

Extreme Weather, Climate Change, and Harvey

John W. Nielsen-Gammon, Texas A&M University
Texas State Climatologist

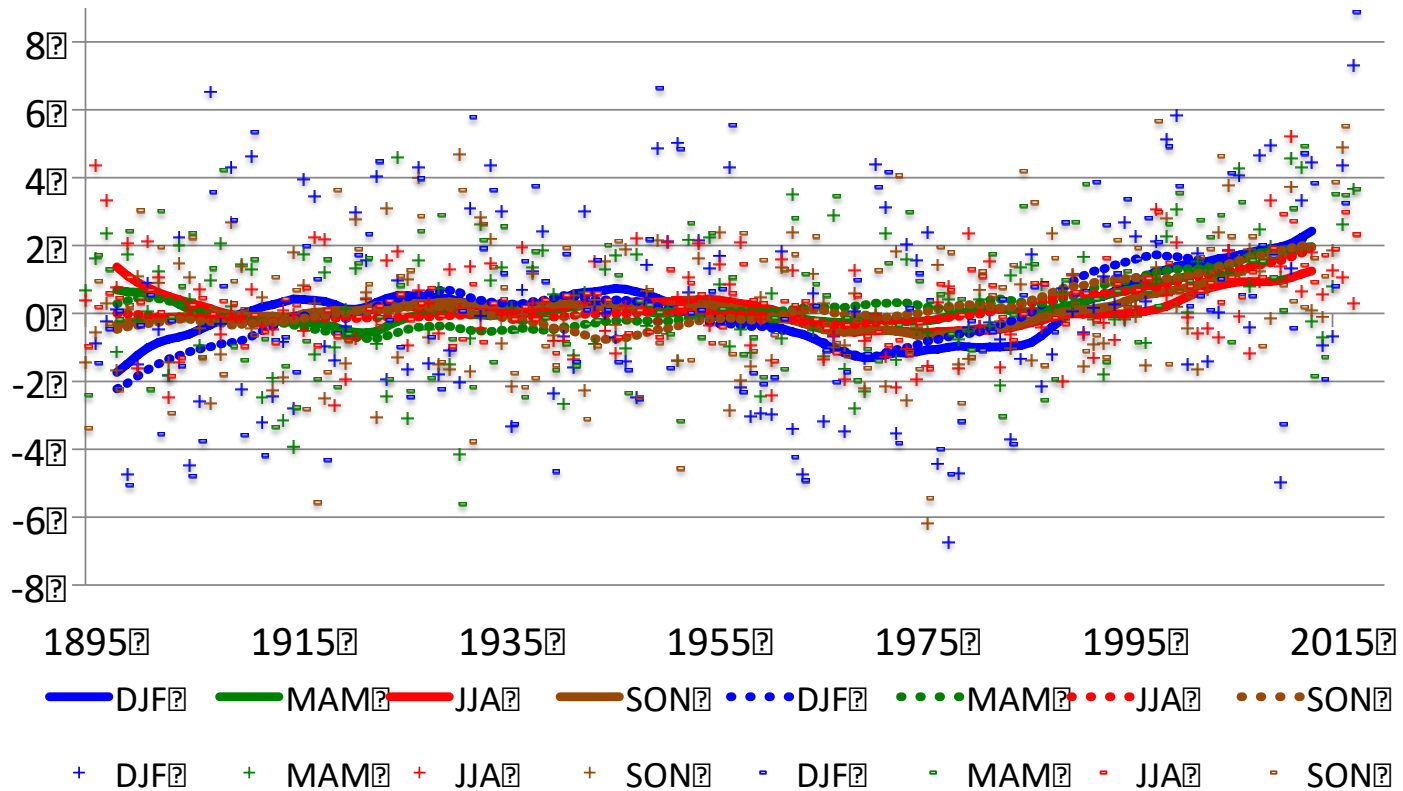


TEXAS A&M
UNIVERSITY.

Upper Coast Seasonal Temperature Anomalies

Tmax & solid, Tmin & dotted

Difference from 20th Century Average (°F)

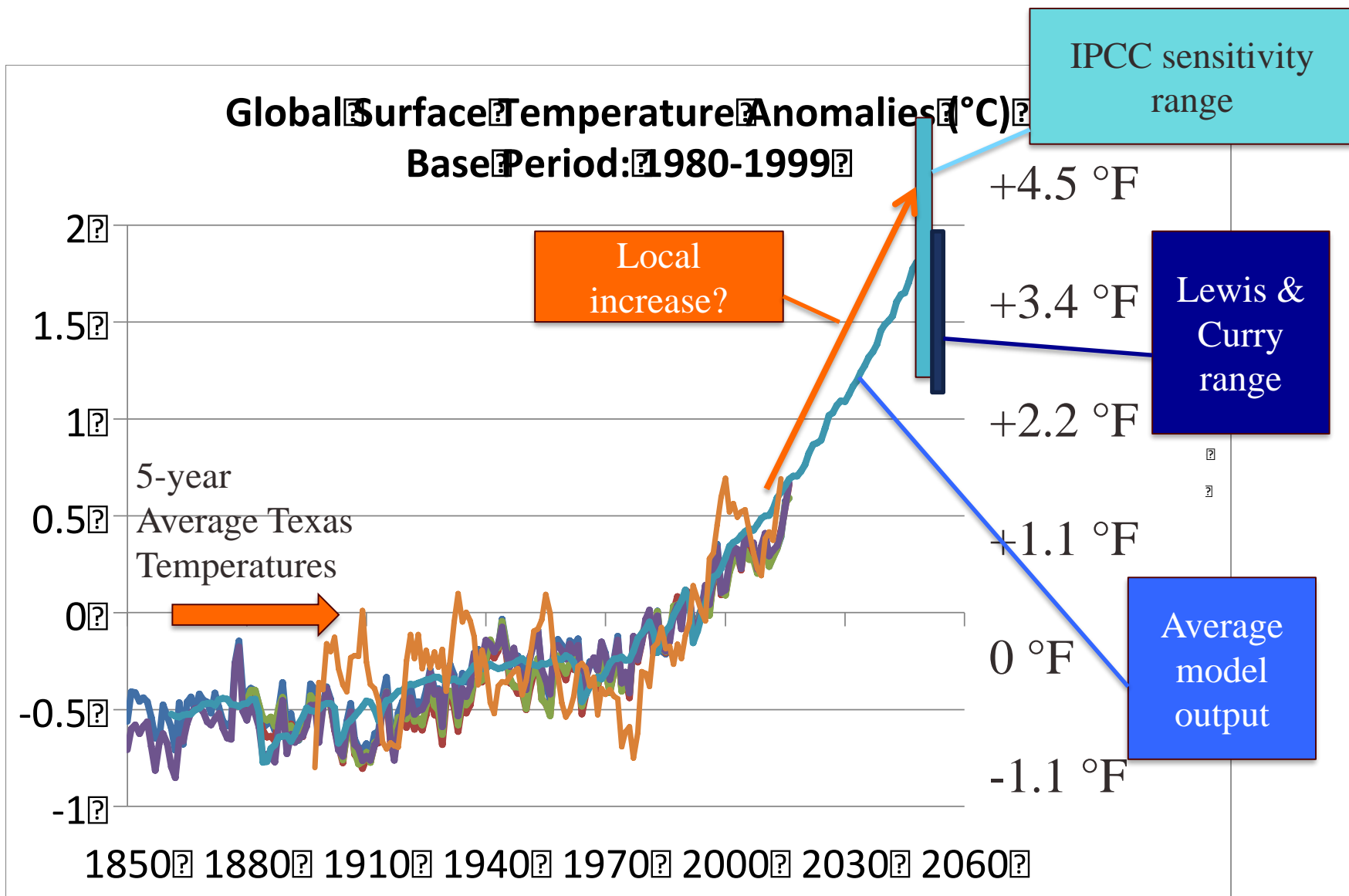


Basis of Climate Prediction

- Past observed changes
- Climate model projections
- Basic physical understanding of climate system

Three out of three

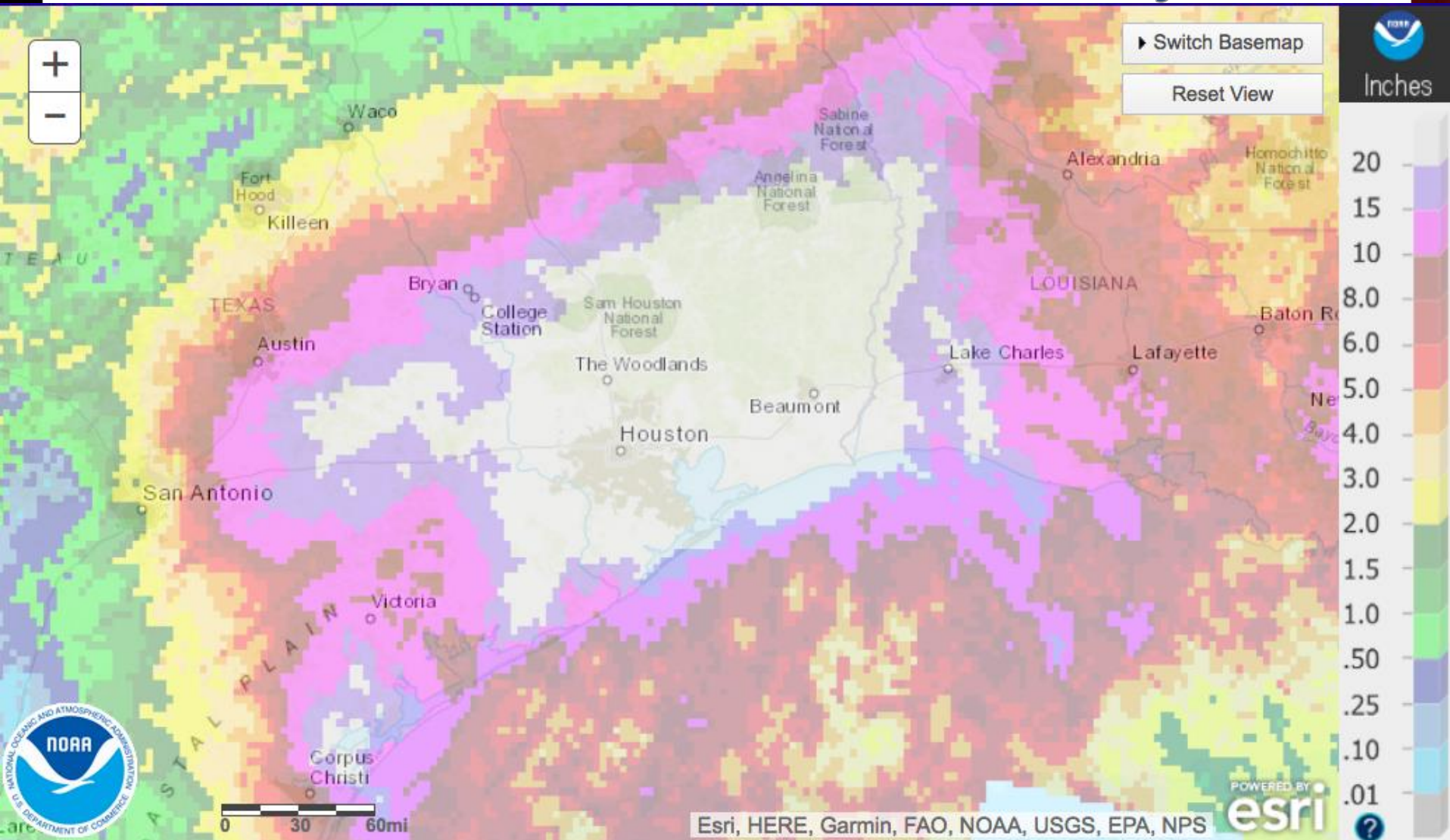
- Higher temperatures
 - More extreme highs
 - Fewer extreme lows
- Extreme rainfall
 - More extreme rain
 - More dry days, droughts
- Sea level rise



Other Relevant Changes

- Decreased soil moisture (2 out of 3)
- Increased flooding (it depends)
- Decreased streamflow (it depends)

Total Rainfall from Harvey



Probability of Harvey

- Probability of a tropical cyclone in southeast Texas
- Given a storm, the probability that such a storm will be a major hurricane
- Given a major hurricane, the probability that the hurricane will stall
- Given a stalled hurricane, the probability of massive rain



Probability of Harvey

(blue = less likely, red = more likely)

- Probability of a tropical cyclone in southeast Texas
- Given a storm, the probability that such a storm will be a major hurricane
- Given a major hurricane, the probability that the hurricane will stall
- Given a stalled hurricane, the probability of massive rain



Probability of Harvey

(blue = less likely, red = more likely)

- Probability of a tropical cyclone in southeast Texas
- Given a storm, the probability that such a storm will be a major hurricane
- Given a major hurricane, the probability that the hurricane will stall
- Given a stalled hurricane, the probability of massive rain



Probability of Harvey

(blue = less likely, red = more likely)

- Probability of a tropical cyclone in southeast Texas
- Given a storm, the probability that such a storm will be a major hurricane
- Given a major hurricane, the probability that the hurricane will stall
- Given a stalled hurricane, the probability of massive rain



Probability of Harvey

(blue = less likely, red = more likely)

- Probability of a tropical cyclone in southeast Texas
- Given a storm, the probability that such a storm will be a major hurricane
- Given a major hurricane, the probability that the hurricane will stall
- Given a stalled hurricane, the probability of massive rain



Probability of Harvey

(blue = less likely, red = more likely)

- Probability of a tropical cyclone in southeast Texas
- Given a storm, the probability that such a storm will be a major hurricane
- Given a major hurricane, the probability that the hurricane will stall
- Given a stalled hurricane, the probability of massive rain



The climate change debate

- A: “It’s all bad”
- B: “It doesn’t exist, the science is wrong, and it’s good anyway”
- Reality: We’ve figured out a lot of stuff. Deal with it.

