

Climate Change 101: A New Jersey Perspective

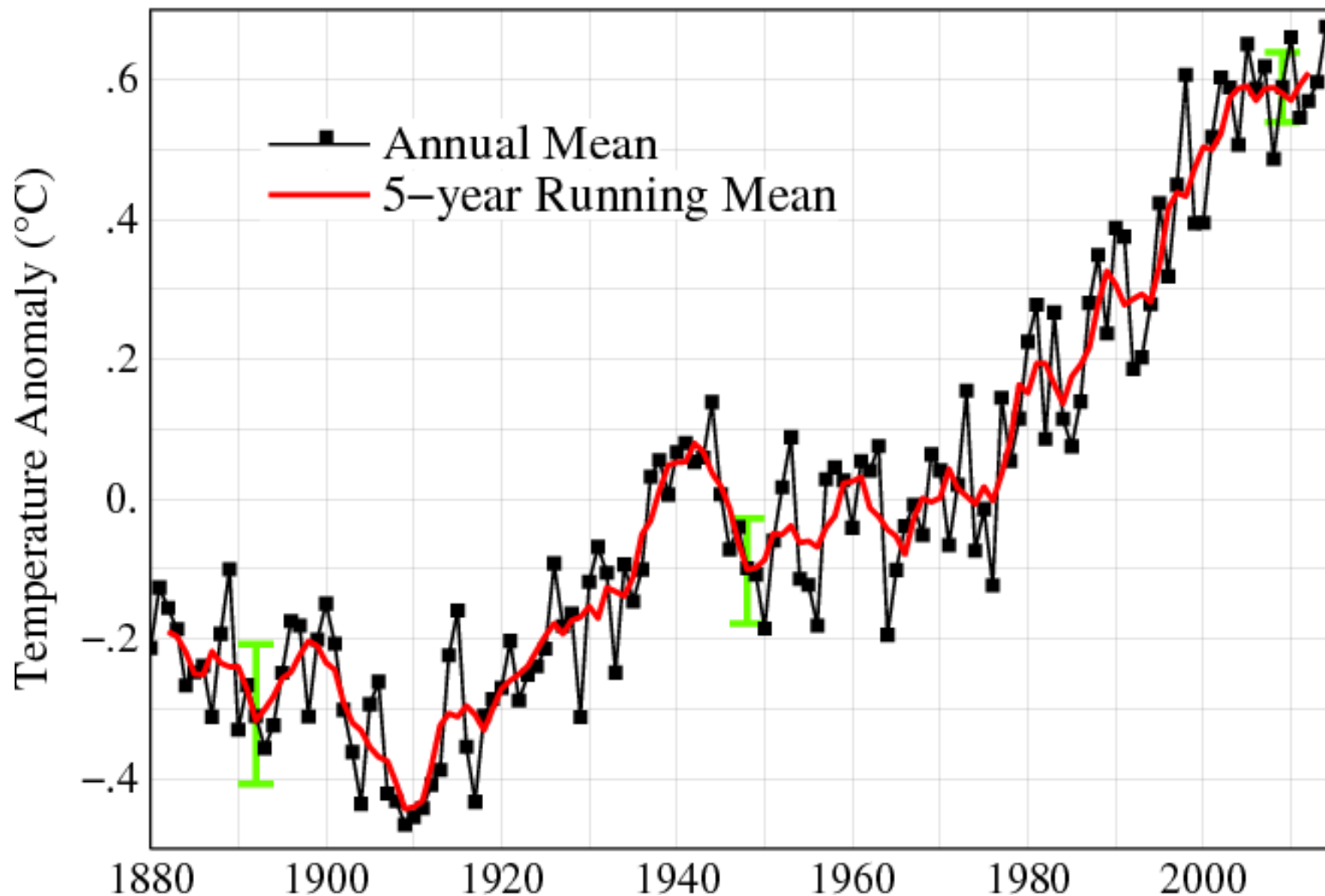
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"Climate Change and Agriculture in New Jersey"
Rutgers EcoComplex
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Climate change...it's
real, it's happening
now, and it's affecting
New Jersey.



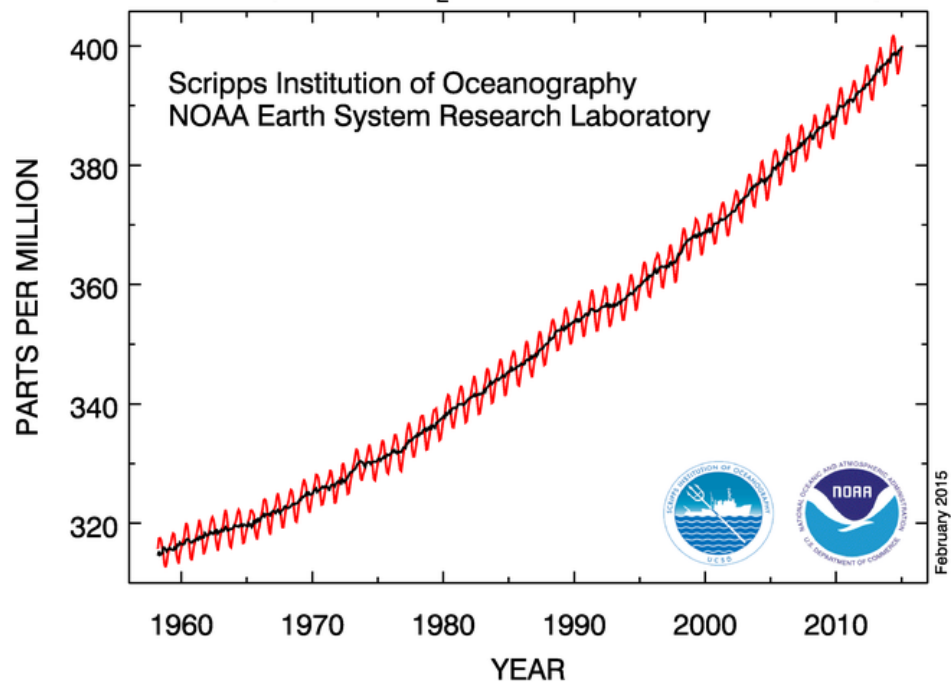
Global Land–Ocean Temperature Index



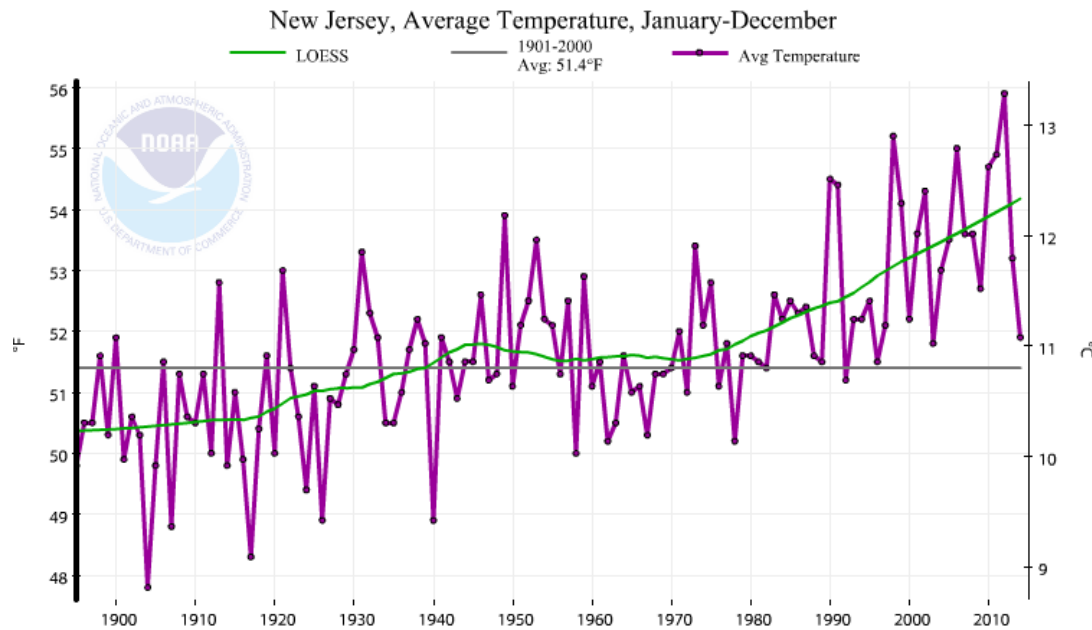
Source: NASA/Goddard Institute for Space Studies



Atmospheric CO₂ at Mauna Loa Observatory



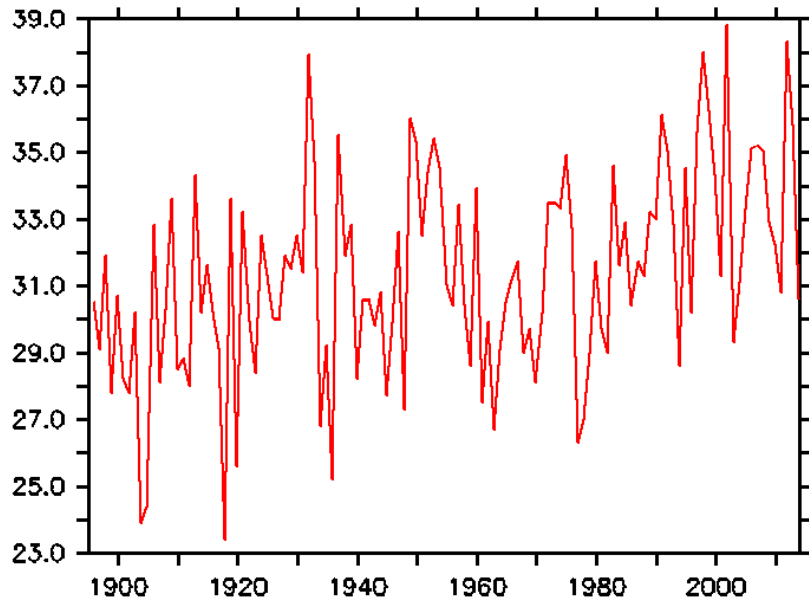
Trends in annual mean New Jersey temperature



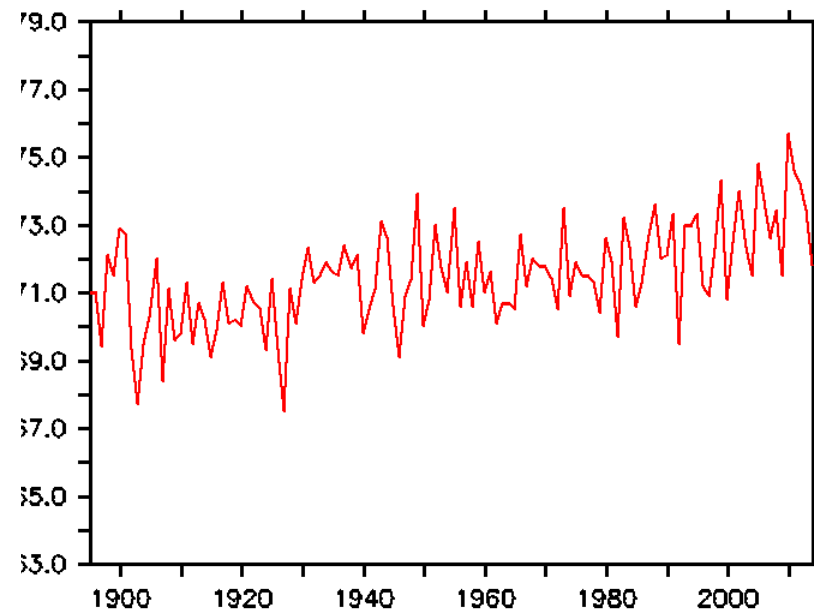
- Long-term upward trend of 2.7°F per 100 years
- More rapid warming since 1980
- The three warmest years have occurred since 1998
- 2012 was the warmest year on record

Trends in winter and summer temperature in N.J.

New Jersey, Avg. Temperature, Dec.–Feb.



New Jersey, Avg. Temperature, Jun.–Aug.



- Larger warming trend in winter ($3.7^{\circ}\text{F}/100$ yrs) than in summer ($2.4^{\circ}\text{F}/100$ yrs)
- Year-to-year temperature variability is much larger in winter, which can mask long-term trends
- The three warmest summers have occurred since 2005



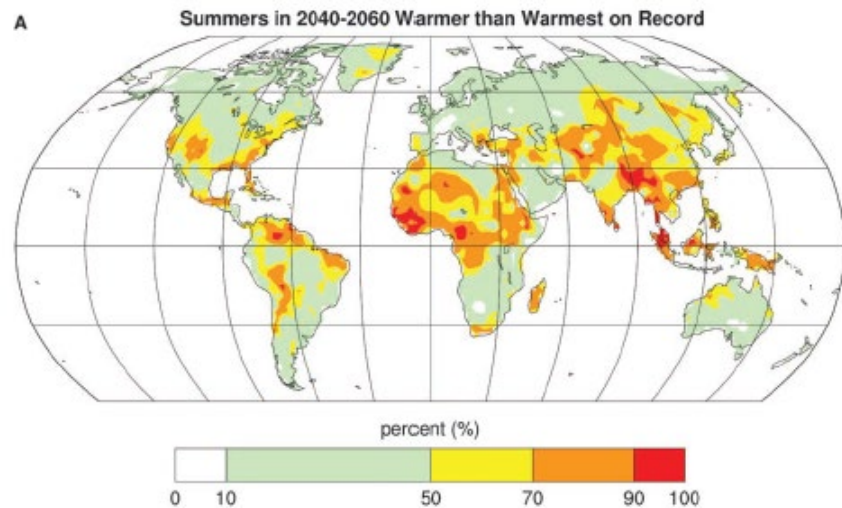
Unusually warm and cold months in New Jersey



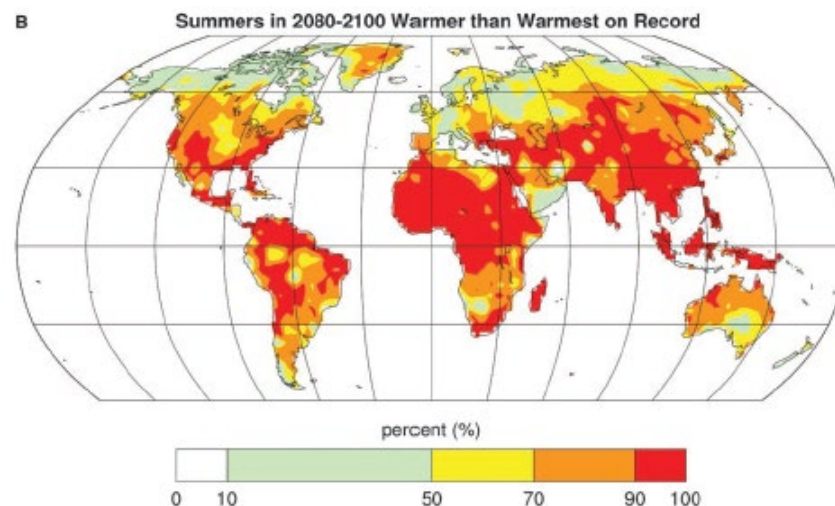
- Unusually warm and cold months are defined as the five warmest and coldest for each calendar month (total of 60 warm and 60 cold plus ties)
- 40 cold months occurred before 1930
- 32 warm months occurred since 1990
- Since 2000, there have been 25 warm months and 3 cold months

Warmer summers ahead

Question: How many summers will be warmer than what would now be the warmest summer on record?

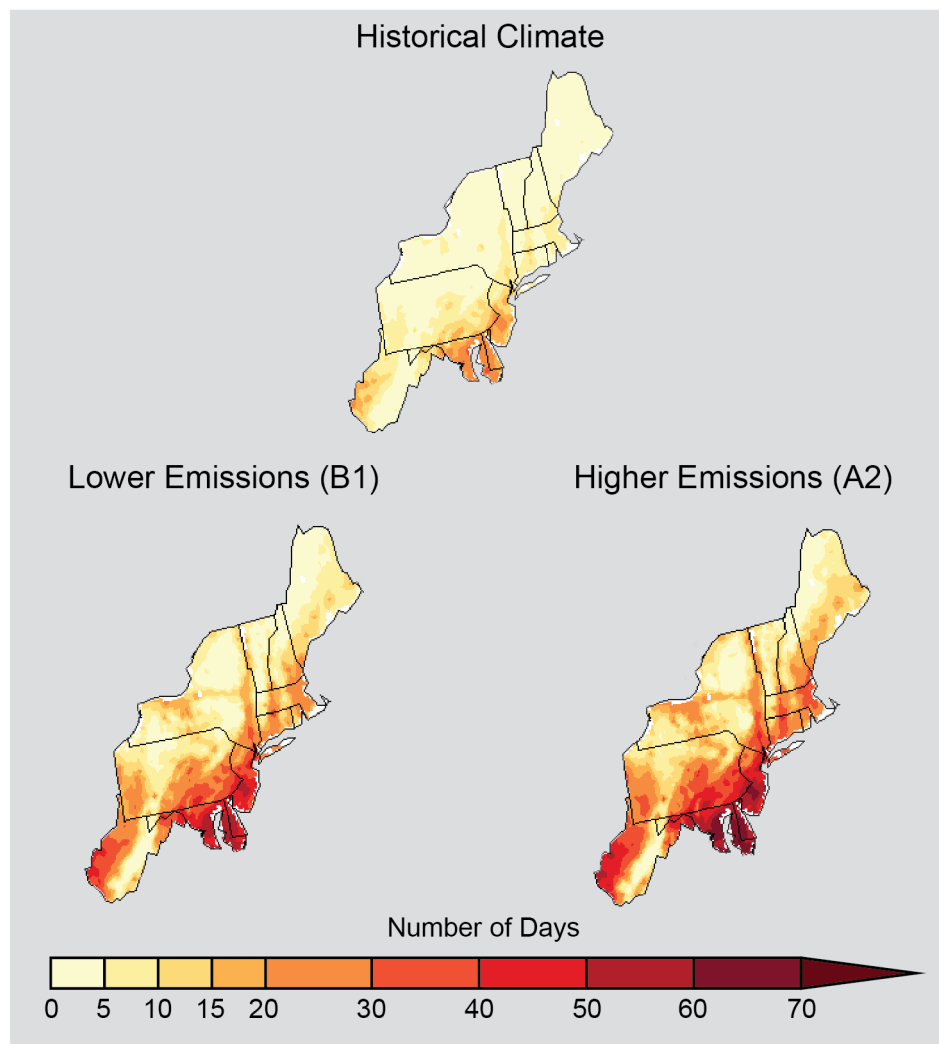


NJ: about 70%



NJ: about 90%

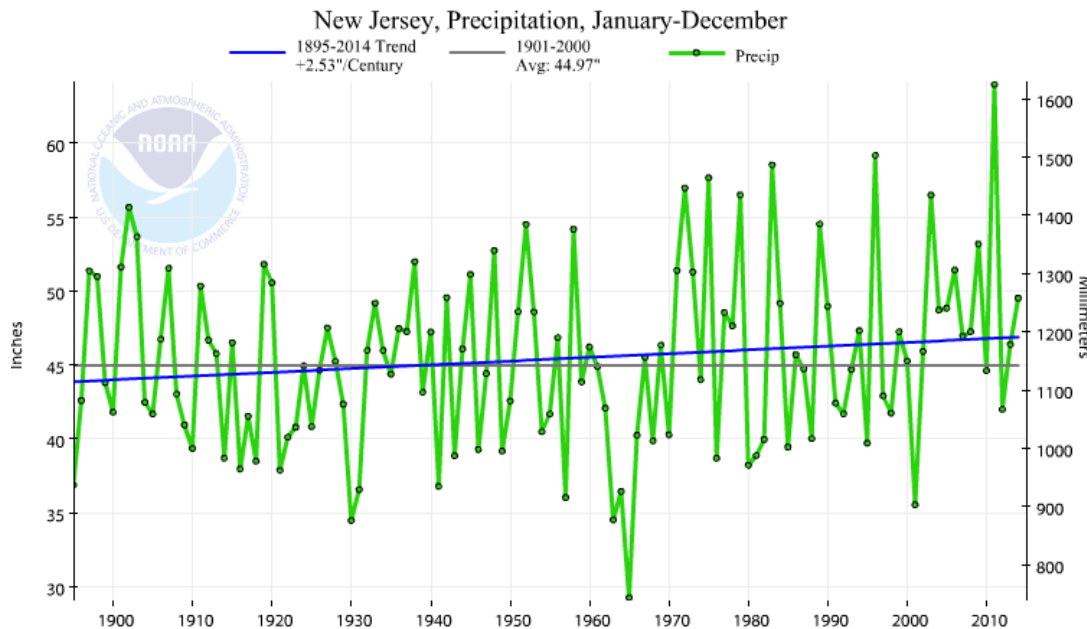
Projected Increases in the Number of Days over 90°F



Source: National Climate Assessment (2014)

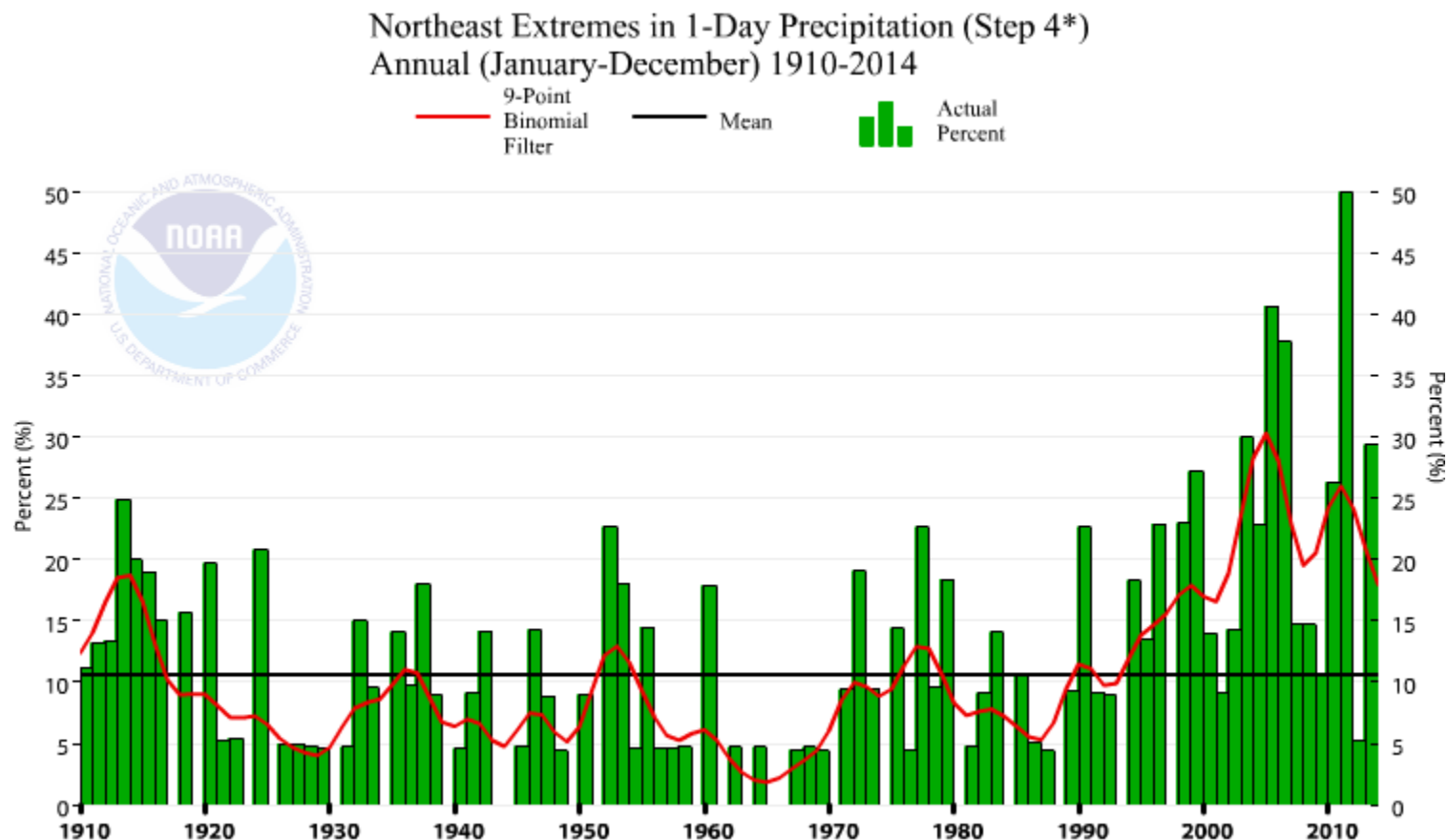


Trends in annual mean New Jersey precipitation



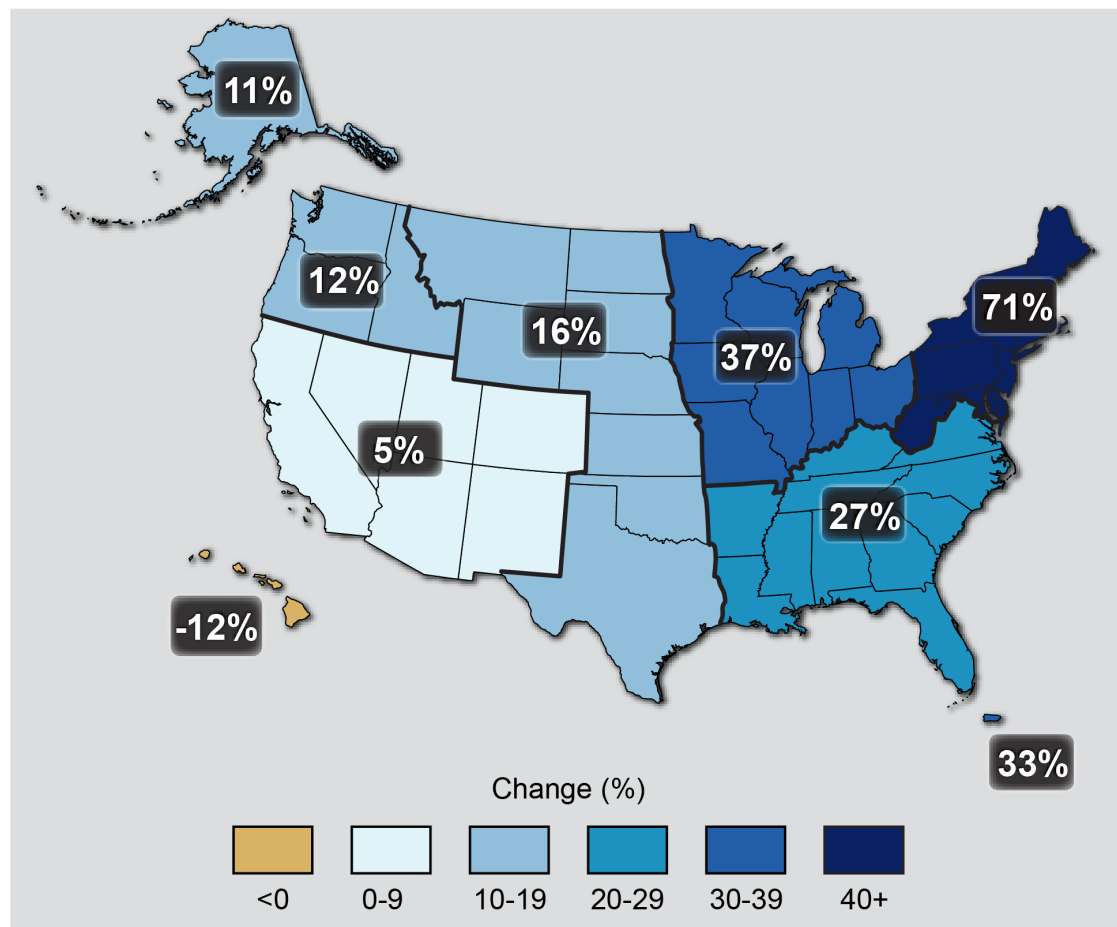
- Long-term upward trend of 2.5" per 100 years
- Large decadal variability (early 1960s drought, wet 1970s, very wet in last decade)
- Most of the upward trend comes from changes in spring and fall

Area with unusually large fraction of precipitation falling in extreme 1-day precipitation events



Source: National Climatic Data Center

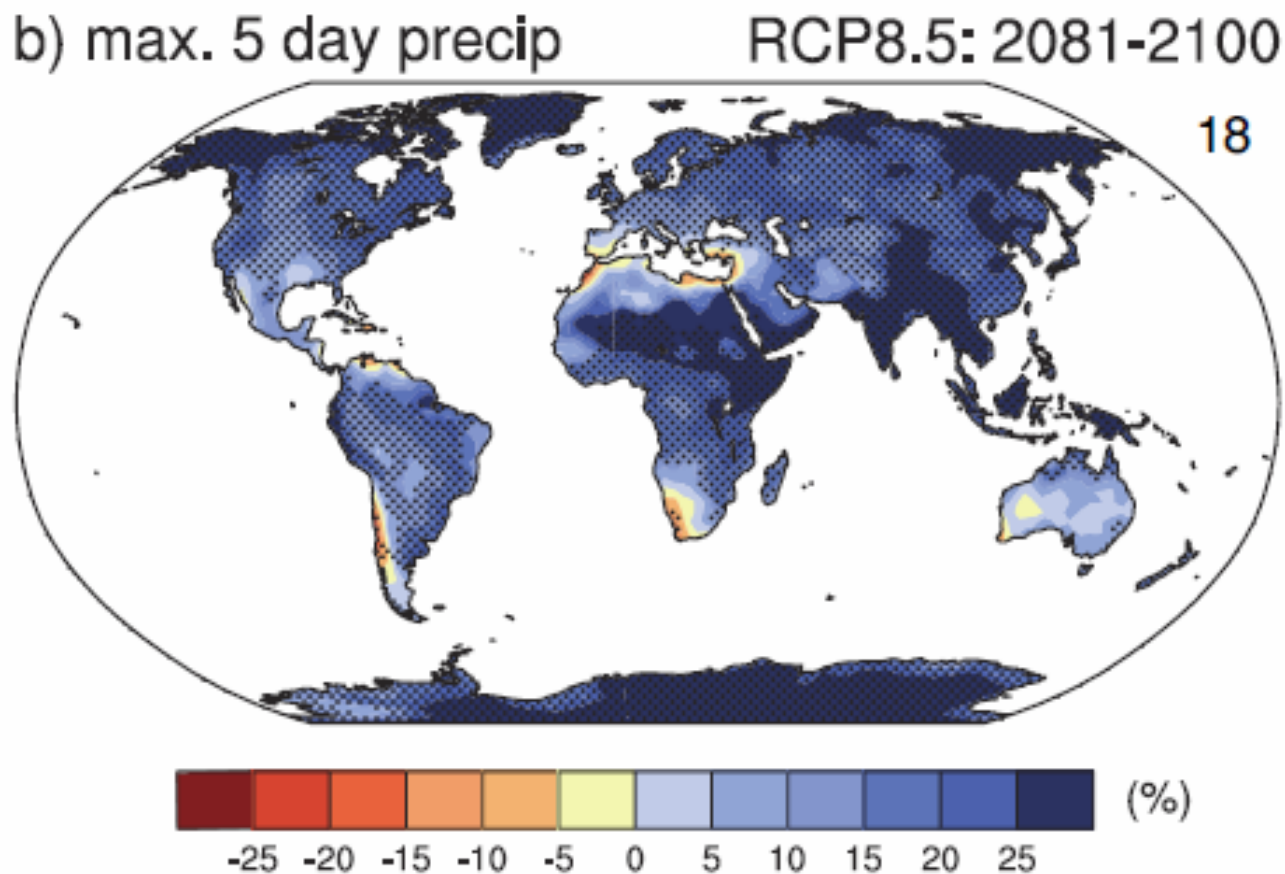
Change in amount of precipitation from very heavy events



- 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)

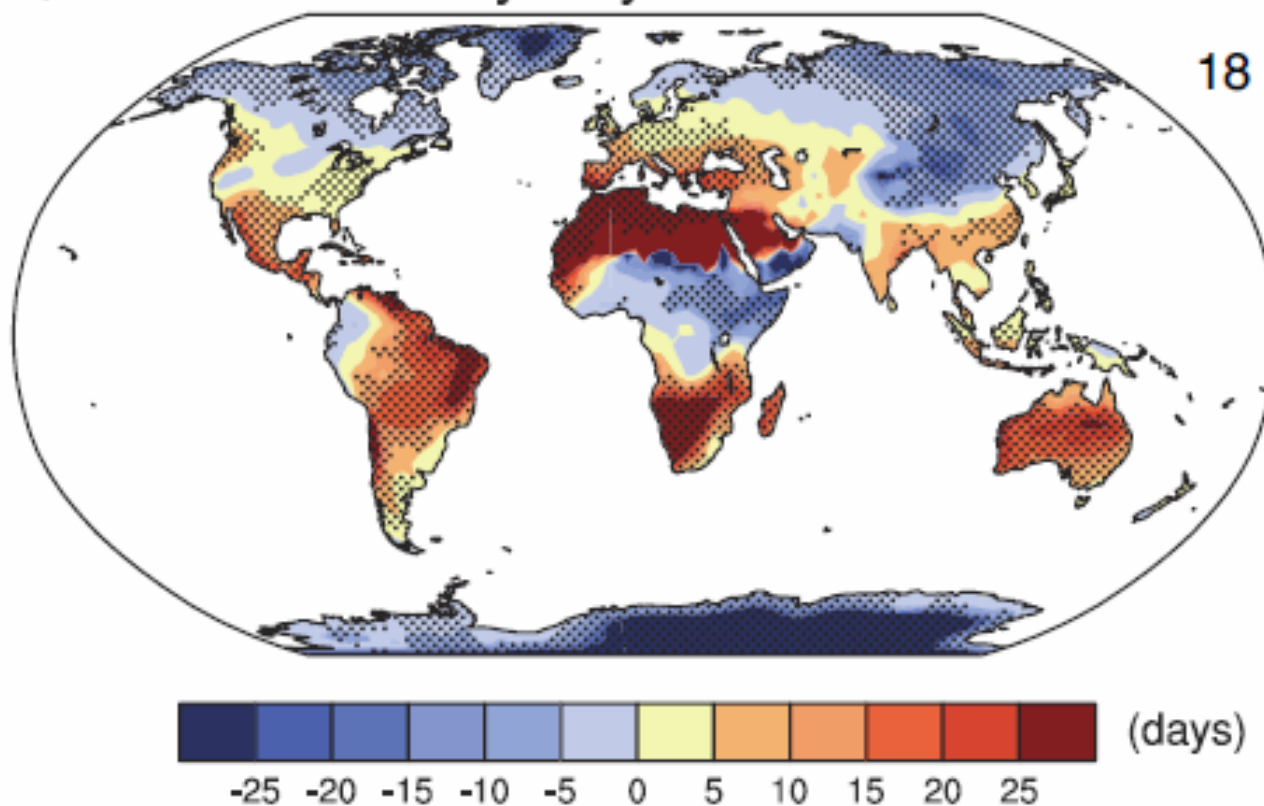
Heavy rains may become heavier...



Source: Intergovernmental Panel on Climate Change

...and dry spells may lengthen

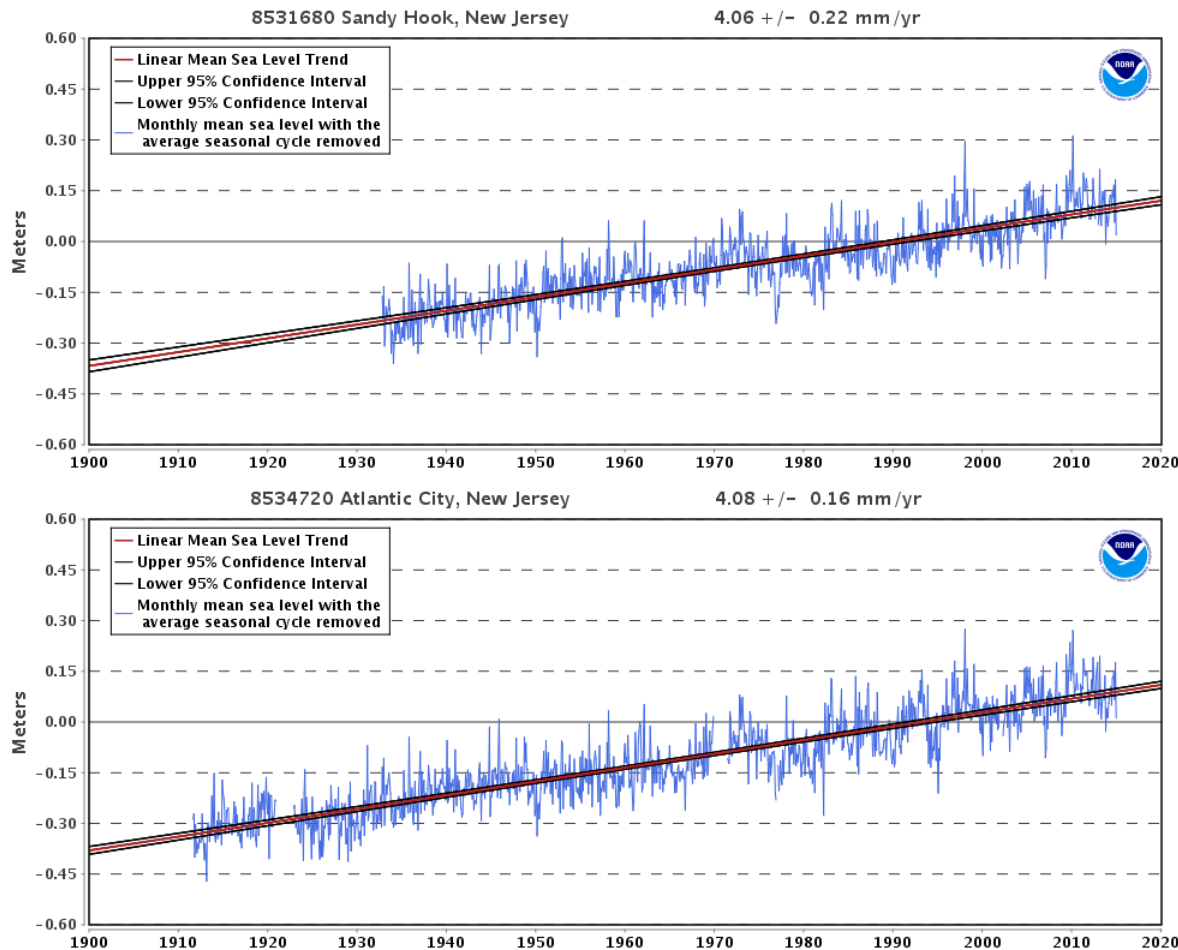
c) Consecutive Dry Days RCP8.5: 2081-2100



Source: Intergovernmental Panel on Climate Change

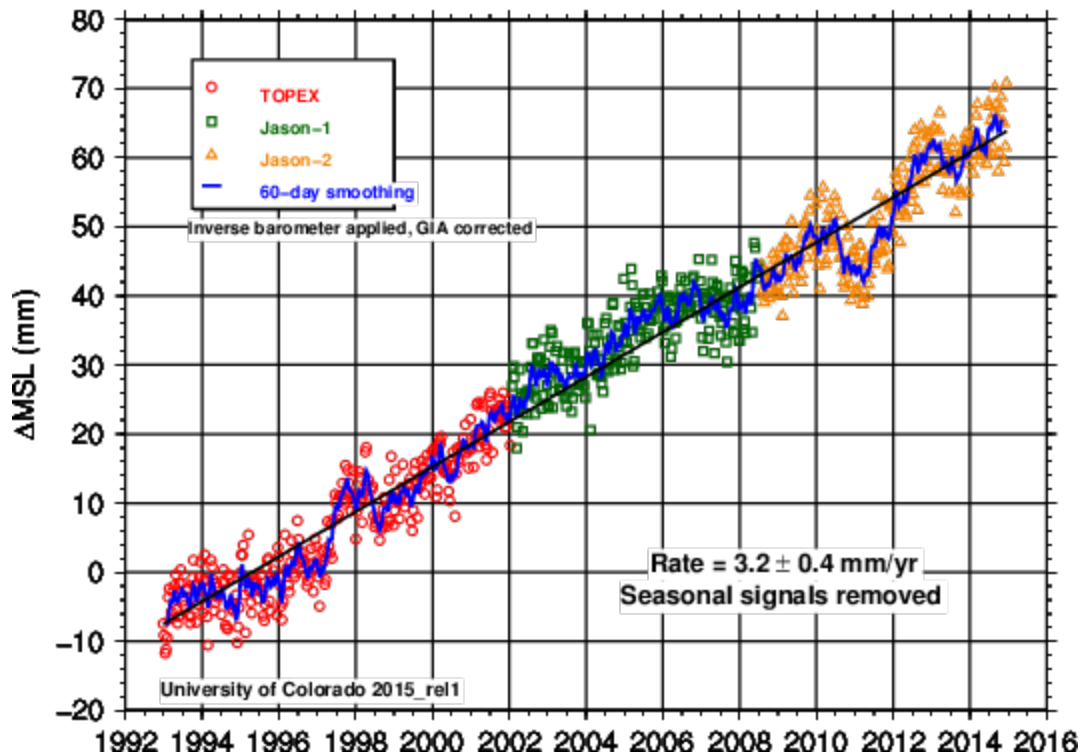


New Jersey sea level trends



- Century-scale global sea level rise has been $1.7 \pm 0.3 \text{ mm/yr}$
- Local sea level rise along the NJ coast has been more rapid than the global rise 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 3.2 ± 0.4 mm/yr
- Miller et al. (2013) project the following sea level rise on the NJ coastal plain (relative to 2000)
 - 2050: 18" (range 13-28")
 - 2100: 42" (range 30-71")
- Projected ranges are relatively wide because we don't know what future emissions will be or how rapidly ice sheets will respond.

A satellite image of Earth from space, showing a large hurricane with a distinct eye and spiral cloud bands over the Atlantic Ocean. The coastline of North America is visible on the left side of the frame.

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

