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THE STATE UNIVERSITY OF NEW JERSEY

The State of New Jersey's Climate

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Climate Change Policy in New Jersey
Duke Farms
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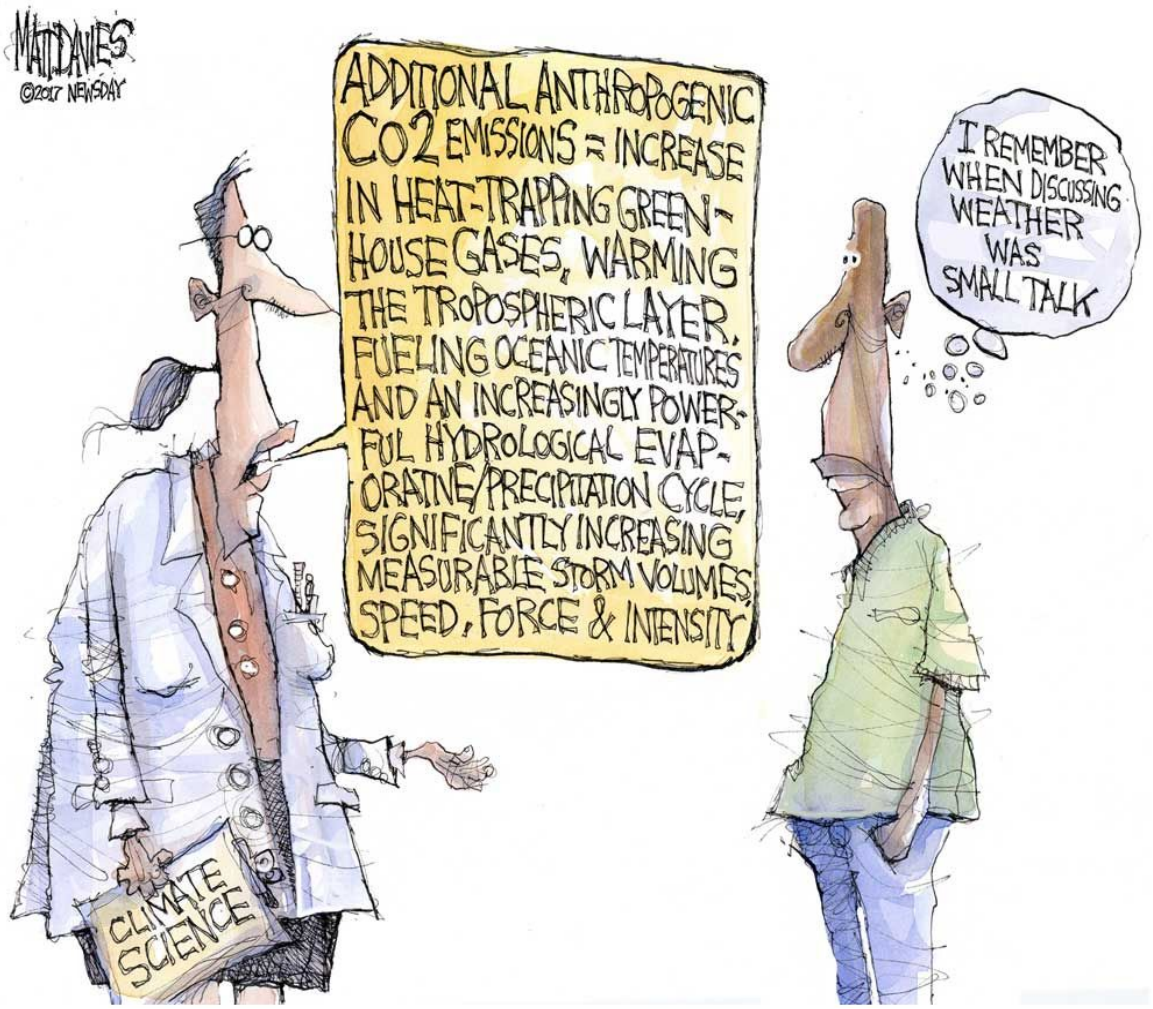
MATT DAVIES
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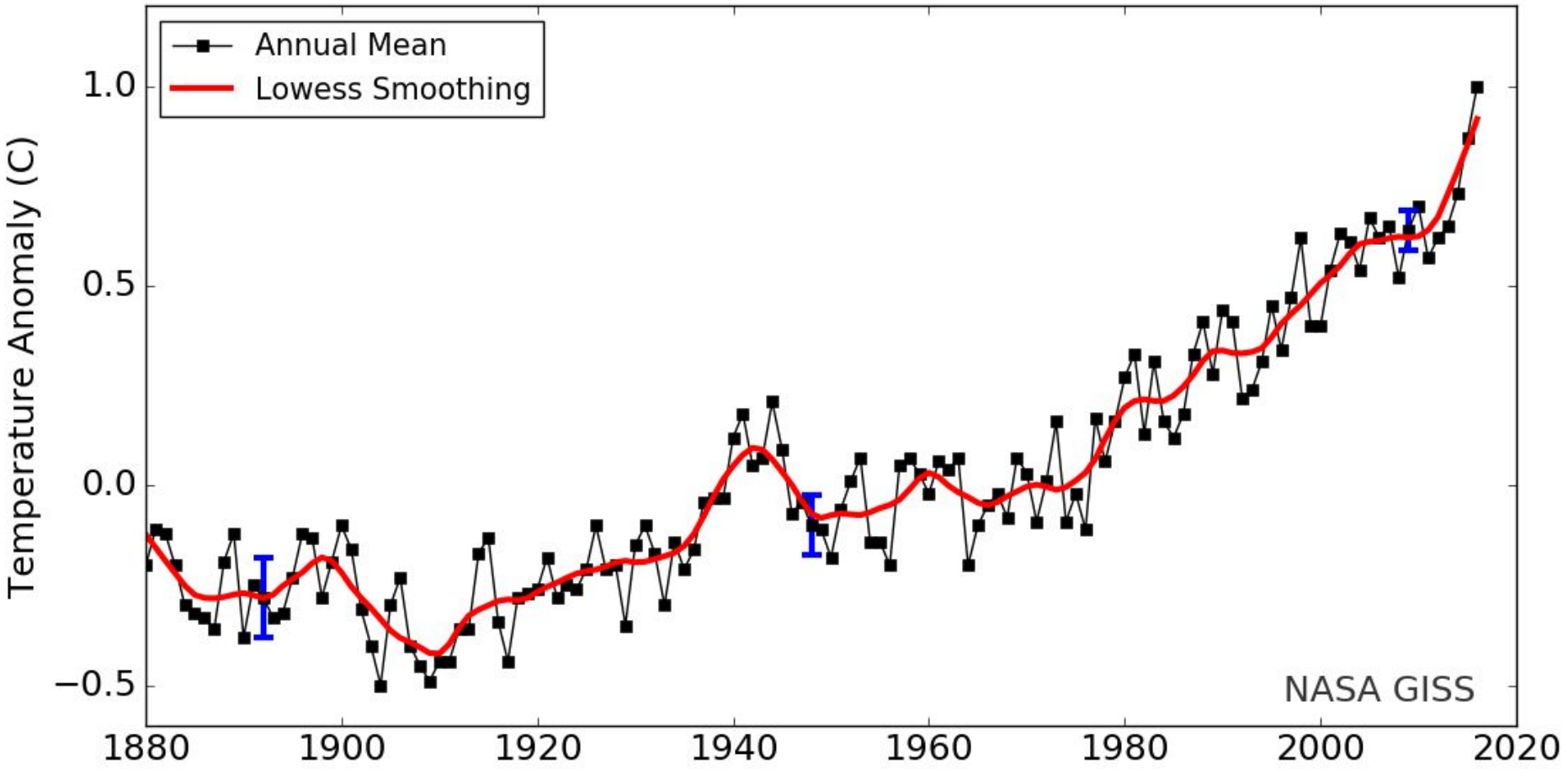
ADDITIONAL ANTHROPOGENIC CO2 EMISSIONS = INCREASE IN HEAT-TRAPPING GREEN-HOUSE GASES, WARMING THE TROPOSPHERIC LAYER, FUELING OCEANIC TEMPERATURES AND AN INCREASINGLY POWER-FUL HYDROLOGICAL EVAP-ORATIVE/PRECIPITATION CYCLE, SIGNIFICANTLY INCREASING MEASURABLE STORM VOLUMES, SPEED, FORCE & INTENSITY
CLIMATE SCIENCE
I REMEMBER WHEN DISCUSSING WEATHER WAS SMALL TALK

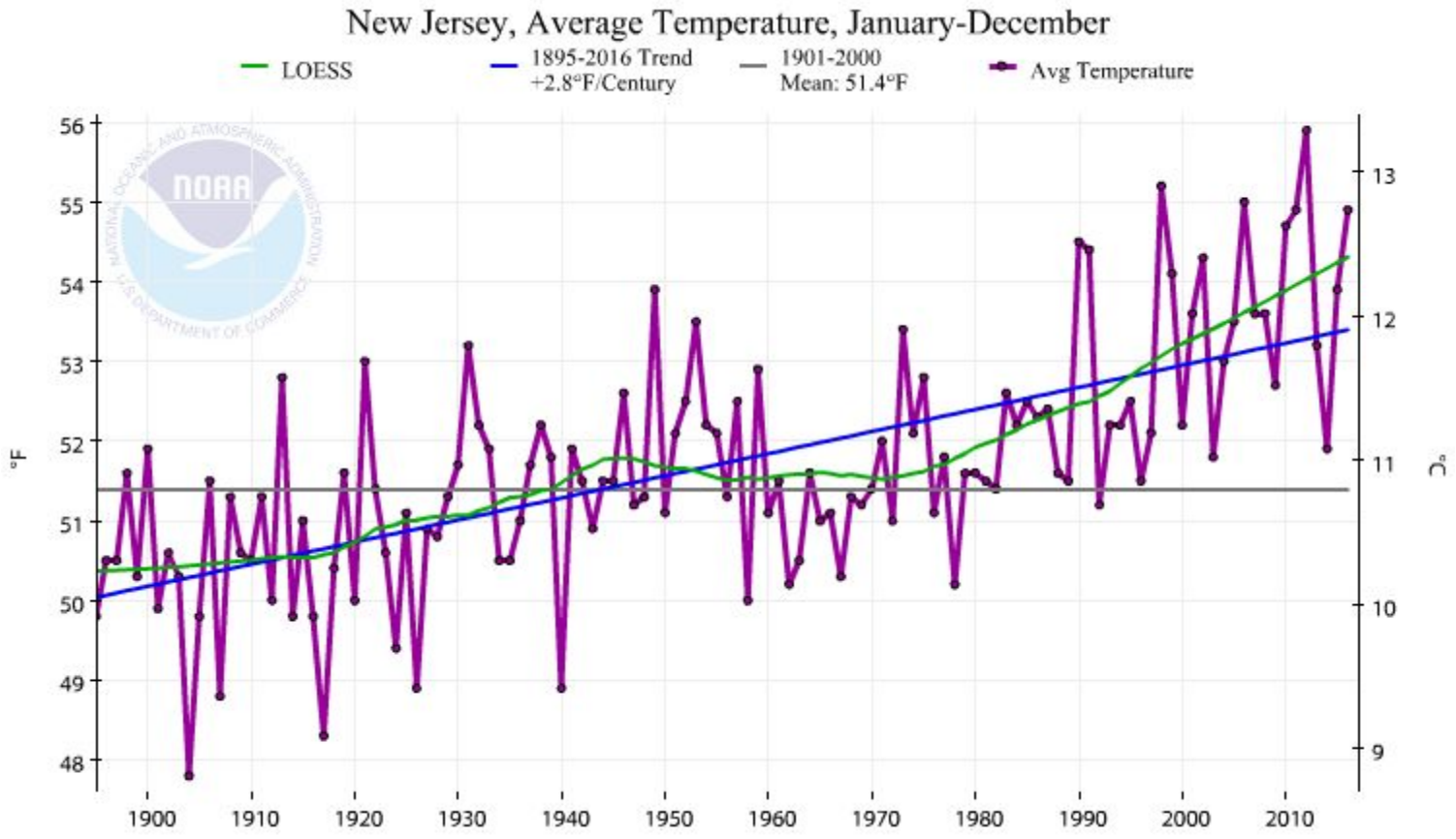
Climate change…it's real, it's happening now, and it's affecting New Jersey.

Trends in global average temperature



Source: NASA/Goddard Institute for Space Studies

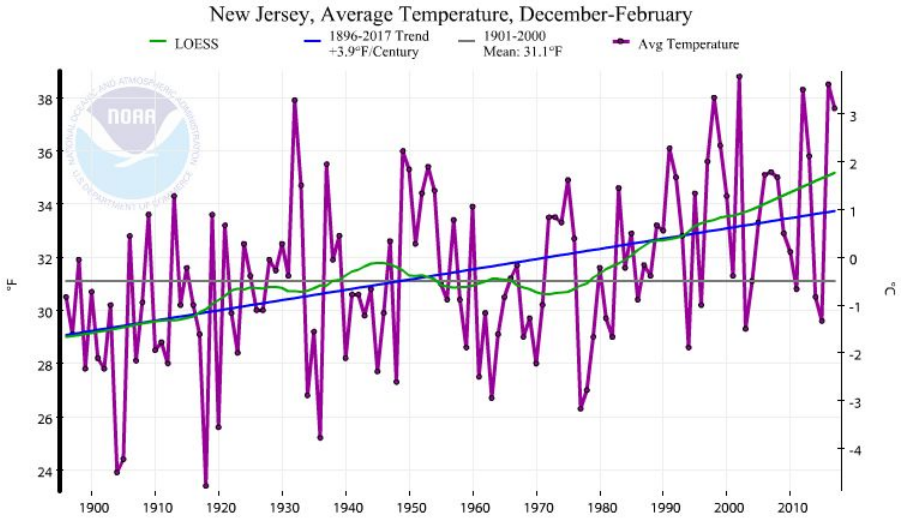
Trends in annual mean New Jersey temperature

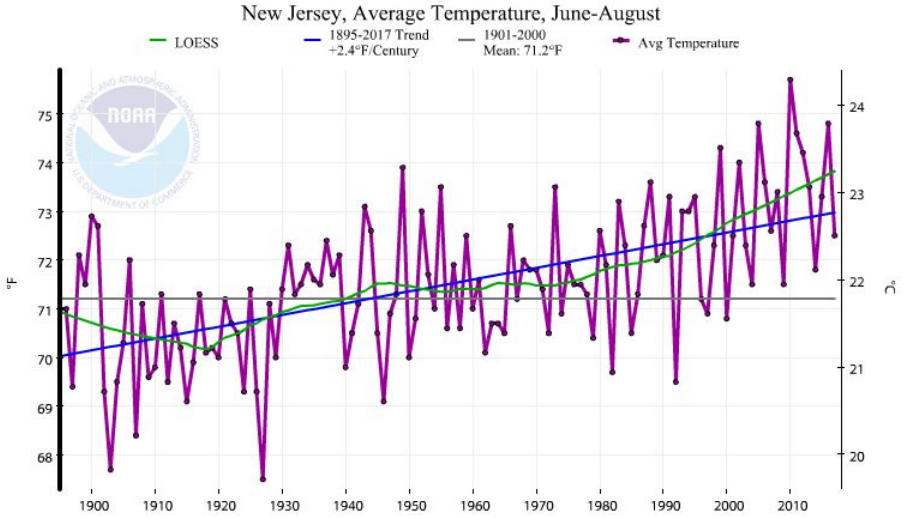


- Long-term upward trend of 2.8°F per 100 years
- More rapid warming since 1970
- The five warmest years have occurred since 1998
- 2012 was the warmest year on record

Source: National Centers for Environmental Information

Trends in winter and summer temperature in N.J.





- Larger warming trend in winter (3.9°F/100 yrs) than in summer (2.4°F/100 yrs)
- Year-to-year temperature variability is much larger in winter, which can make it harder to perceive long-term trends
- The four warmest winters have occurred since 1998
- The seven warmest summers have occurred since 1999

Source: National Centers for Environmental Information

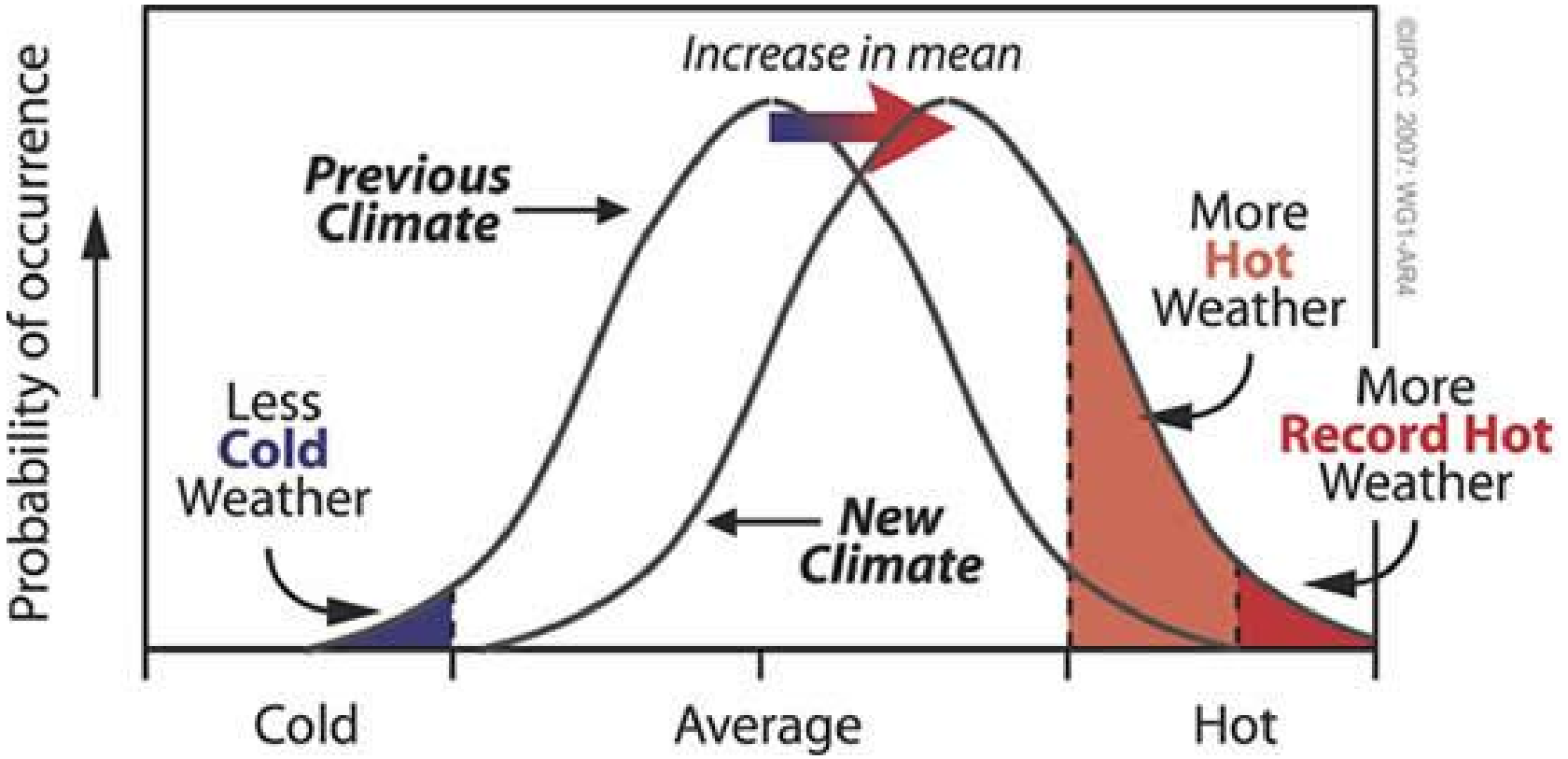
Unusually warm and cold months in New Jersey

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Jan							3											
Feb			4										3					1
Mar													1				4	
Apr			5								2	5						1
May					1								4			1		
Jun									3		1							
Jul											4	1	5	5				
Aug		5	3			2											1	
Sep						3										2	4	
Oct								1										
Nov							1			3		4				1		
Dec		3					2					5	4			1		

- Unusually warm and cold months are defined as the five warmest and coldest for each calendar month (total of 60 warm and 60 cold plus ties)
- Since 2000, there have been 36 unusually warm months and 0 unusually cold months

Source: National Centers for Environmental Information

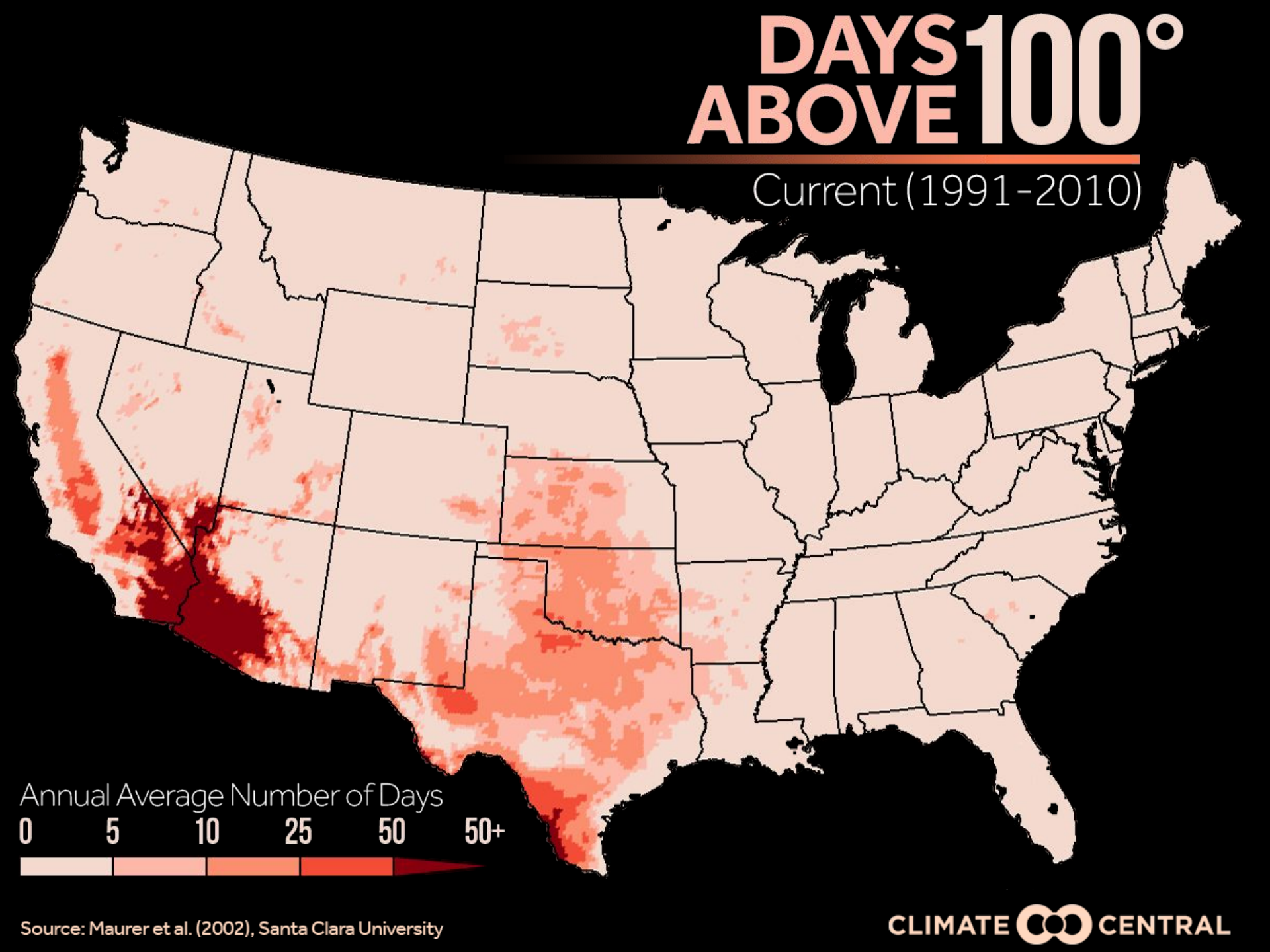
Changes in average temperature lead to changes in extremes



Source: Intergovernmental Panel on Climate Change

DAYS ABOVE 100°

Current (1991-2010)

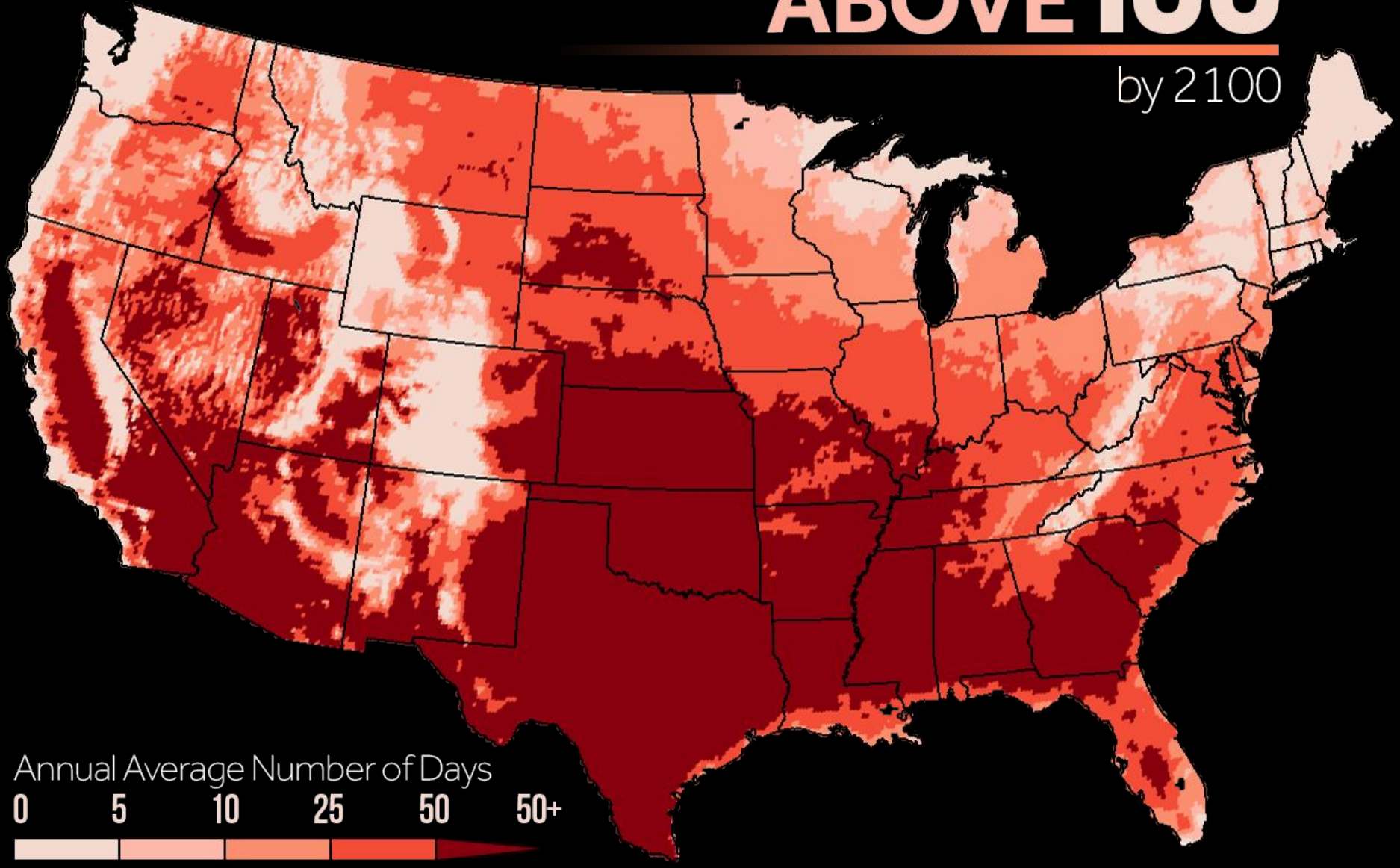


Source: Maurer et al. (2002), Santa Clara University

CLIMATE CENTRAL

DAYS ABOVE 100°

by 2100

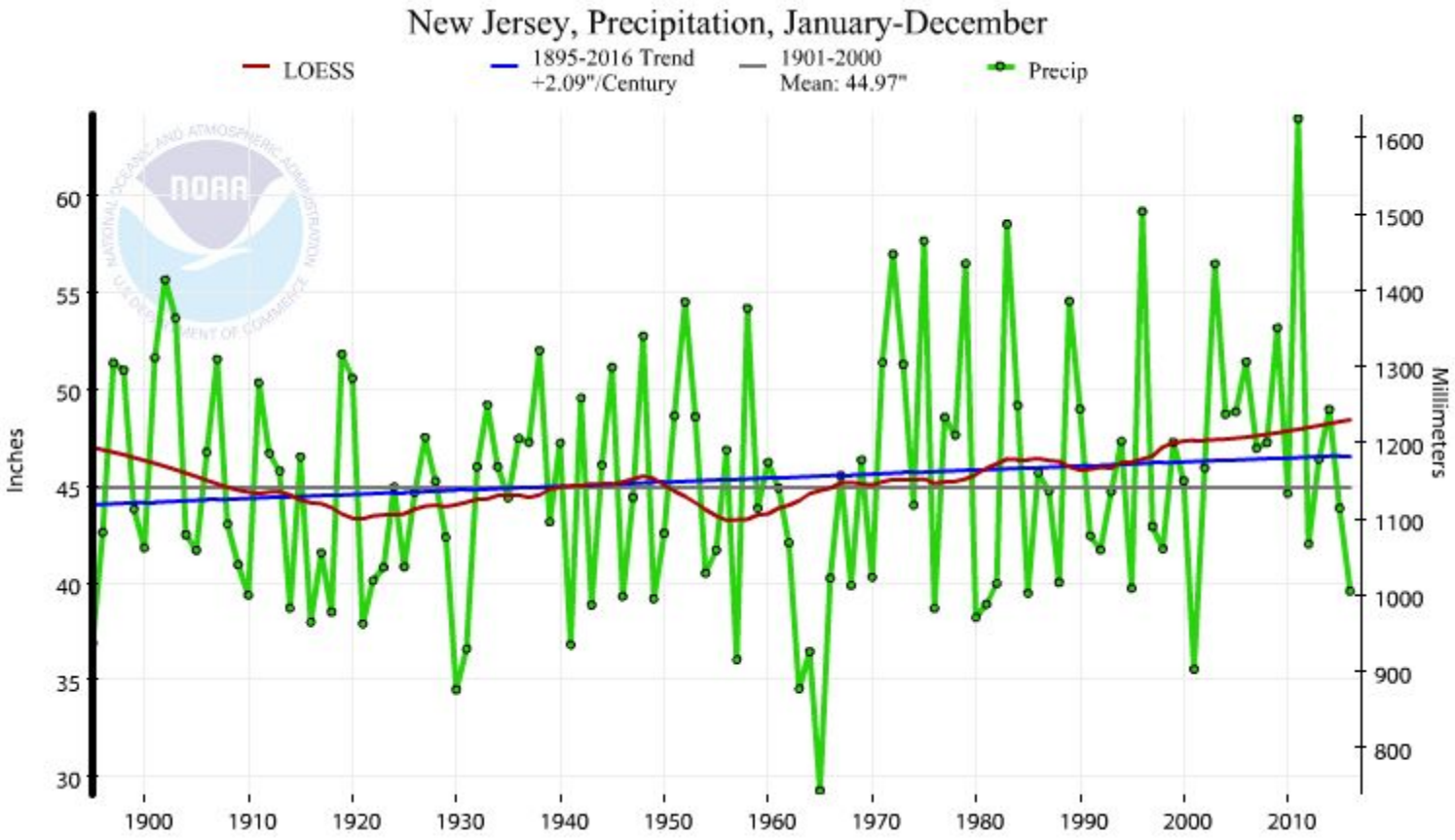


Source: CMIP5 model projections of daily maximum temperature averaged over 20 year periods.

CLIMATE CENTRAL


STOP
4-WAY

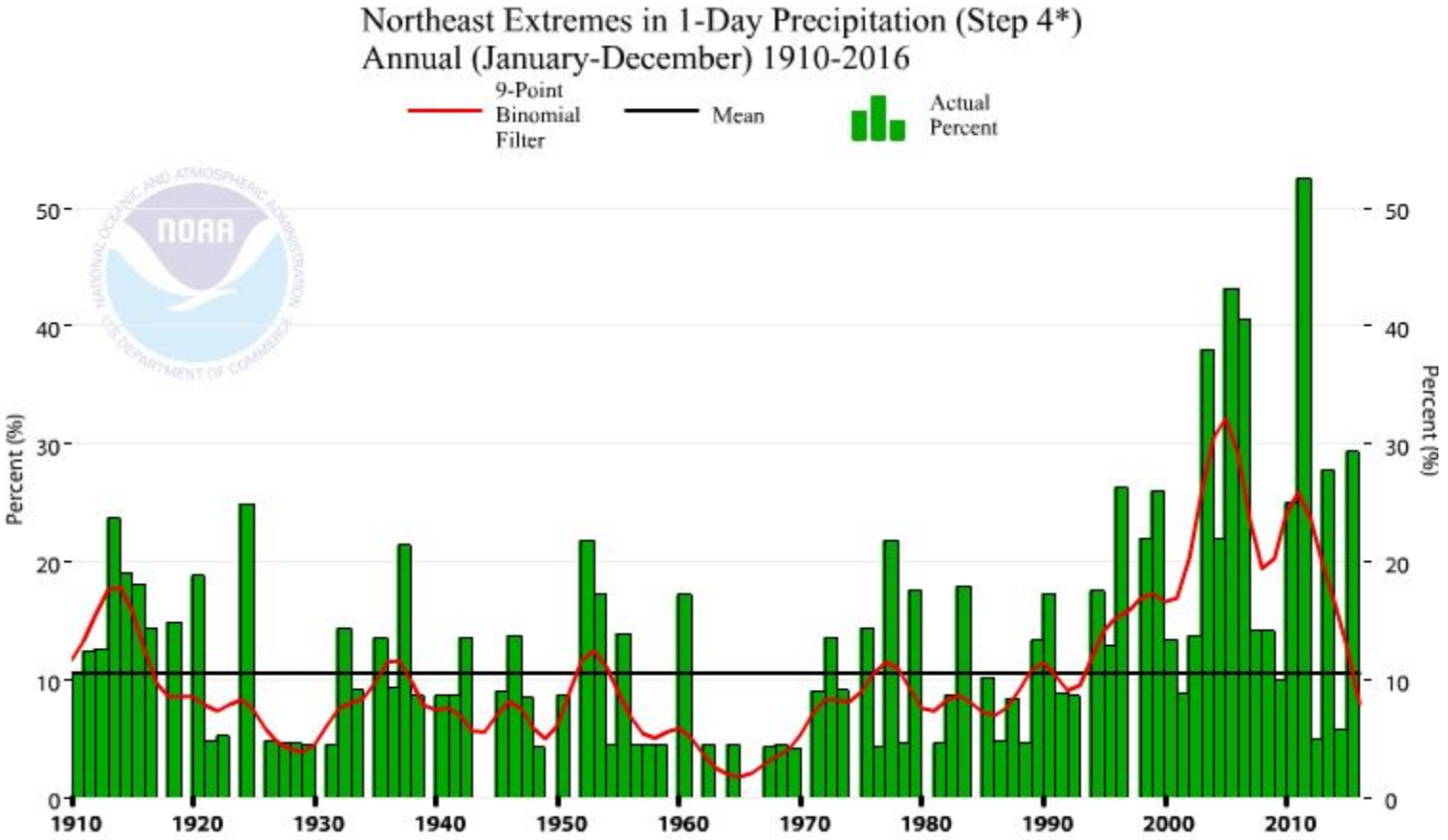
Trends in annual mean New Jersey precipitation



- Long-term upward trend of 2.1” per 100 years
- Large decadal variability (early 1960s drought, wet 1970s, very wet in 2000s)
- Most of the upward trend comes from changes in spring and fall

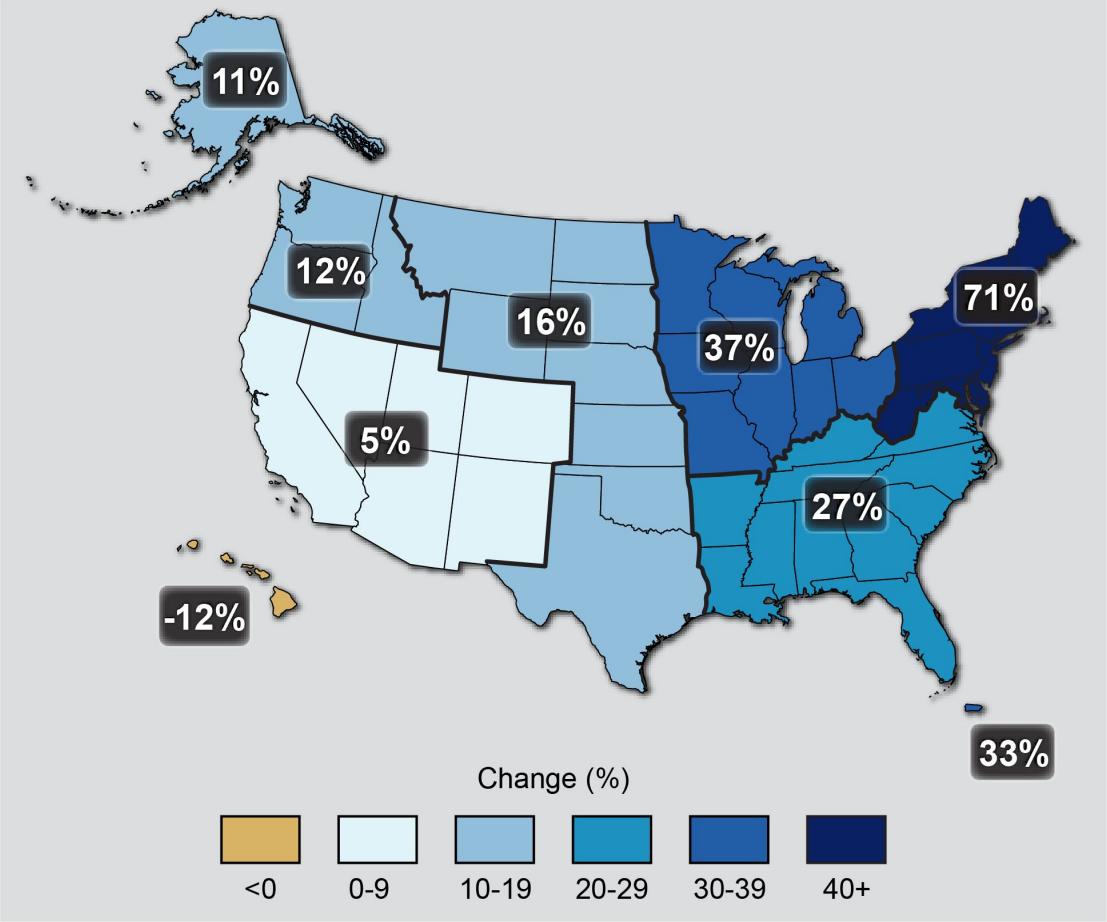
Source: National Centers for Environmental Information

Percentage of area with a much greater than normal fraction of precipitation derived from extreme 1-day precipitation events



Source: National Centers for Environmental Information

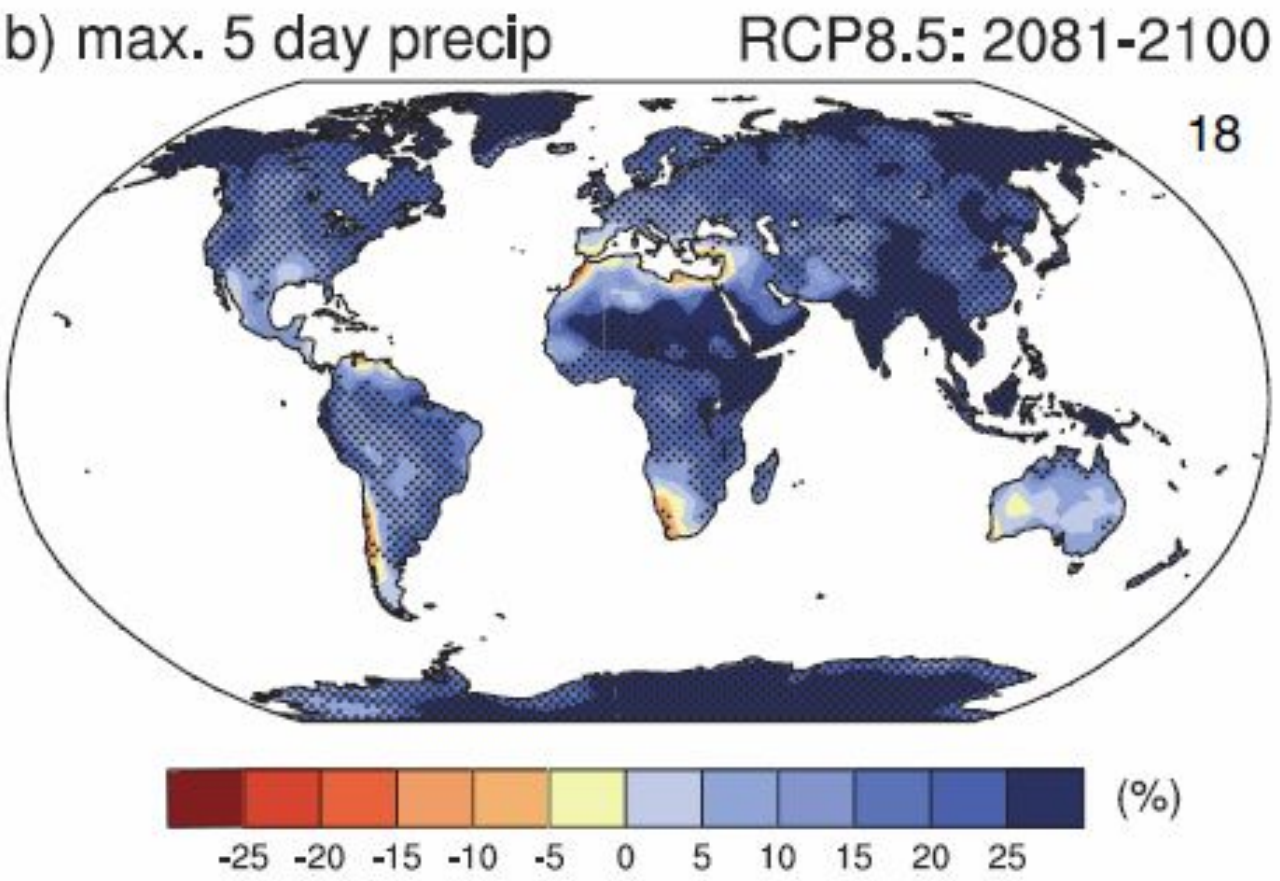
Change in amount of precipitation from very heavy events



- Period: 1958 to 2011
- Very heavy = the heaviest 1% of precipitation events
- A similar analysis indicates that recent decades have are also higher than the first half of the 20th century

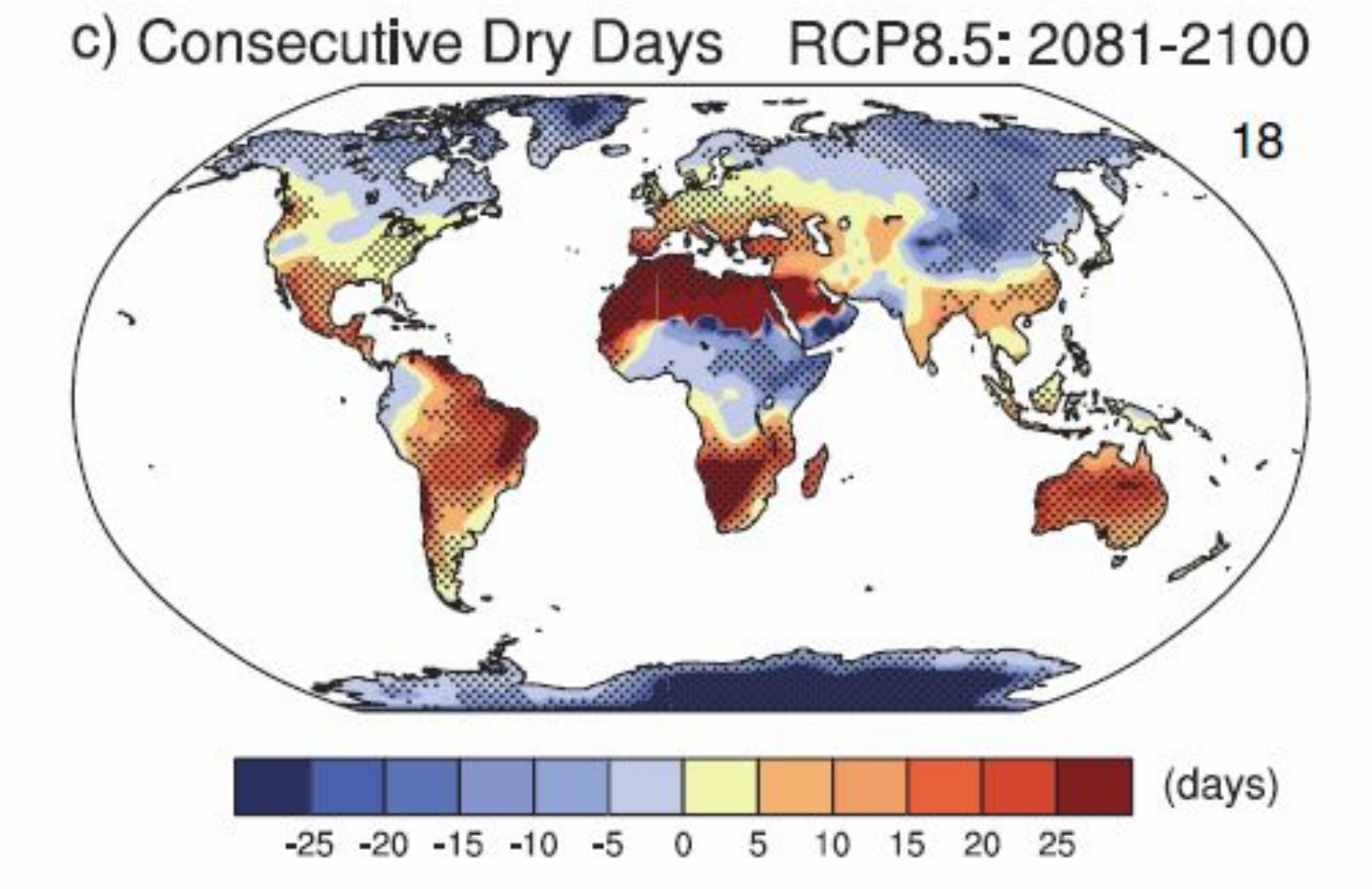
Source: National Climate Assessment (2014)

Heavy rains may become heavier…



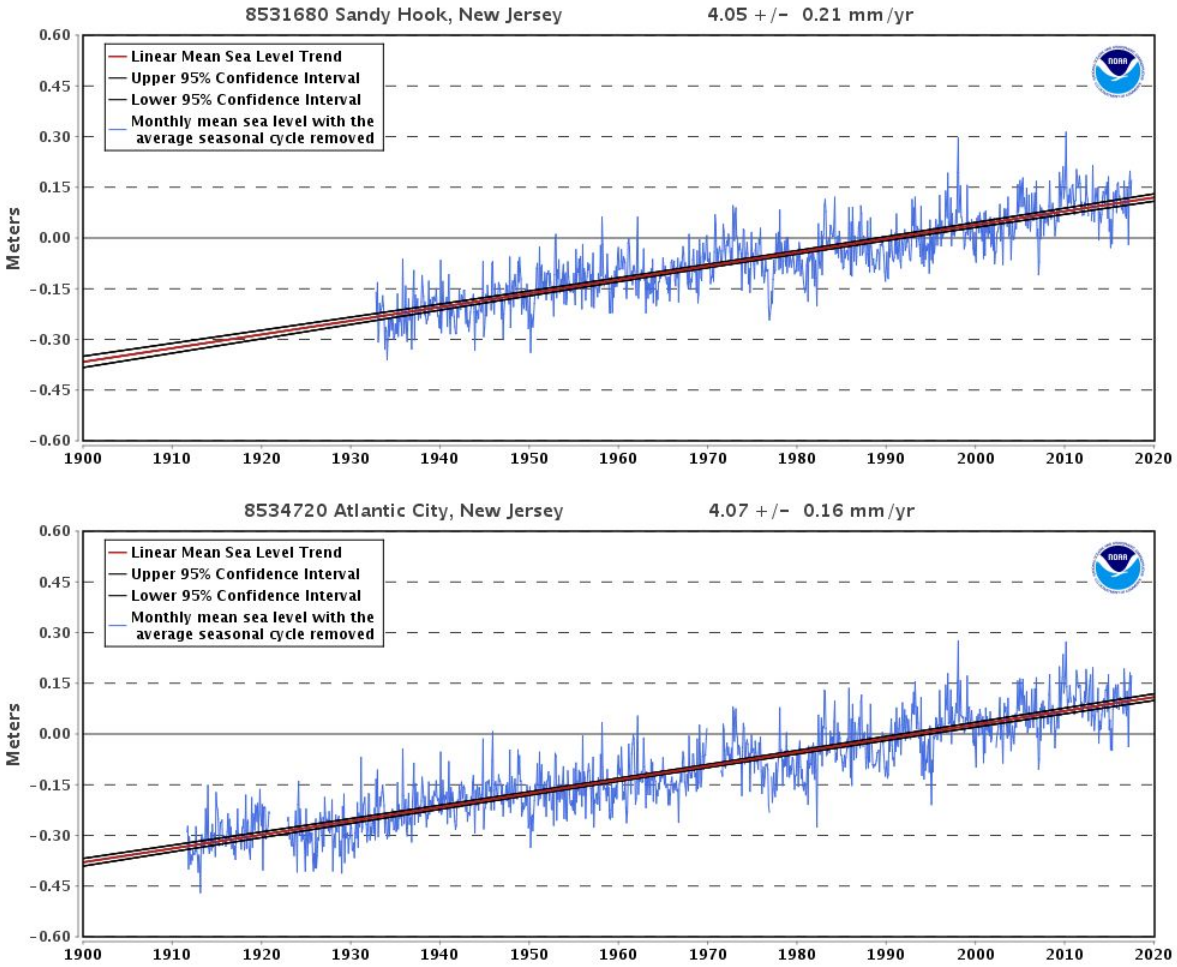
Source: Intergovernmental Panel on Climate Change

…and dry spells may lengthen



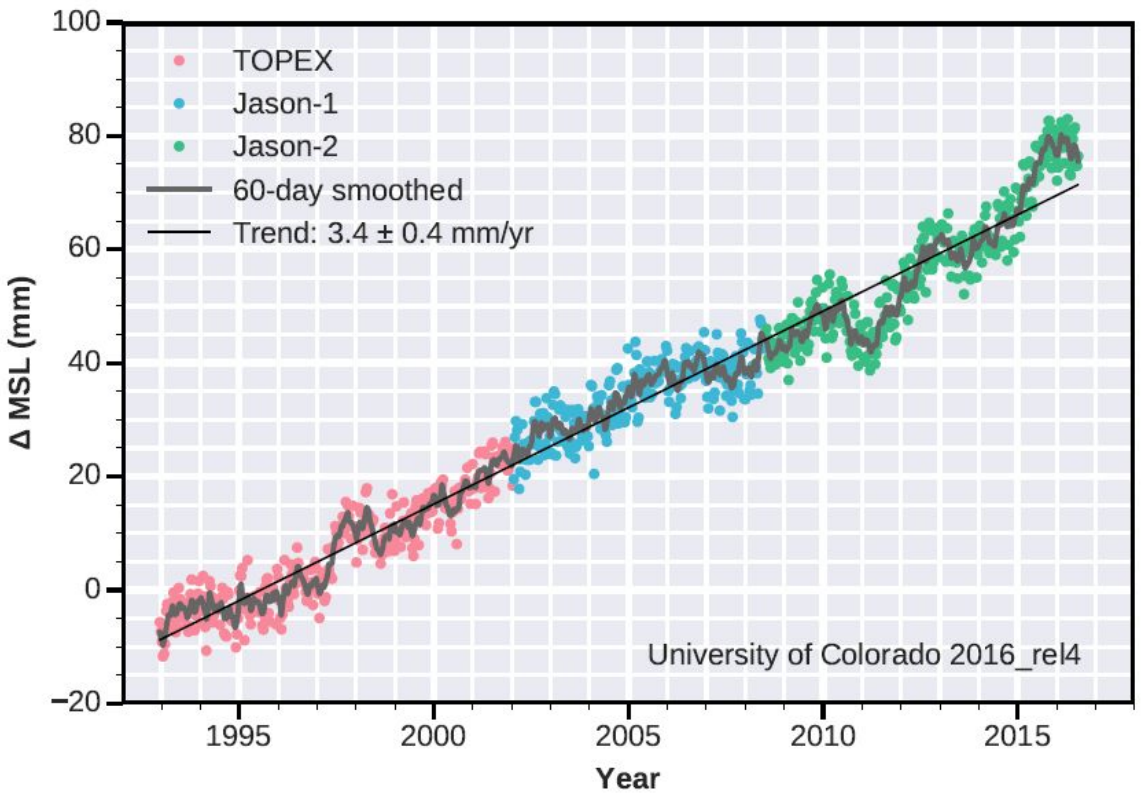
Source: Intergovernmental Panel on Climate Change

New Jersey sea level trends



- Century-scale global sea level rise has been 1.7±0.3 mm/yr
- Local sea level rise along the NJ coast has been more rapid than the global rise (4.1 ±0.2 mm/yr)
- The difference is due to land subsidence (combination of post-glacial movement of earth's crust and compaction of coastal plain sediments)

Acceleration of global sea level rise



- Global trend during past two decades (satellite-derived) has been 3.4±0.4 mm/yr
- Kopp et al. (2016) project the following sea level rise on the NJ coastal plain (relative to 2000)

  2050: 1.4 feet
  (67% range: 1.0-1.8 feet)

  2100 (low emissions): 2.3 feet
  (67% range: 1.7-3.1 feet)

  2100 (high emissions): 3.4 feet
  (67% range: 2.4-4.5 feet)
- Projected ranges are relatively wide because we don't know how rapidly ice sheets (Greenland and Antarctica) will respond

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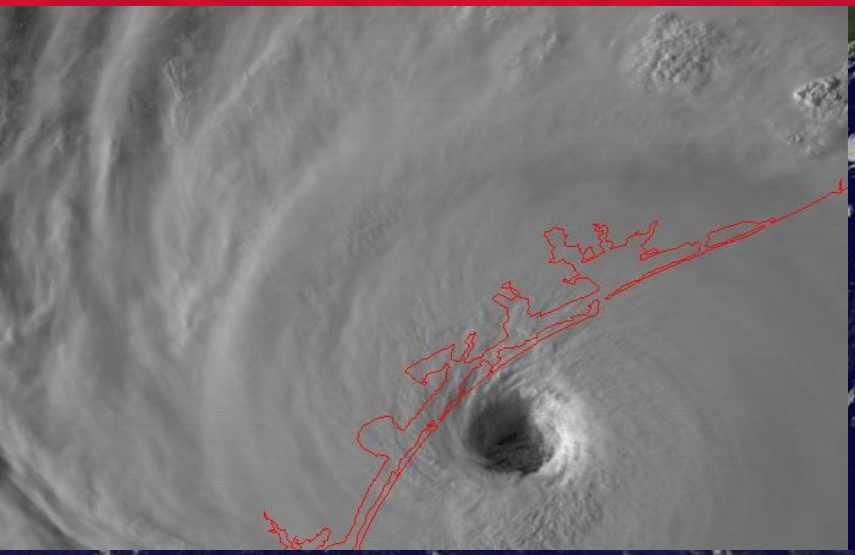
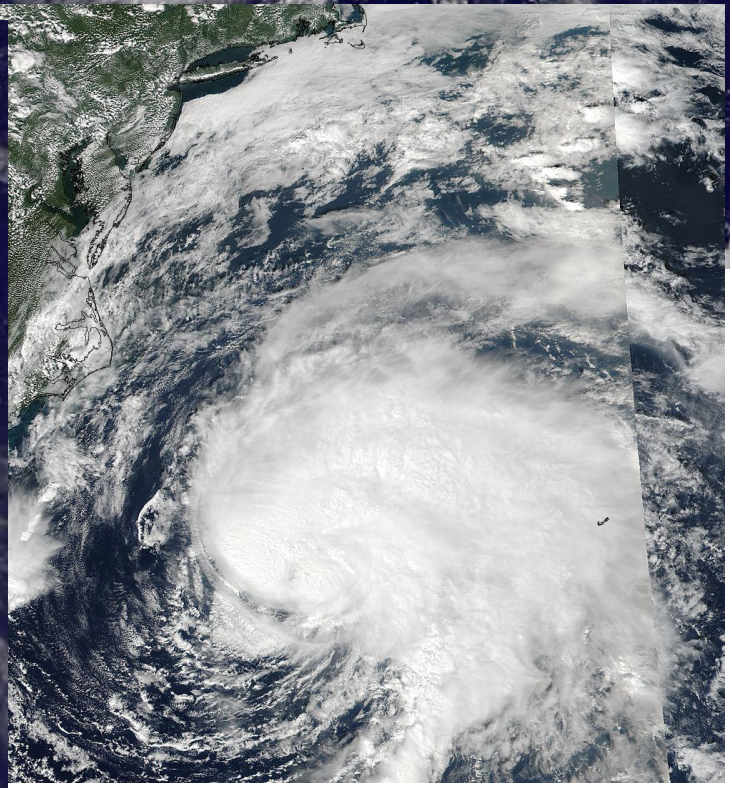
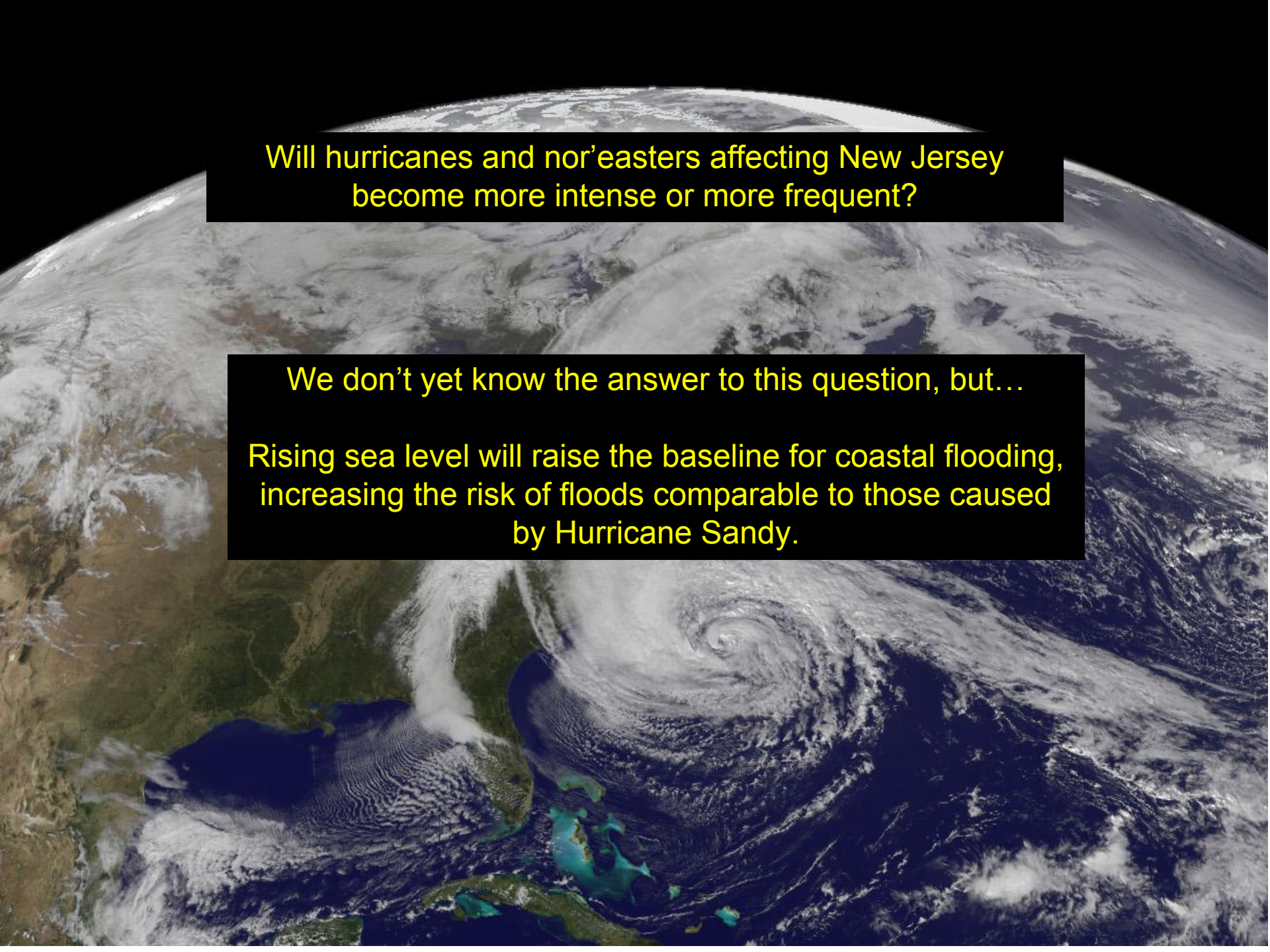




How will tropical cyclones change?

- The overall global number of tropical cyclones is expected to decrease or remain essentially unchanged.
- The average maximum wind speed in tropical cyclones is expected to increase. (Intensity of strongest TCs will increase.)
- Heavy rainfall events accompanying tropical cyclones are expected to increase.
- Confidence in these results is moderate; this remains an area of active research.



Will hurricanes and nor'easters affecting New Jersey become more intense or more frequent?

We don't yet know the answer to this question, but…

Rising sea level will raise the baseline for coastal flooding, increasing the risk of floods comparable to those caused by Hurricane Sandy.

Climate Change in New Jersey

- More warm extremes and fewer cold extremes
- Heavy rains become more intense
- More frequent dry spells
- Rising sea level with increased frequency and intensity of coastal flooding