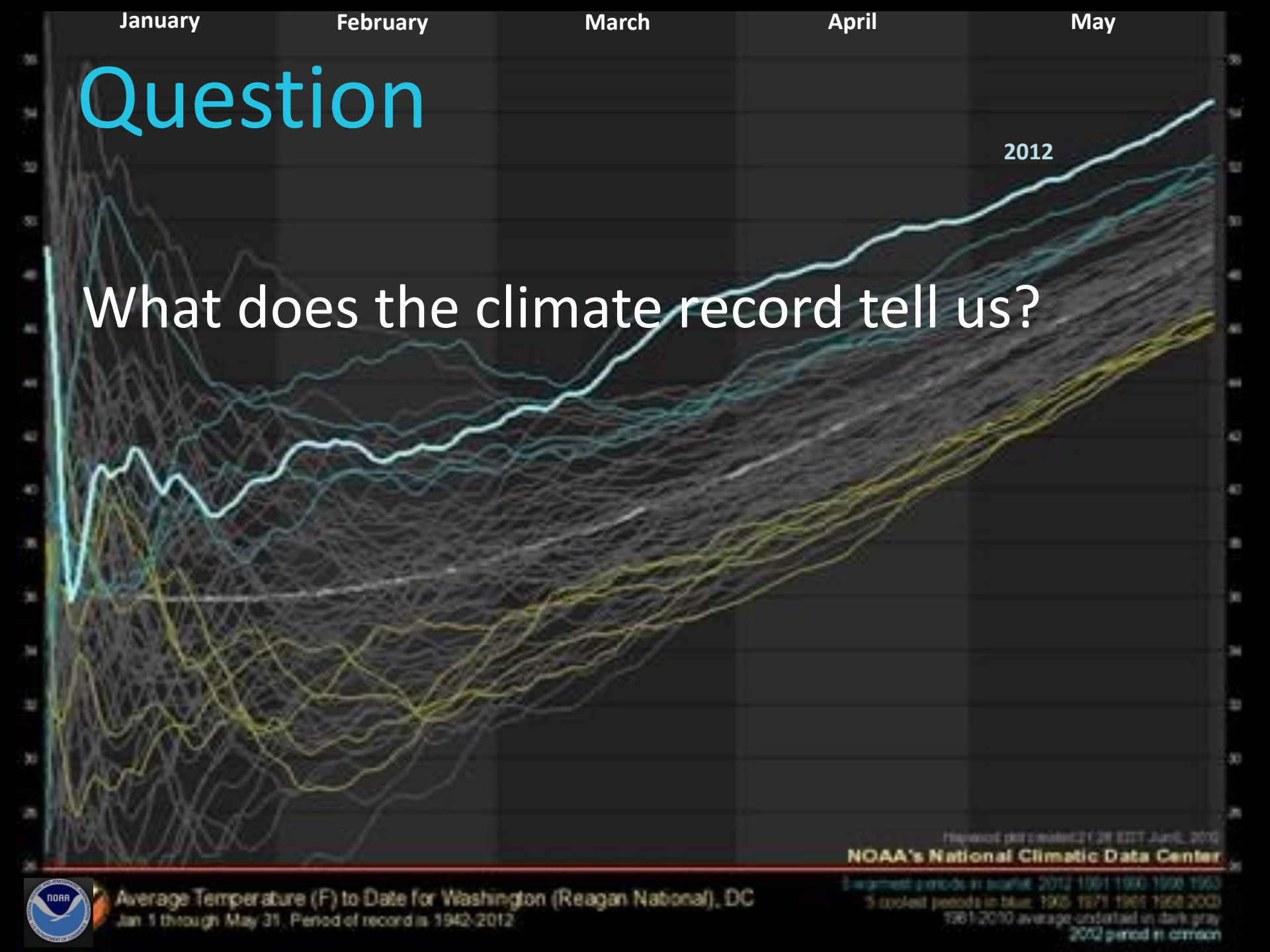
Comparing Weather and Climate

Weather describes current and near-term conditions

Climate describes weather patterns over a longer term



"Weather is what you get; climate is what you expect."

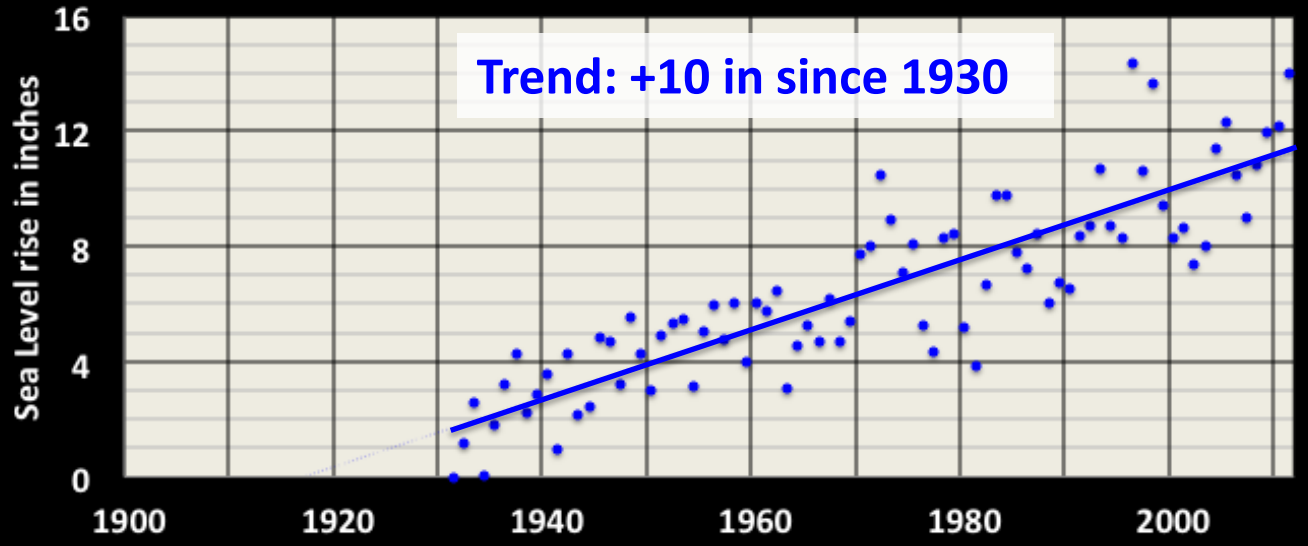


Question

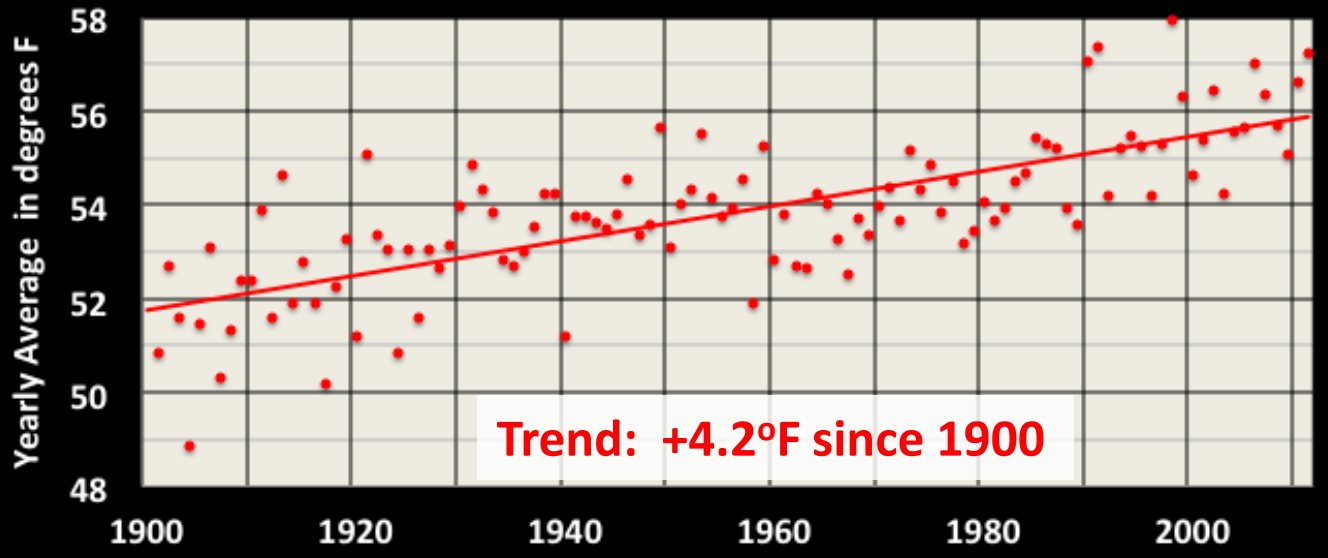
What does the climate record tell us?

What's already happened ***locally***?

Sea Level
has risen over decades, though individual years vary somewhat

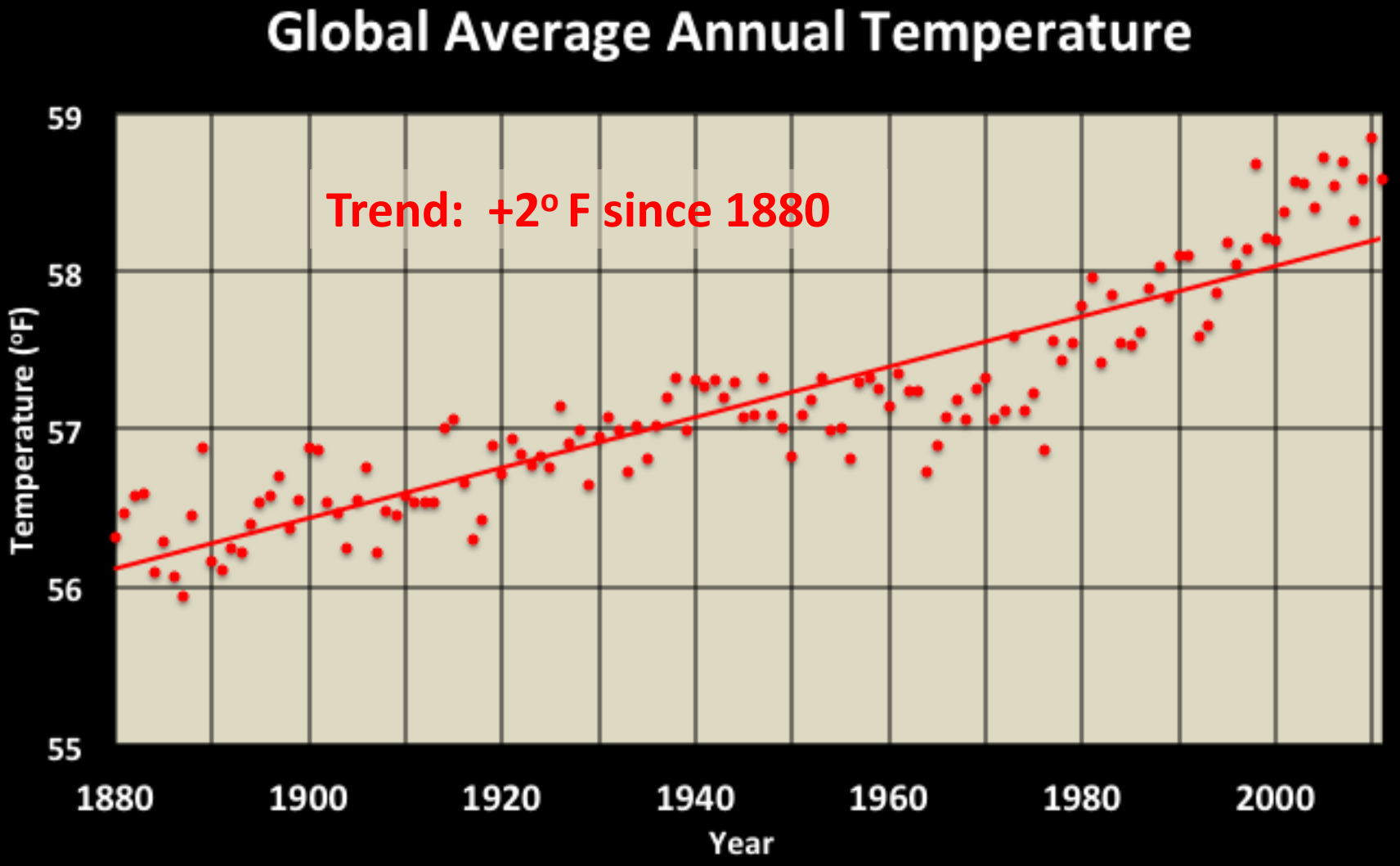


Temperature
has risen too, but the trend varies more year-to-year



A century of local data tells us <u>the climate is changing</u>

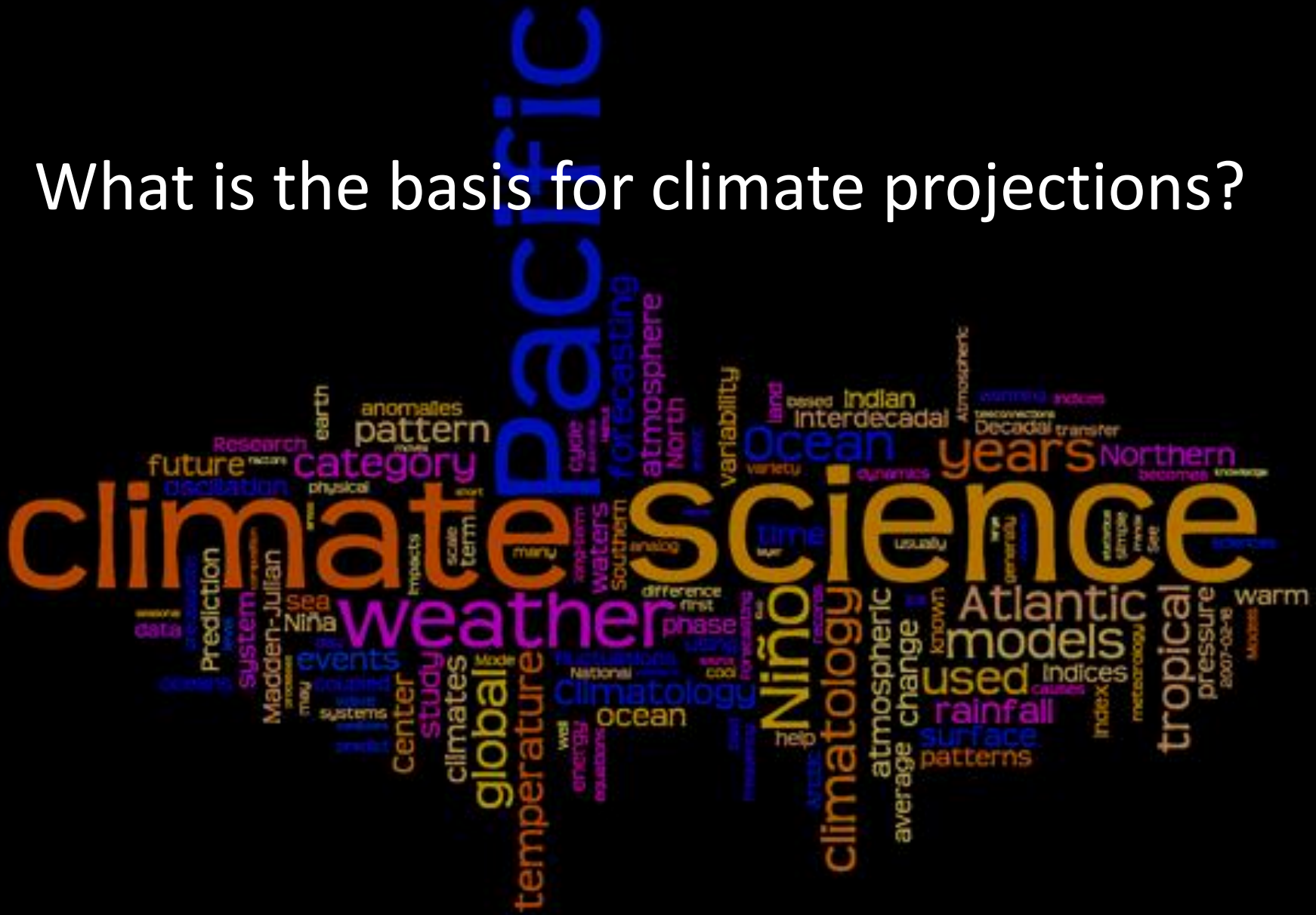
Part of a larger pattern?



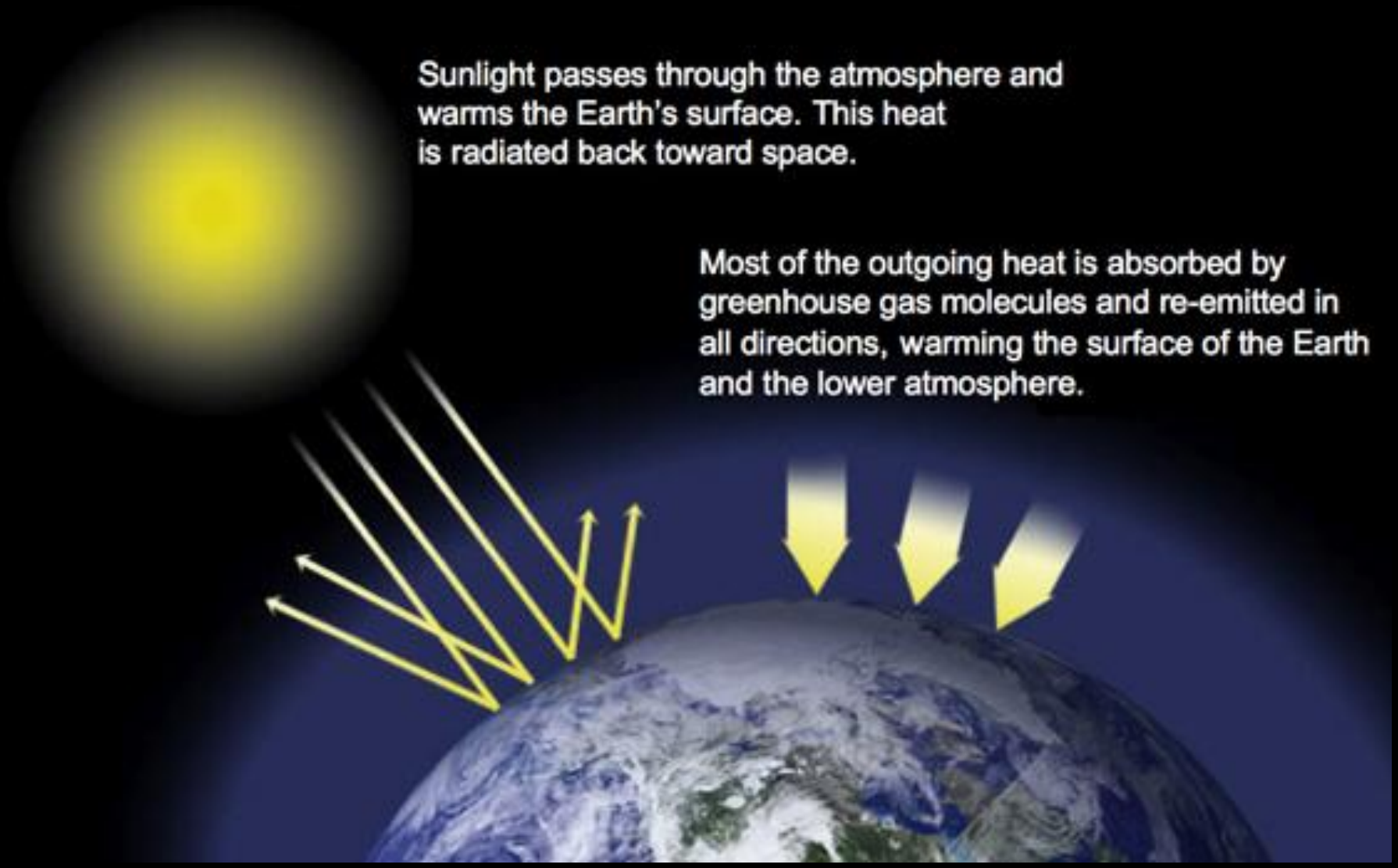
Observed local patterns reflect world-wide trends

Question

What is the basis for climate projections?

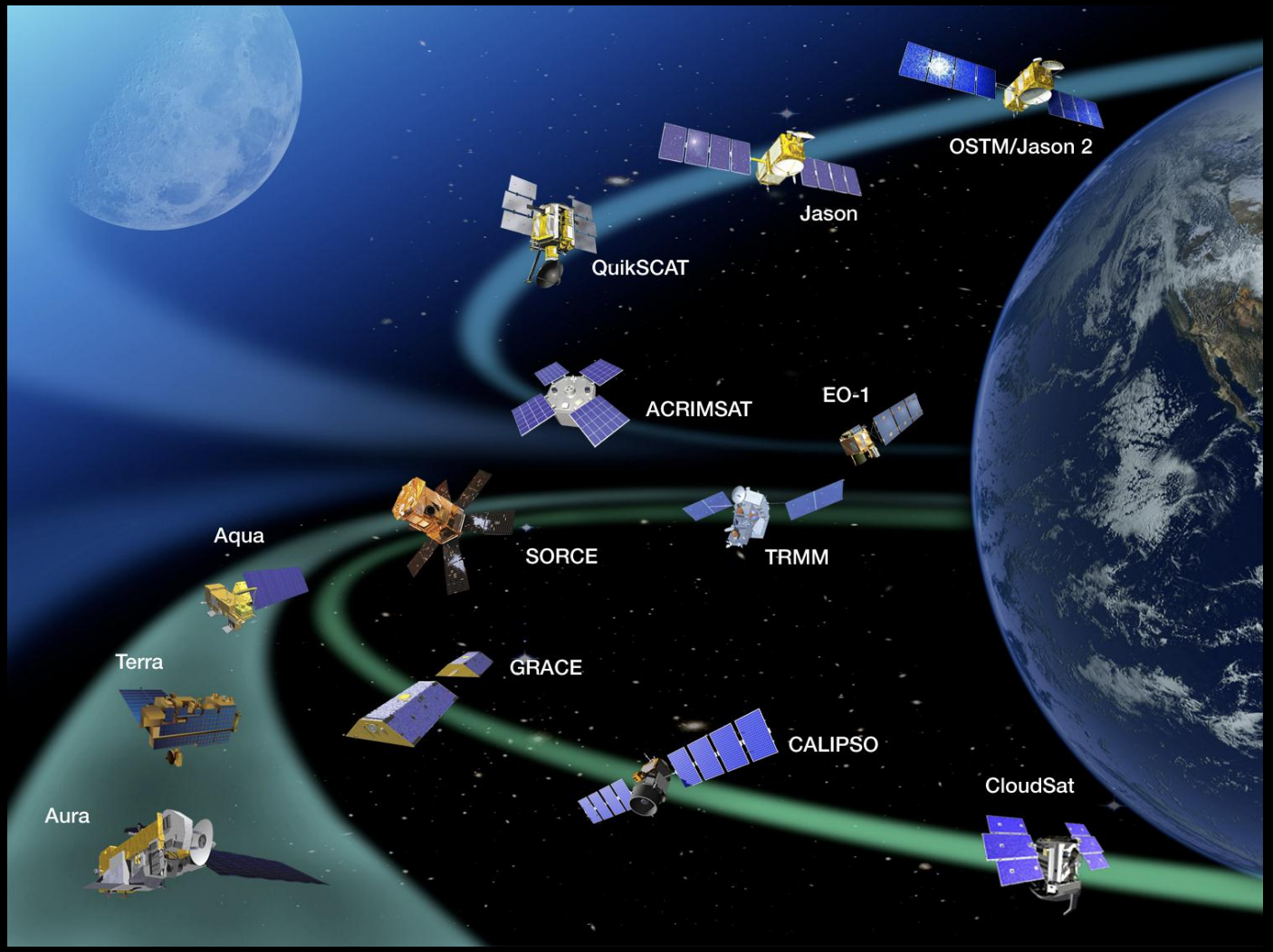


First principles



Scientists have understood this pattern for over a century

Gathering better data

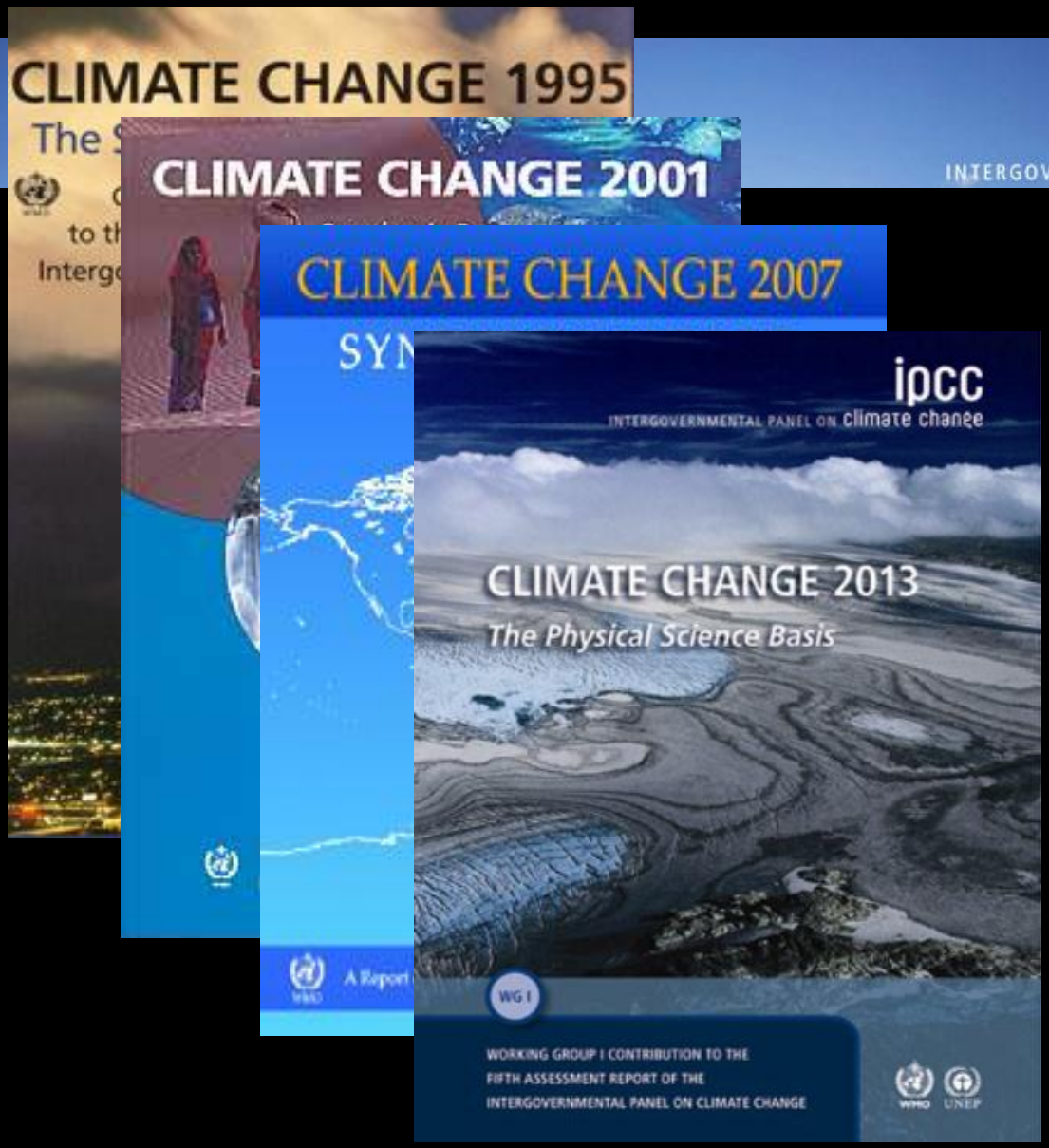


NASA's orbital perspective is a critical vantage-point

Building on a strong foundation

Powerful computer models let us test and refine hypotheses

Intergovernmental Panel on Climate Change

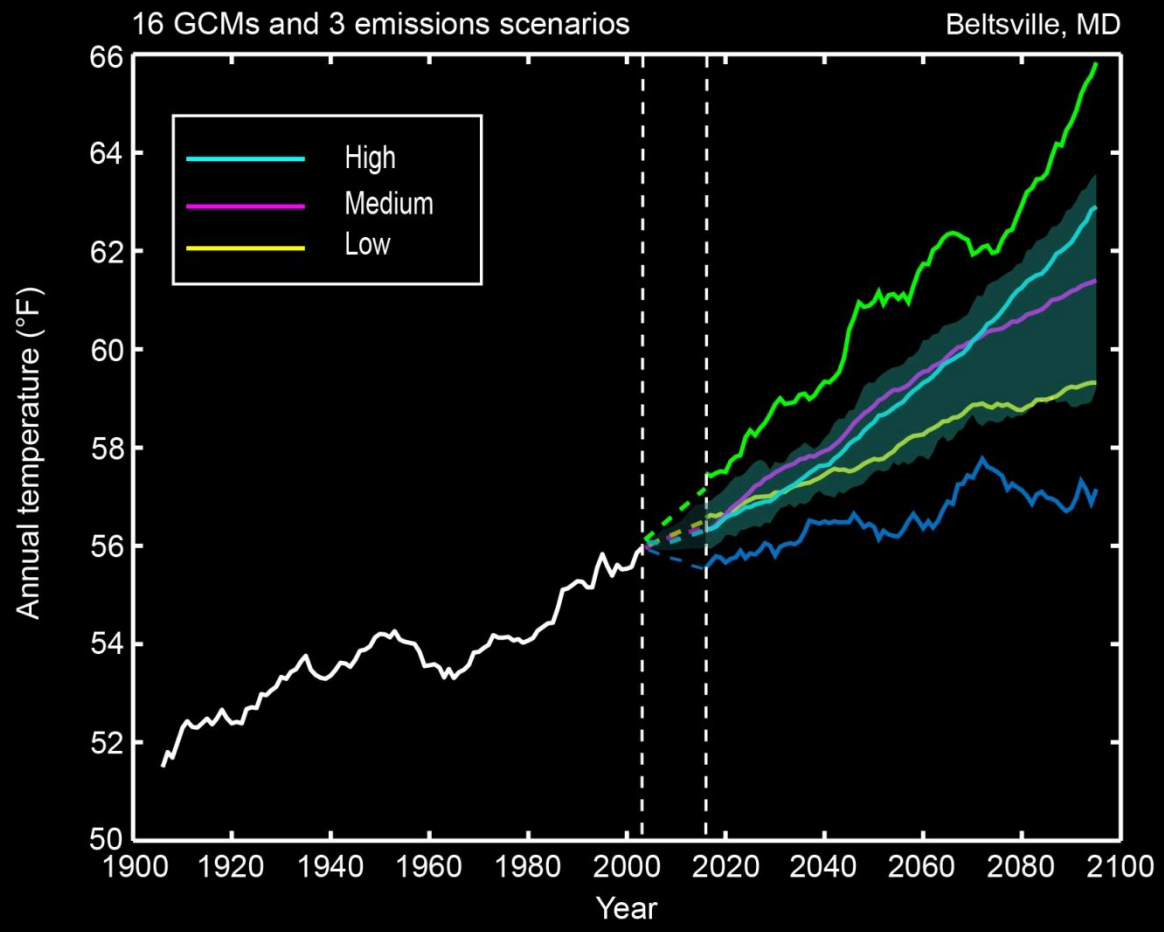


Consensus-based projections using

- Several models
- Several future greenhouse gas emission scenarios

Updated as the science advances

IPCC Models

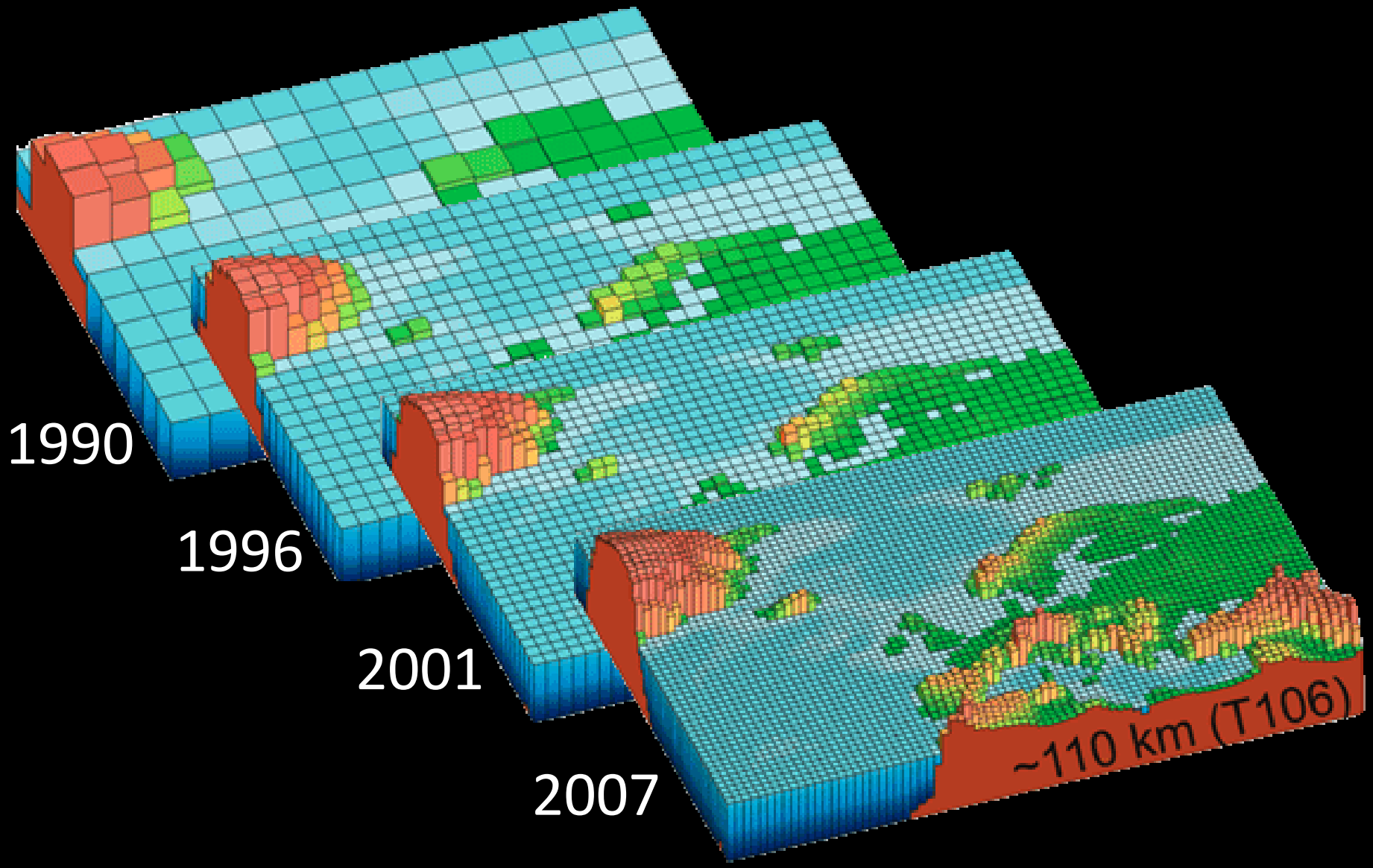


Middle 67%

Range of Projections

Central range of models is basis for NASA's projections

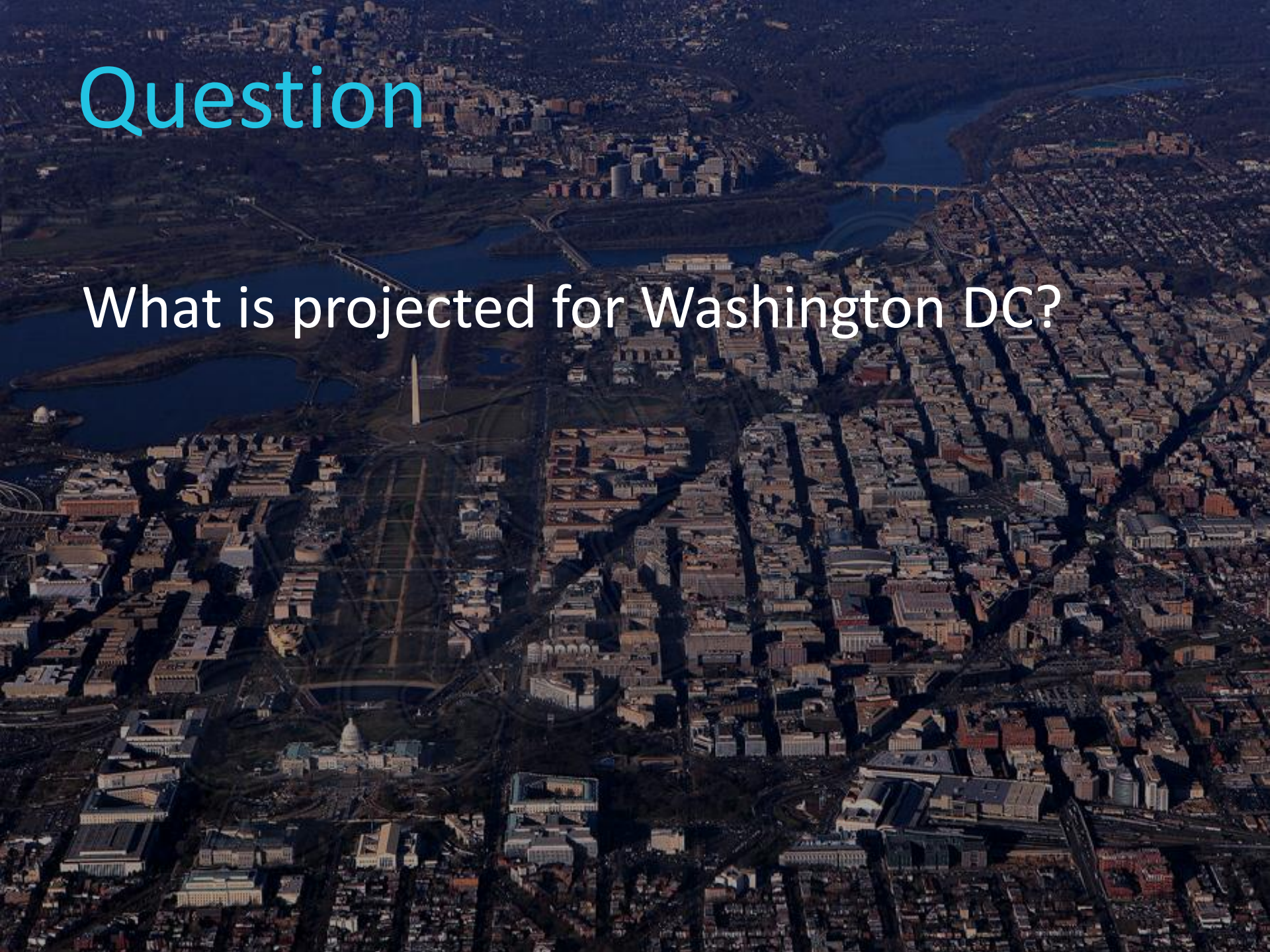
Rising precision/resolution over time



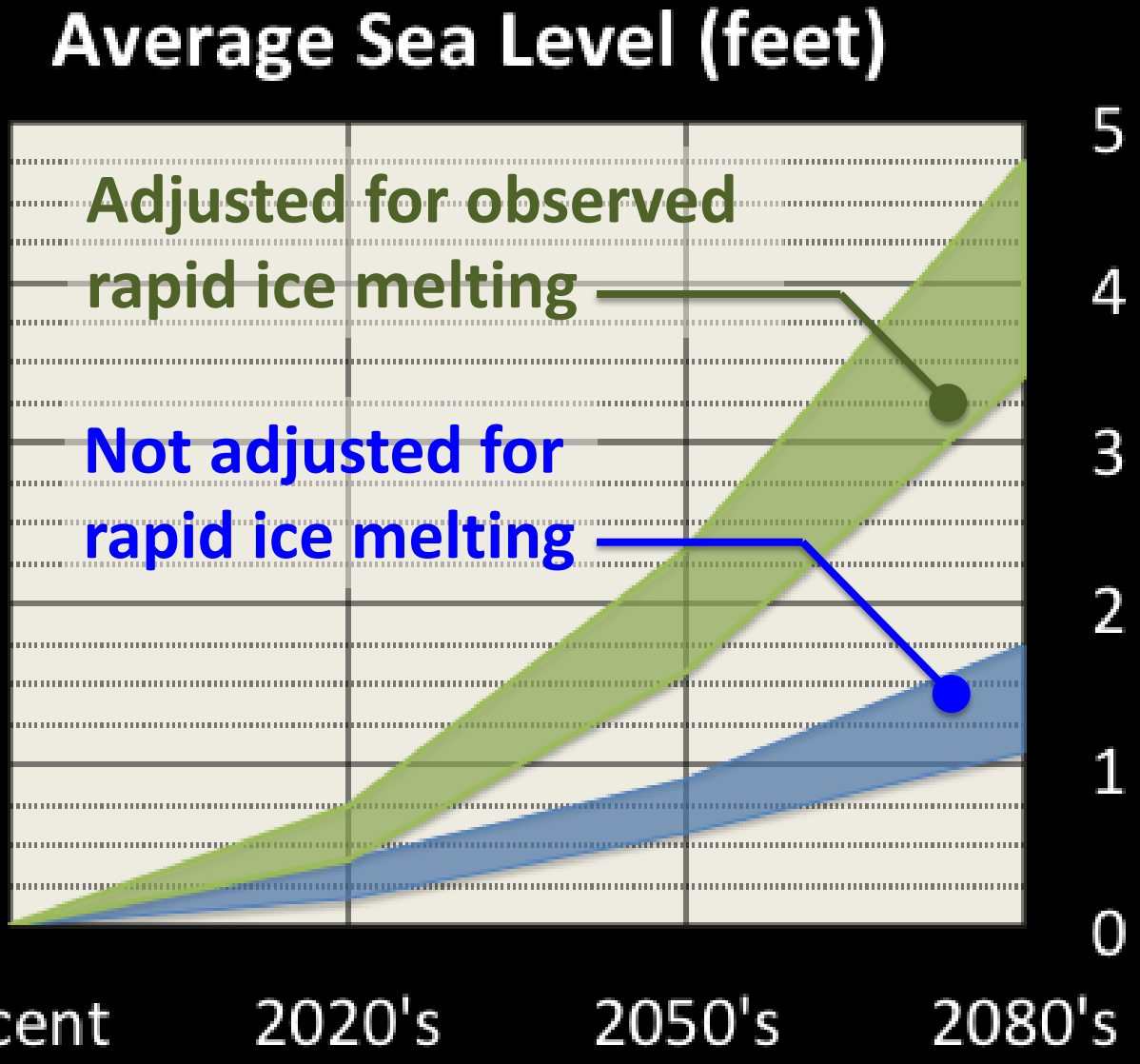
New models + better data = more specific projections

Question

What is projected for Washington DC?

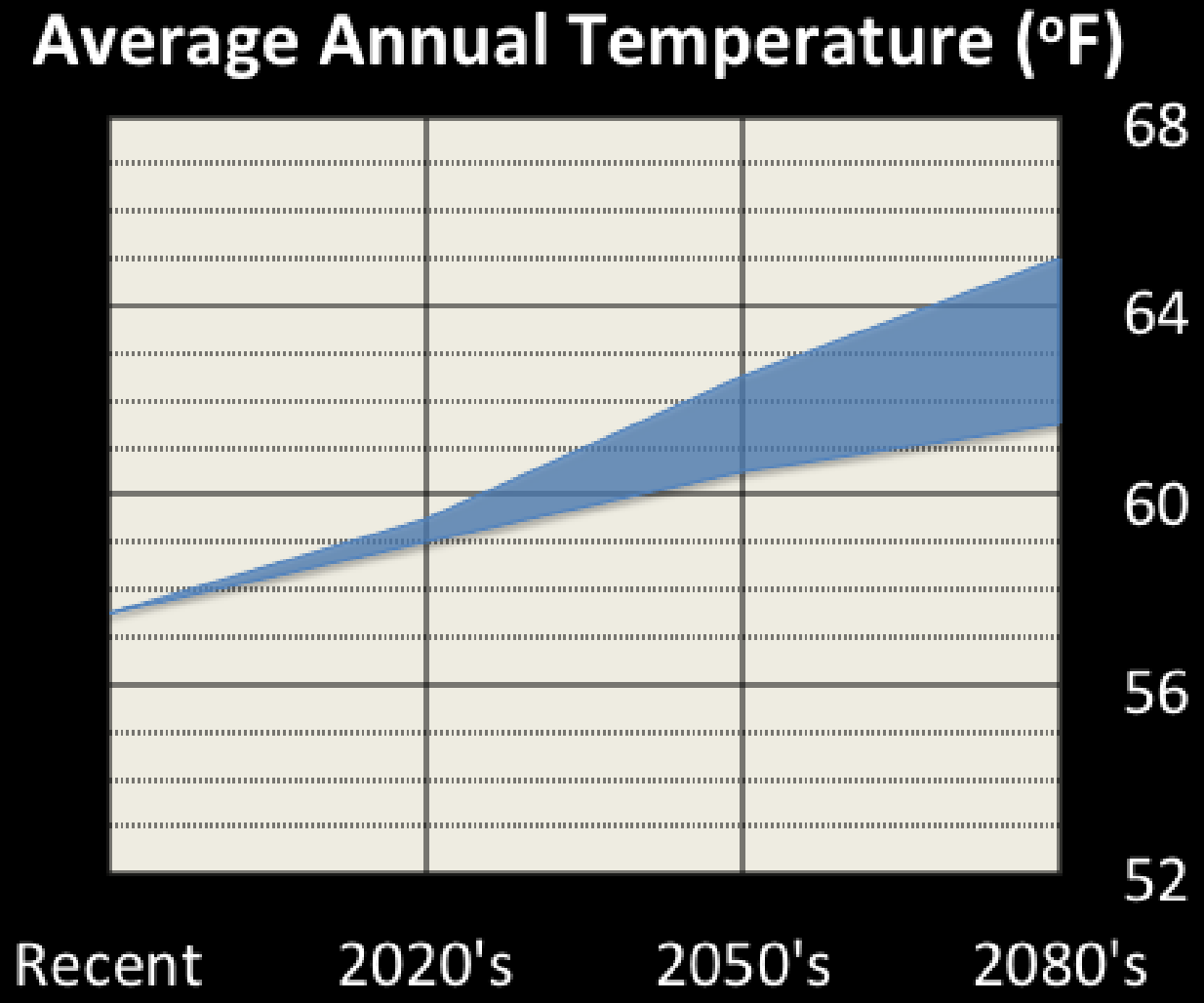


What is projected locally?



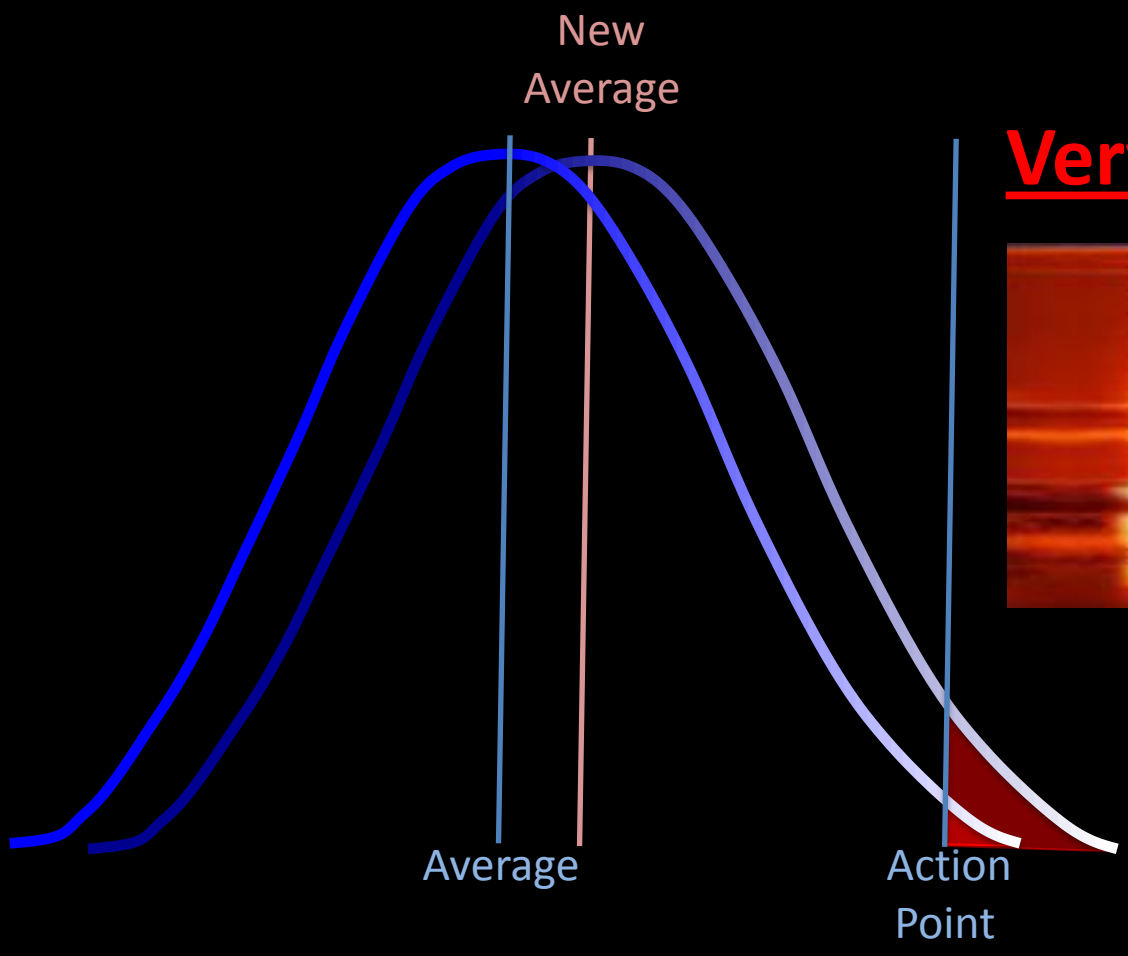
Sea level rise is projected to accelerate this century

What is projected locally?



Average temperatures are projected to rise

What can a few degrees warmer do?

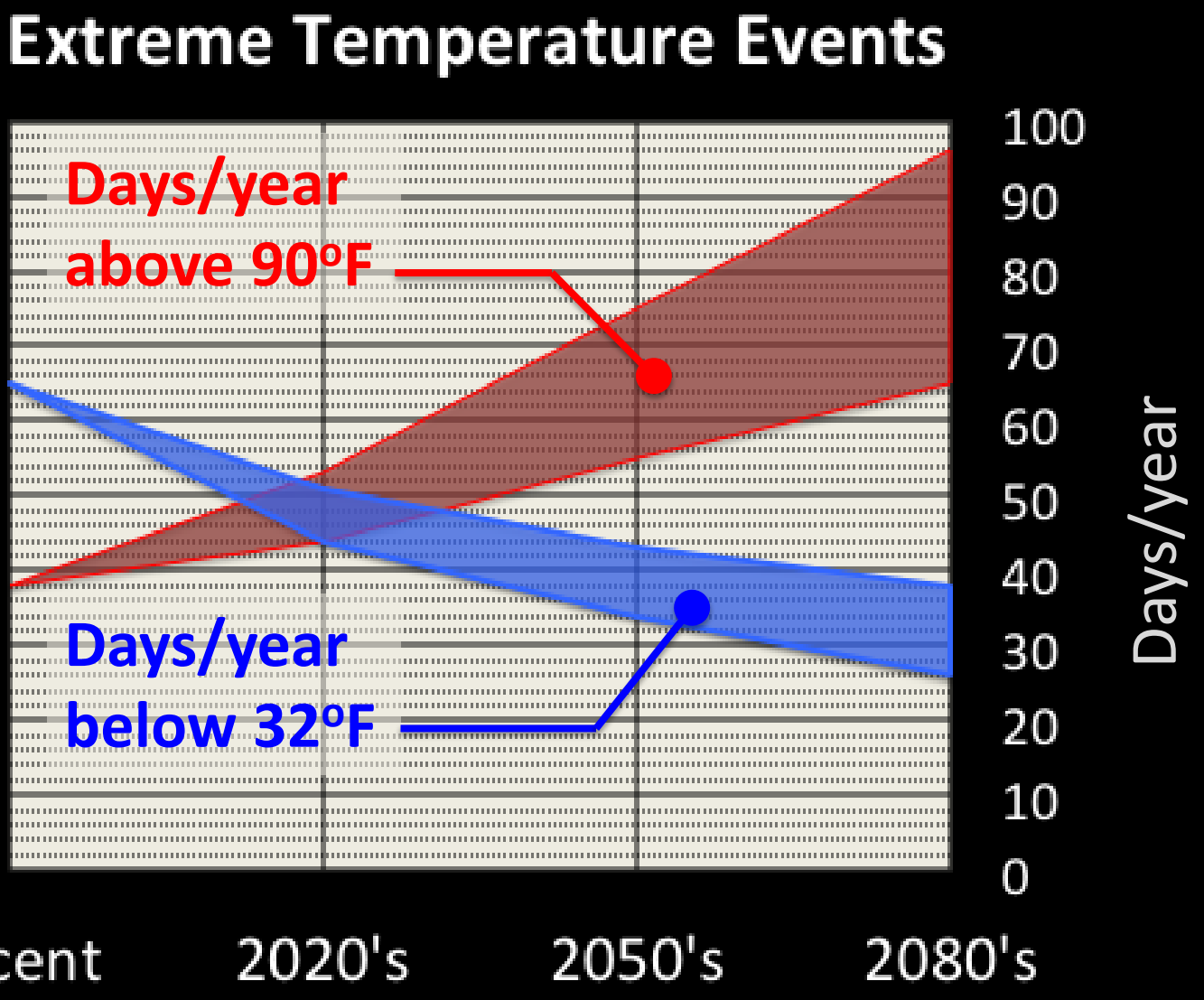


Very Likely Increase:

Extremely warm days

A small average change can mean a big effect on extremes

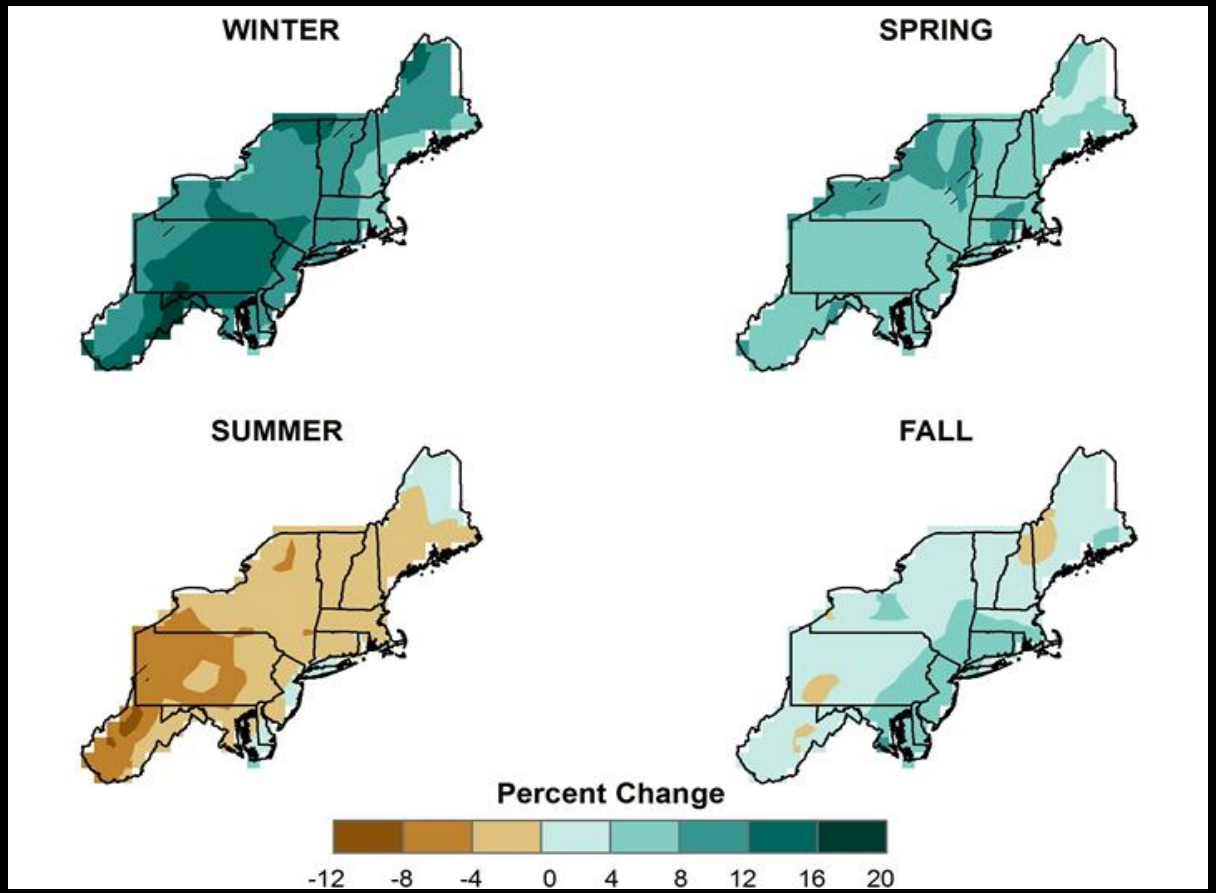
What can a few degrees warmer do?



Extremes can change much faster than averages.

NCA Regional Climate Scenarios

- Information on precipitation are illustrated here for the Northeast Region. Other regions available at: http://scenarios.globalchange.gov/node/1155



Seasonal changes simulated by NARCCAP* indicate an increase in precipitation for winter, spring, and fall, but a decrease for summer

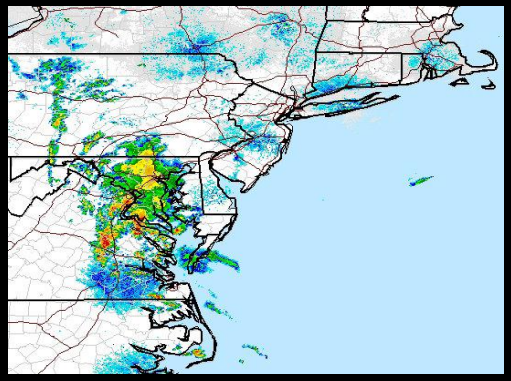
*North American Regional Climate Change Assessment Program (NARCCAP)

Question

What other changes are projected?

What other changes are projected?

Likely Increase



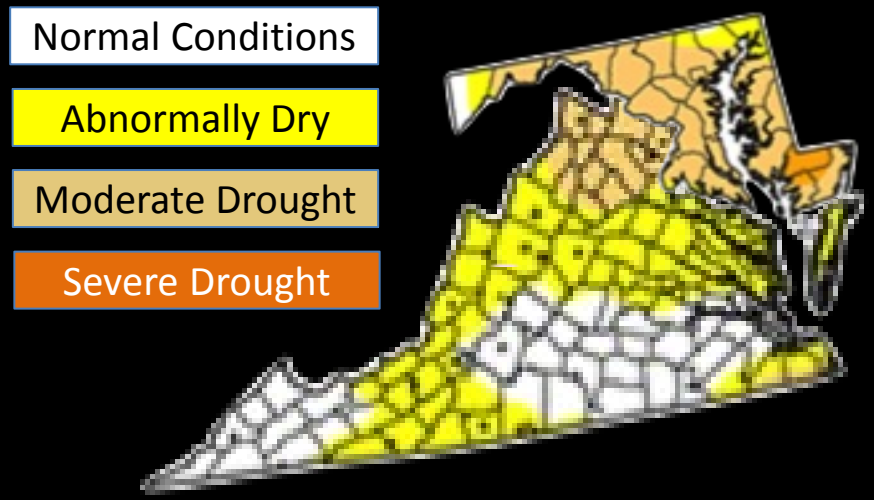
Intense rainfall events

Likely Decrease

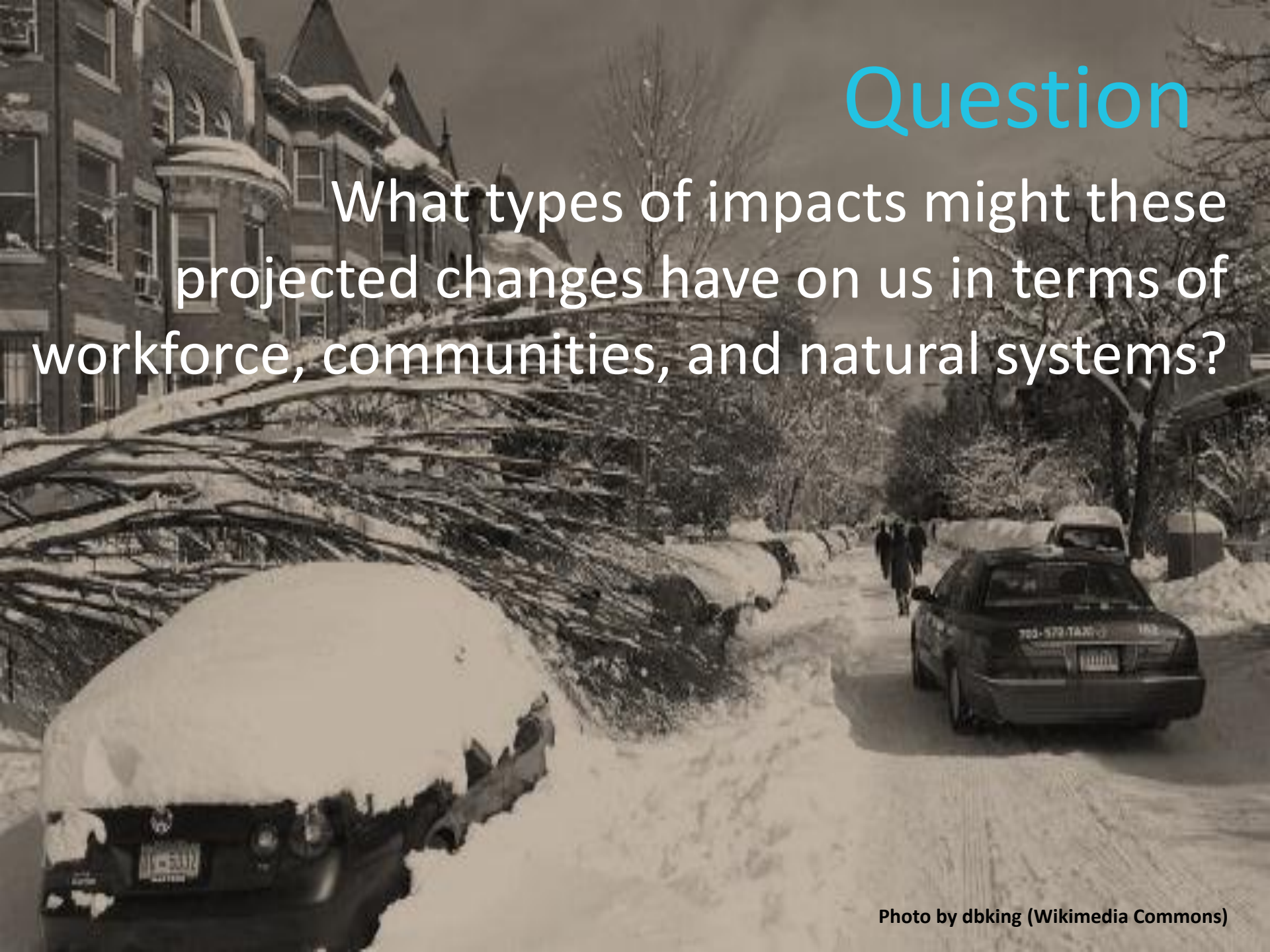
Snowfall frequency & amount

More likely than not

Increases in drought events



There's more to consider than averages

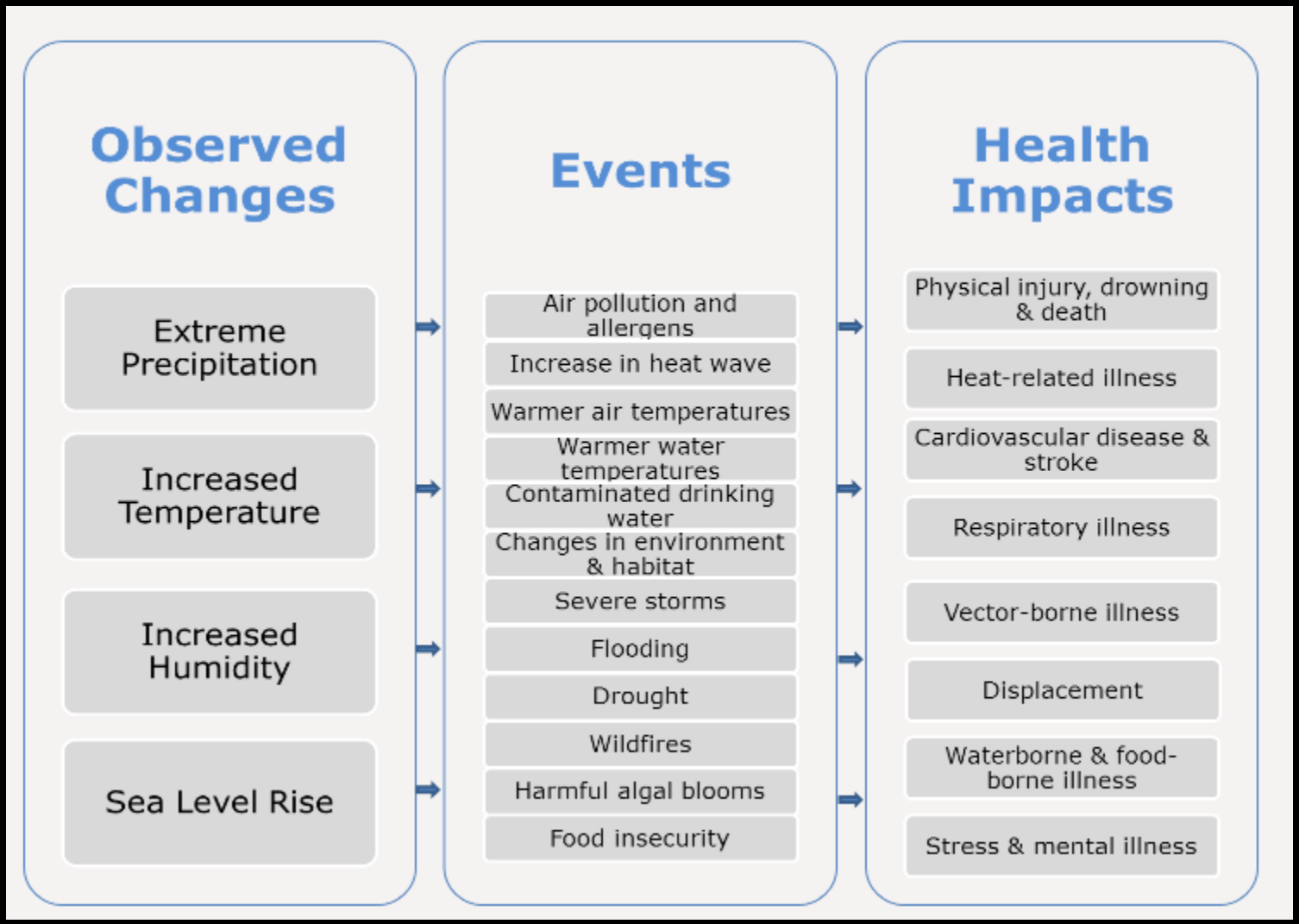


Question

What types of impacts might these projected changes have on us in terms of workforce, communities, and natural systems?

Photo by dbking (Wikimedia Commons)

Public Health Impacts



http://phpa.dhmh.maryland.gov/OEHFP/EH/SitePages/health_impacts.aspx

The Most Immediate Climate-Related Threats to Public Health in this Region

- Air quality
- Extreme heat
- Floods, droughts, and extreme weather events
- Vector borne diseases
- Food borne illness
- Sea level rise
- Contaminated drinking water
- Malnourishment & food insecurity

http://phpa.dhmh.maryland.gov/OEHFP/EH/SitePages/health_impacts.aspx

The Most At-Risk Populations

- Young children
- Elderly 65 years old and older
- Elderly people that live alone
- Communities already stressed by environmental justice and health factors
- Socially isolated persons
- Chronically ill people or people with respiratory diseases
- Persons living in low-lying land areas
- Persons that have a low socioeconomic status

http://phpa.dhmh.maryland.gov/OEHFP/EH/SitePages/health_impacts.aspx

Natural Systems Impacts

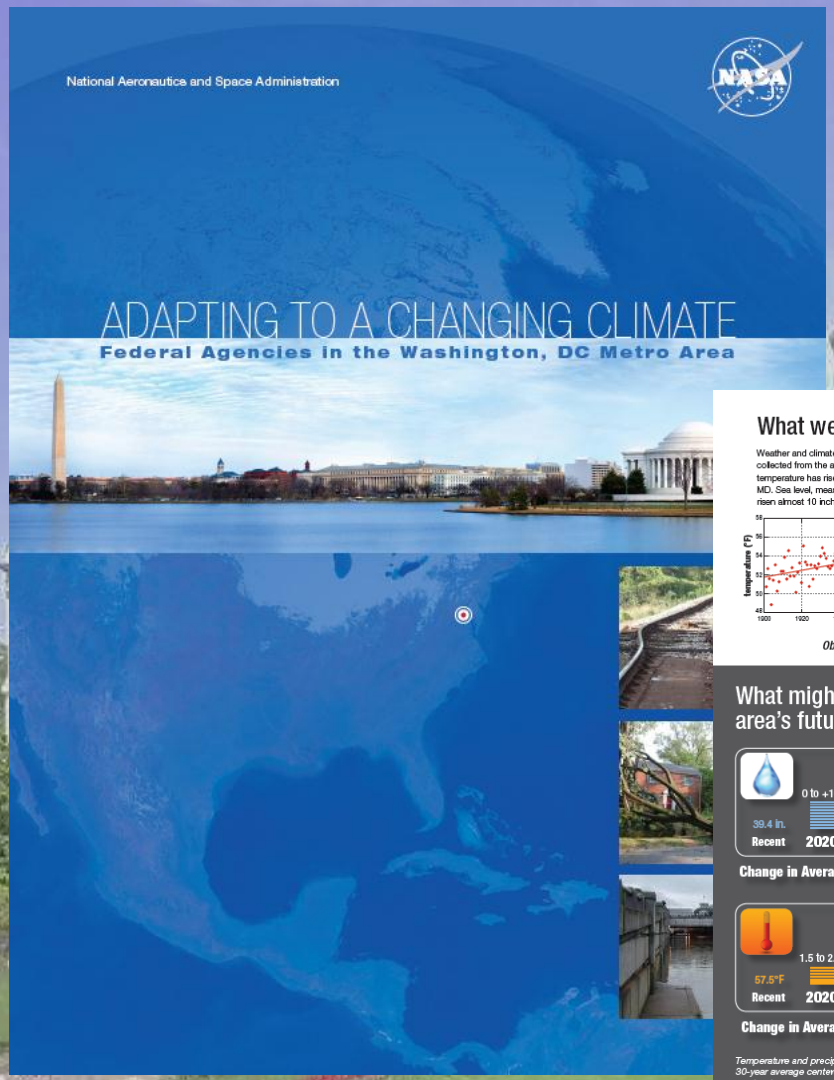
EXAMPLES:

- Inundation of wetlands and low-lying areas.
- Native species may be forced out of the area.
- Dead zones in the Chesapeake Bay will likely increase.
- Establishment of invasive populations of species.
- Degraded water quality in coastal bays due to increases in winter-spring runoff.
- Increased length of the growing season early in century.
- Milk and poultry production negatively impacted by heat stress later in the century.
- Increased forest vulnerability to drought, insect pests, and forest fires.

http://www.umces.edu/applying-science/global-warming-free-state-highlights

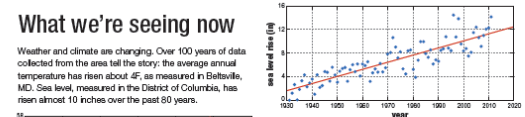
For more information…

http://www.mwcog.org/environment/climate/resilience.asp

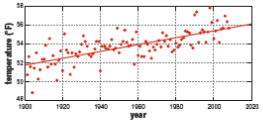


What we're seeing now

Weather and climate are changing. Over 100 years of data collected from the area tell the story: the average annual temperature has risen about 4F, as measured in Beltsville, MD. Sea level, measured in the District of Columbia, has risen almost 10 inches over the past 80 years.



Observed Sea Level



Observed Temperature

Scientists project that these trends will continue, and even accelerate, this century. Furthermore, this warming is driving changes in the frequency and intensity of extreme weather events. Changes in extreme events may include more downpours, more drought, and more heat waves. At facilities vulnerable to coastal storms, rising sea levels magnify the effect of intense storms, producing serious potential impacts from storm surge and flooding.

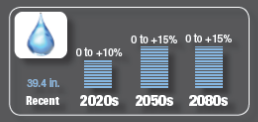
Washington, DC has experienced several extreme weather events in recent years. wThree days of intense tropical downpours in June 2006 swamped the downtown. A cluster of tornadoes in April 2011 put the city on edge. Hurricane Lee in September 2011 produced 7 inches of rain in 3 hours in some parts of the region. A string of days over 100 degrees in July 2012 kinked the tracks of a Metro route, leaving many commuters stranded. And DC residents learned a new word this year – derecho – a widespread and long-lived wind storm that accompanies rapidly moving showers and thunderstorms. The June 29th derecho caused massive tree damage and flooding to the area; power outages across the District disrupted life for several days.

What scientists project

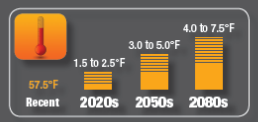
Climate scientists from NASA's Goddard Institute of Space Studies used site-specific climate data from the DC area, combined with climate model outputs, to generate temperature and sea level rise projections for the area. The projections indicate continued rising temperatures and sea levels in the area. Sea levels may rise considerably faster if land-based ice melts faster than most current models project. (See the Rapid Ice Melt projections below.)

Average temperatures and sea levels are projected to rise, but most people are more likely to notice the increase in some kinds of extreme events. Changes in the number of hot days and cold days may affect energy usage patterns, health (e.g., asthma), plant and animal habitats, and infrastructure function (e.g., buckling of concrete roads).

What might the Metro DC area's future look like?



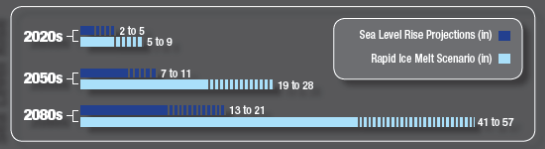
Change in Average Annual Precipitation



Change in Average Annual Temperature

Temperature and precipitation projections reflect a 30-year average centered on the specific decade; sea levels are averages for the specific decade. Temperatures are rounded to the nearest half degree, precipitation projections to the nearest 5%, and sea level rise to the nearest inch. Shown are the central range (middle 67% of values) across the Global Climate Models and greenhouse gas emissions scenarios.

Sea Level Rise

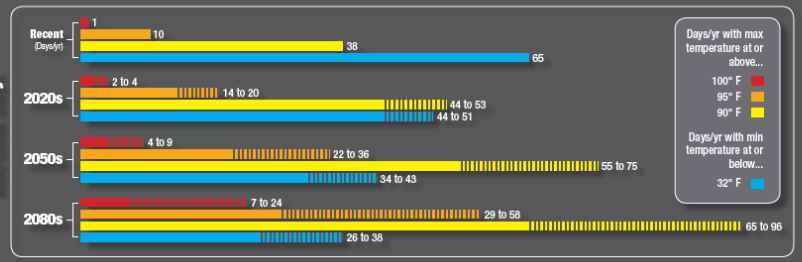


Extreme Event Changes This Century

Event	Direction of Change	Likelihood
Heat Stress	↑	Very Likely
Snowfall Frequency and Amount	↓	Likely
Intense Precipitation Events	↑	Likely
Drought	↑	More Likely than not
Ice Storms/freezing rain	↑	About as Likely as not

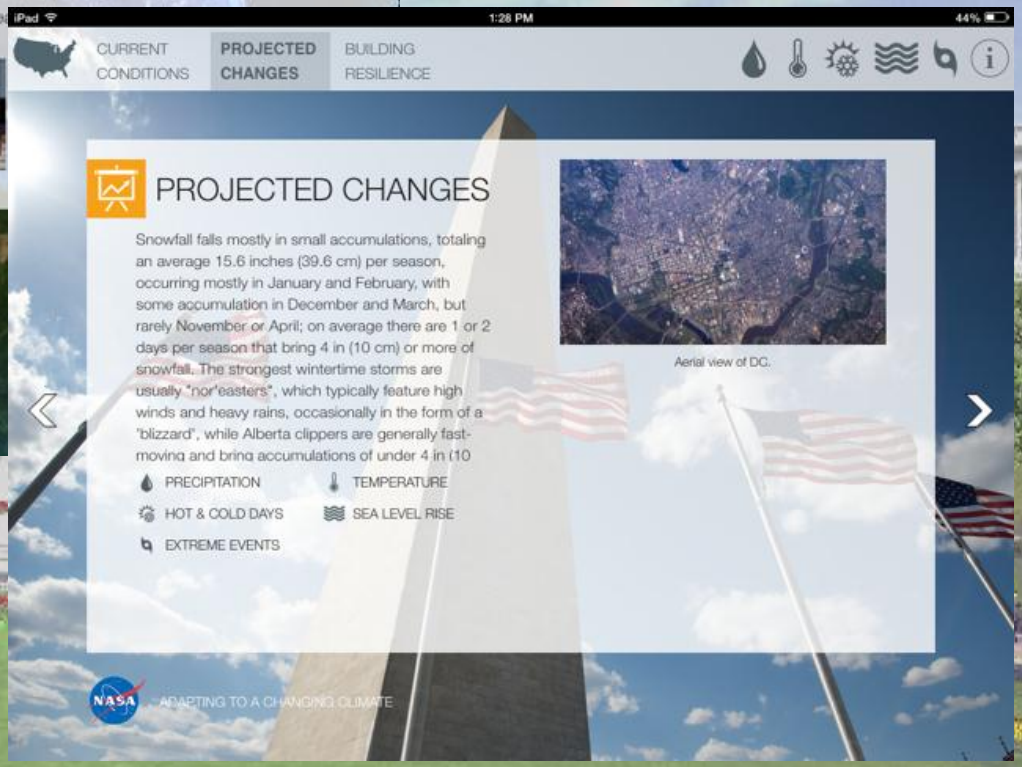
Based on global climate model simulations, published literature, and expert judgment. Source: NASA GISS. Likelihood definitions (>90% Very likely, >66% Likely, >50% More likely than not, 33 to 66% About as likely as not) based on IPCC.

Hot/Cold Days



For more information…

COMING SOON, mobile app with basic location-specific info:



QUESTIONS*?

*You may also pose questions to NASA climate scientists at any time during the course of this series of webinars and workshops using the link under the Questions & Feedback section on:

http://www.mwcog.org/environment/climate/resilience.asp

National Capital Planning Commission

GSA

NASA

Metropolitan Washington Council of Governments

Smithsonian

United States Global Change Research Program