

# Climate Change and its Health Impacts in New England

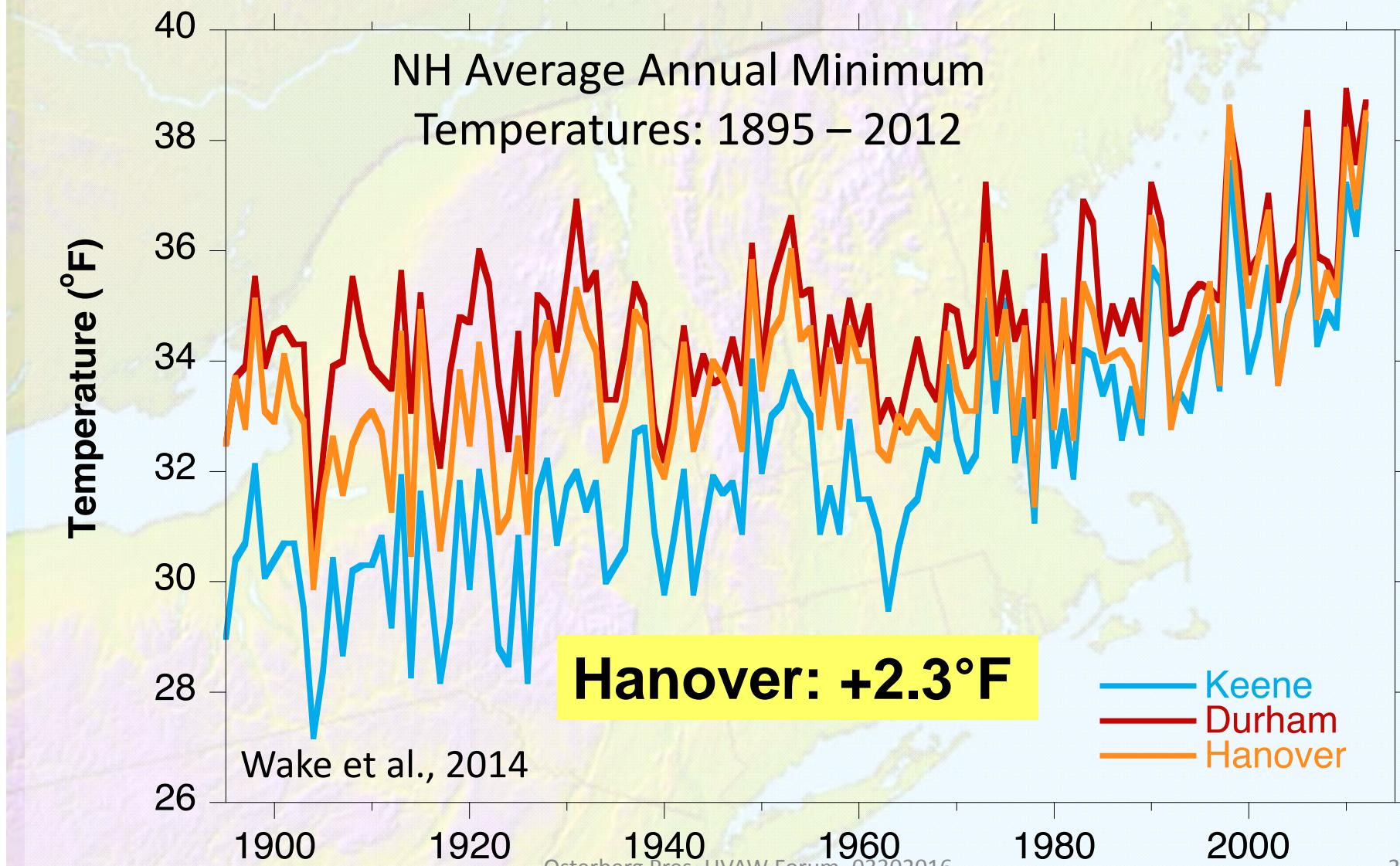


**Dr. Erich Osterberg**  
Dartmouth College Earth Sciences

Osterberg Pres\_UVAW Forum\_03302016

# NH/VT are Already Warming: 2-4°F since 1895

## Winter Warming Fastest





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# 2015 is warmest year on record, NOAA and NASA say

By Brandon Miller, CNN senior meteorologist

⌚ Updated 12:21 PM ET, Wed January 20, 2016

## No surprise, NH just experienced its warmest winter ever recorded

By DAN SEUFERT

Union Leader Correspondent

NEW HAMPSHIRE  
**UNION LEADER**



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# February shatters heat records, becomes hottest month for planet

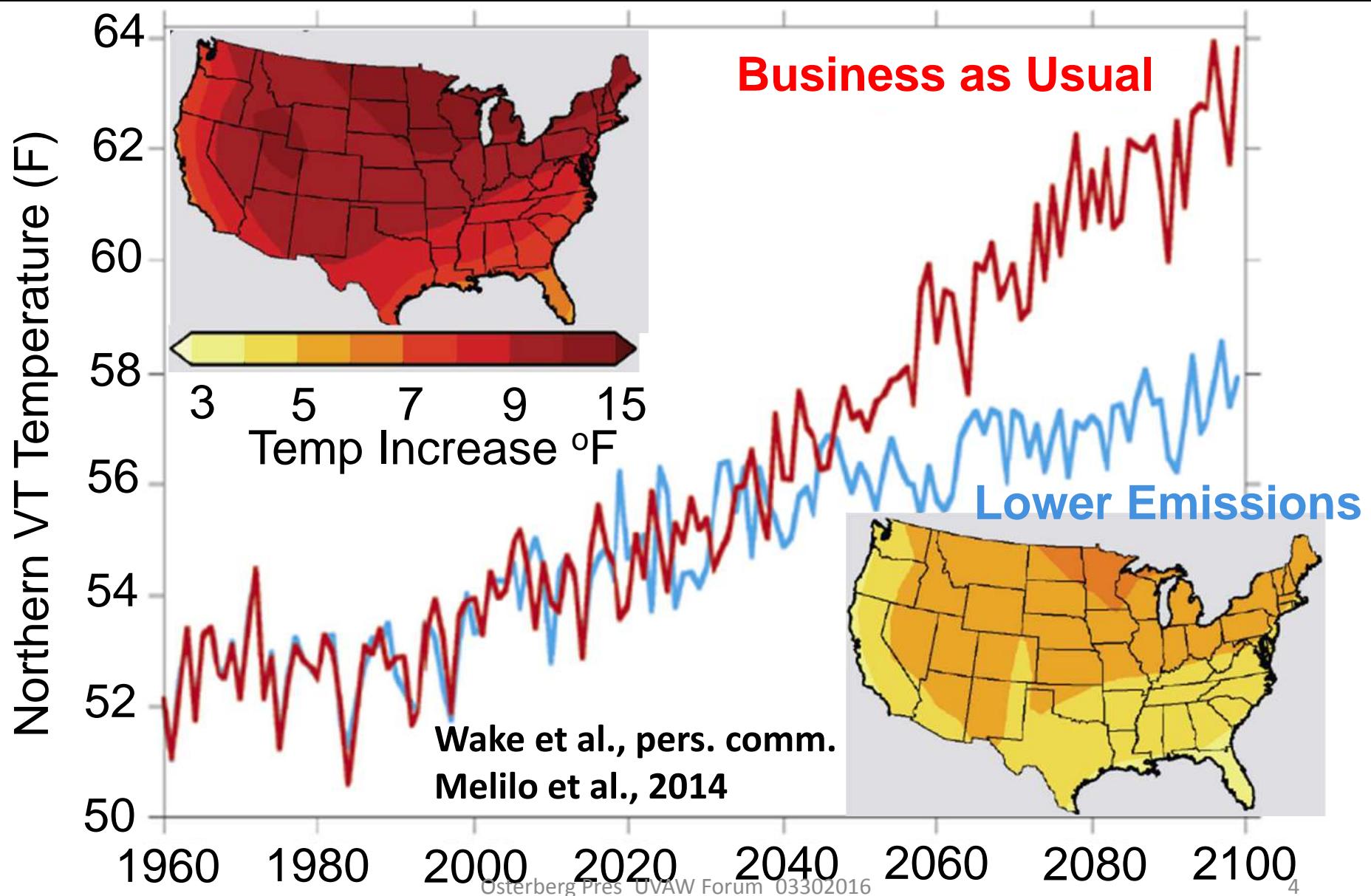
By Brandon Miller, CNN Senior Meteorologist

⌚ Updated 10:31 AM ET, Thu March 17, 2016

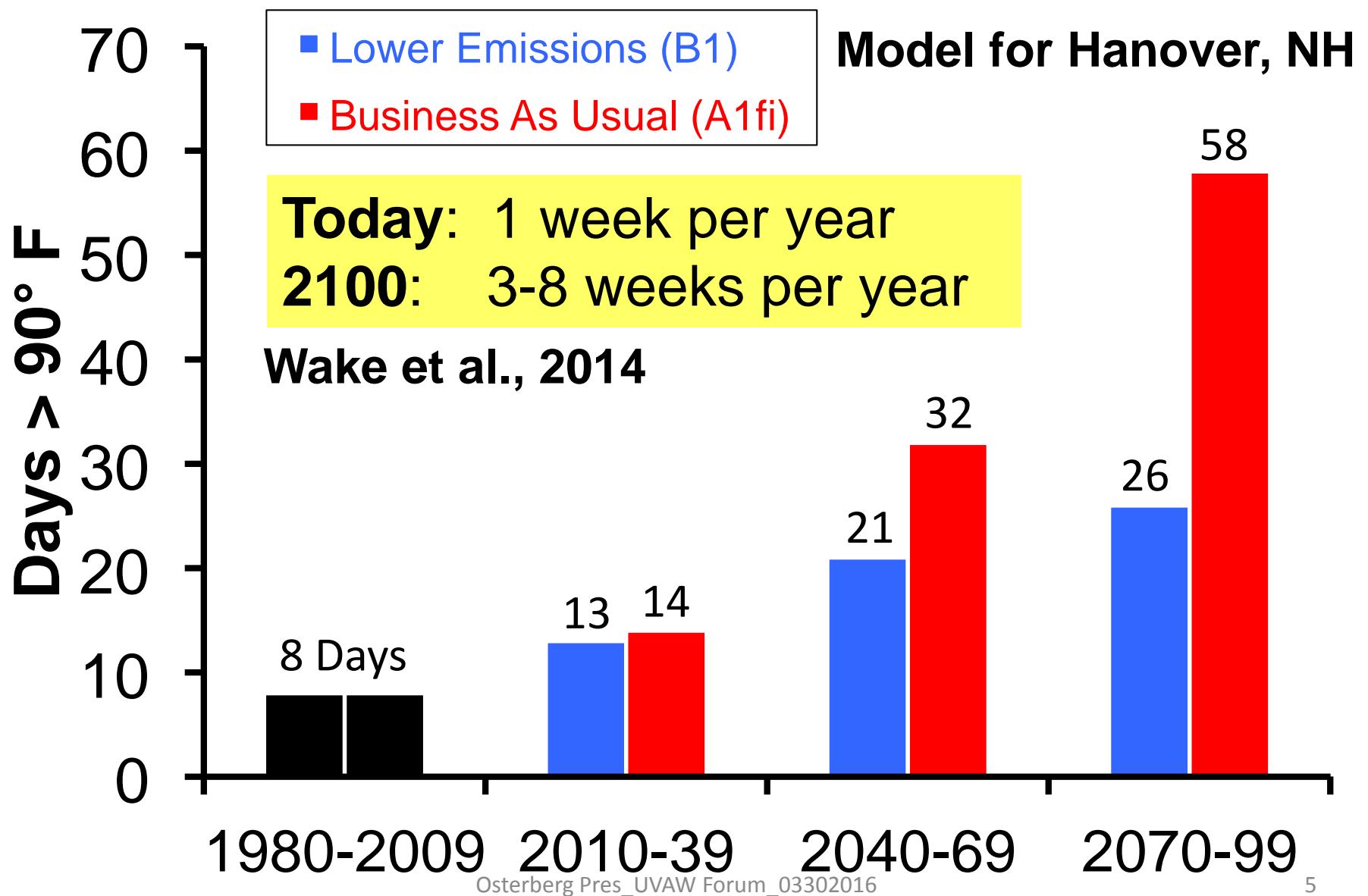
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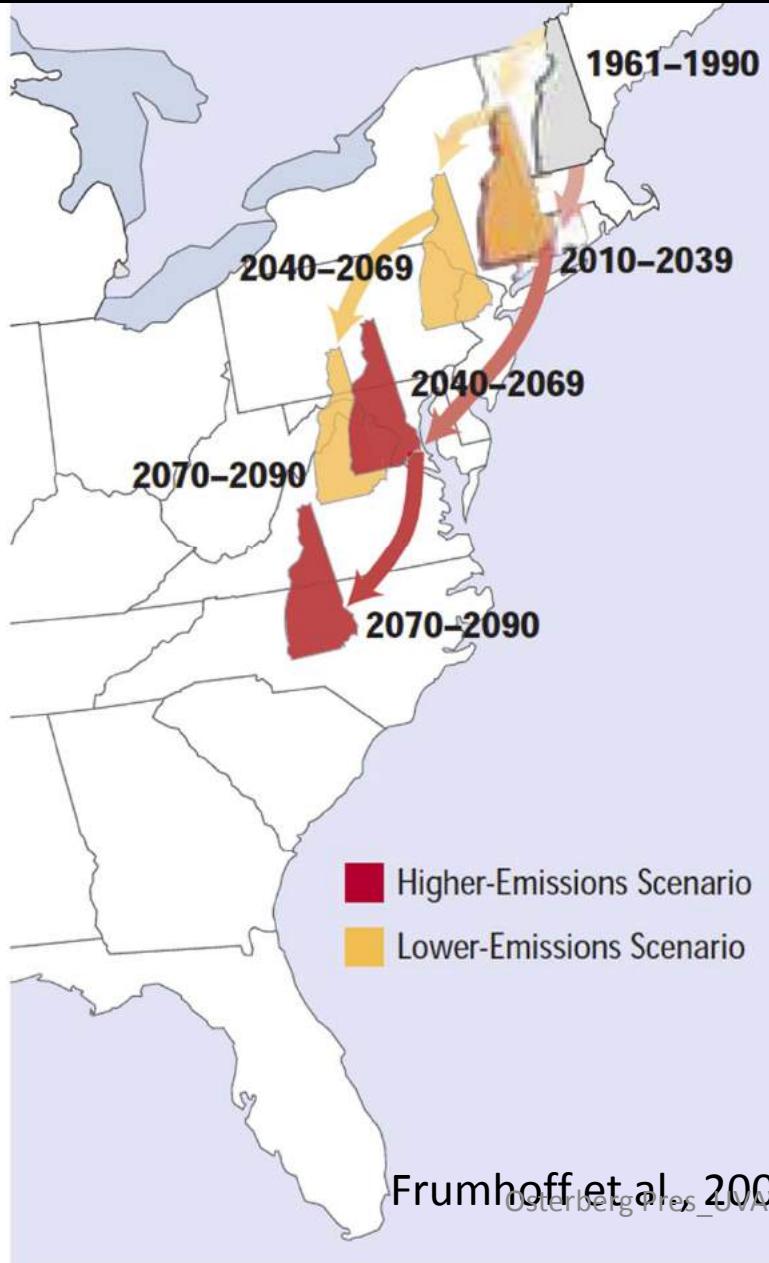
# Our Choice: Temperatures 4-9 °F Warmer by 2100



## The Future: Many More Very Hot Days



# The Future: NH Summers Will Feel Like N. Carolina

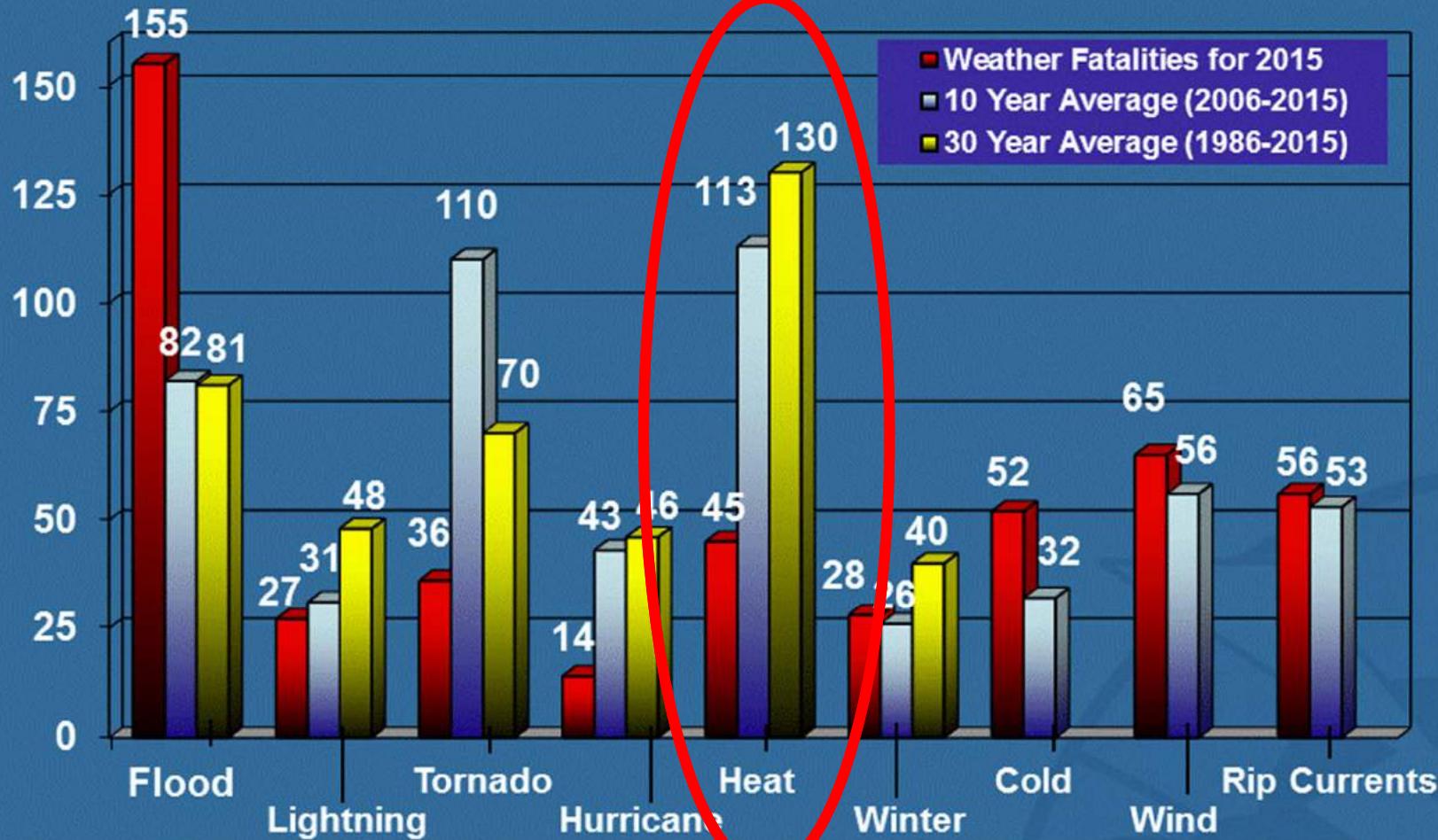


- **Under Business as Usual**: In 65 years, NH's summers will feel like North Carolina's summers do today
- Heat index related to temperature AND humidity = “feels like”

# Temperature Effects: Heat Stress Increases Fatalities of At-Risk Populations



## Weather Fatalities



# 2003 European Heat Wave: 35,000+ Deaths

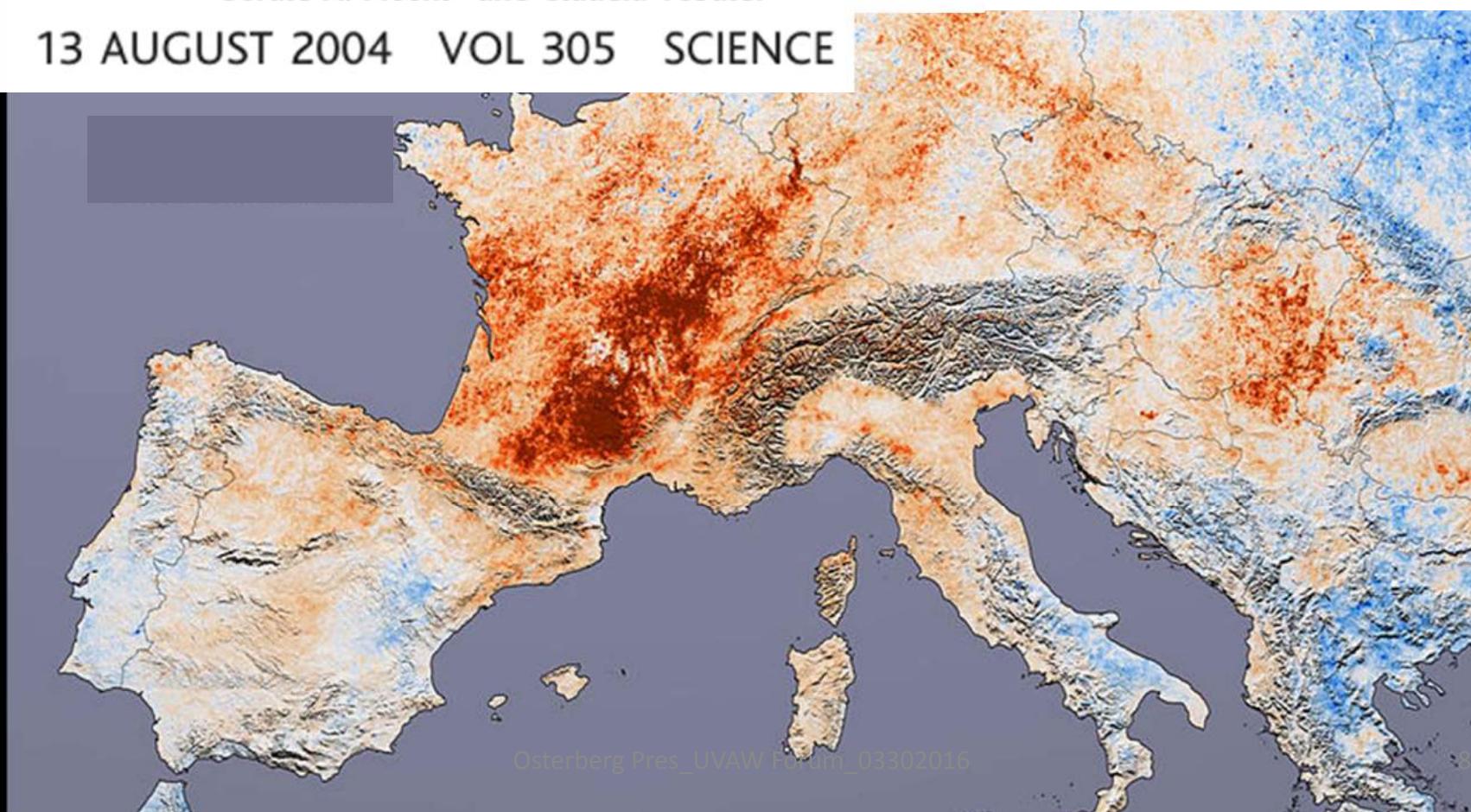
**More Intense, More Frequent, and  
Longer Lasting Heat Waves in  
the 21st Century**

Temp. Anomaly

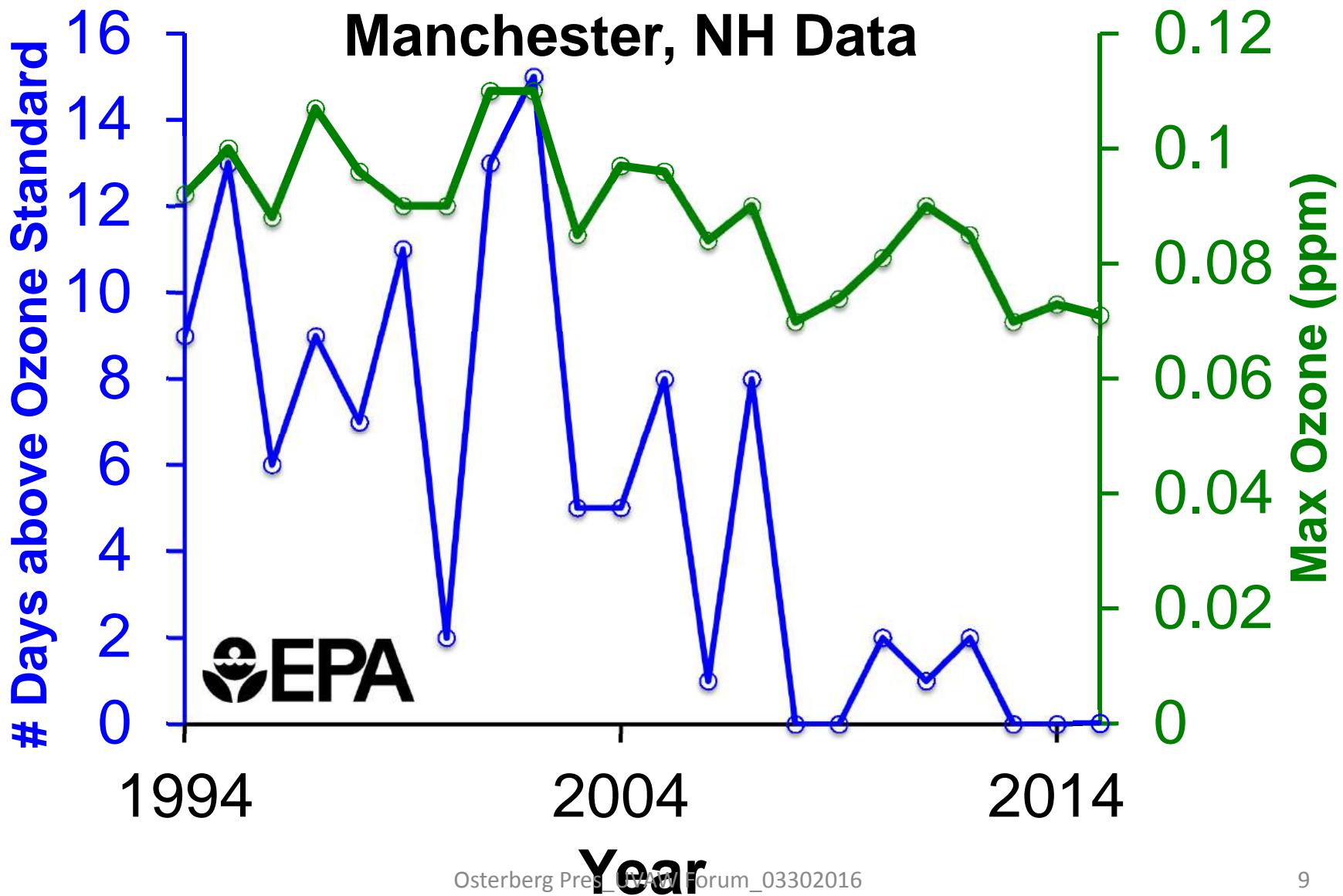
-18 -9 0 9 18  
°F

Gerald A. Meehl\* and Claudia Tebaldi

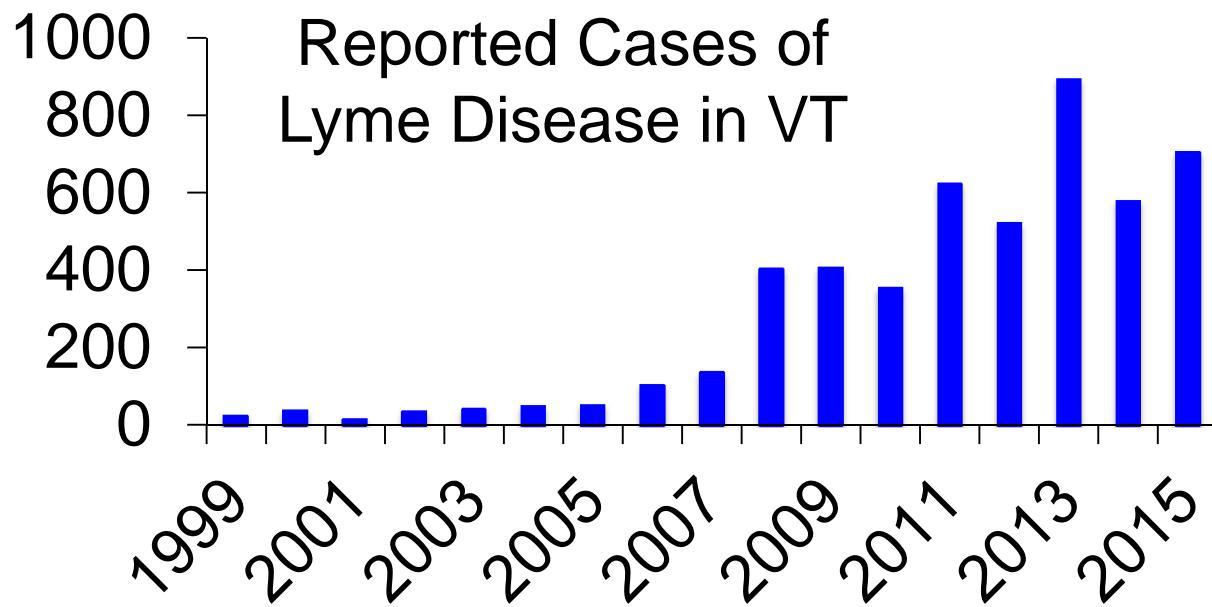
13 AUGUST 2004 VOL 305 SCIENCE



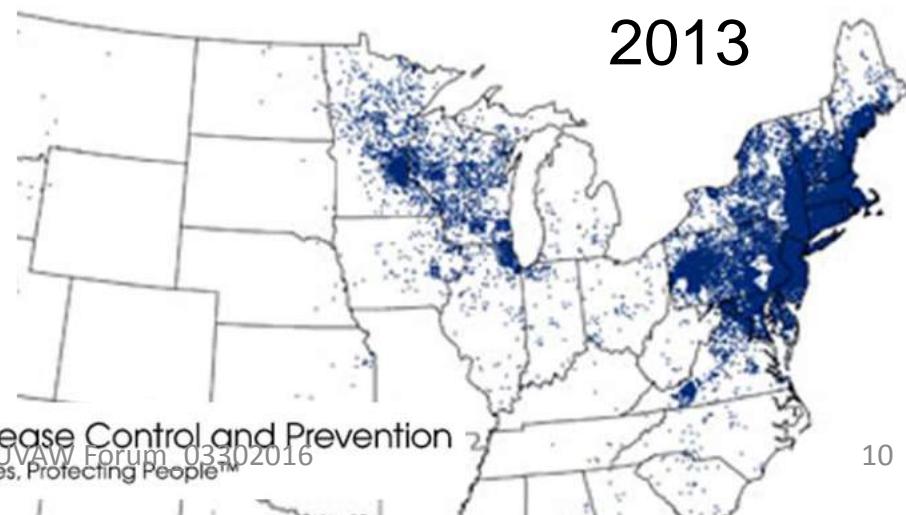
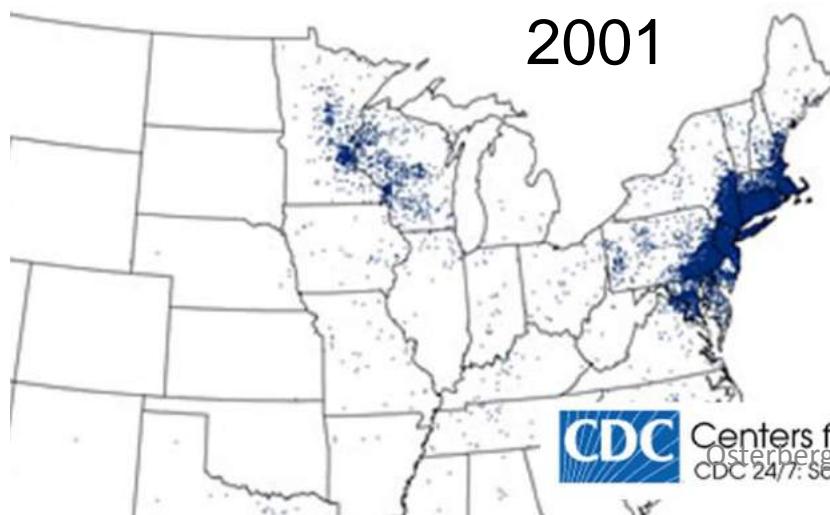
# Warming Increases Smog, But Smog Levels Declining due to Mitigation



# Increased Lyme Disease in NE: Climate Connection?



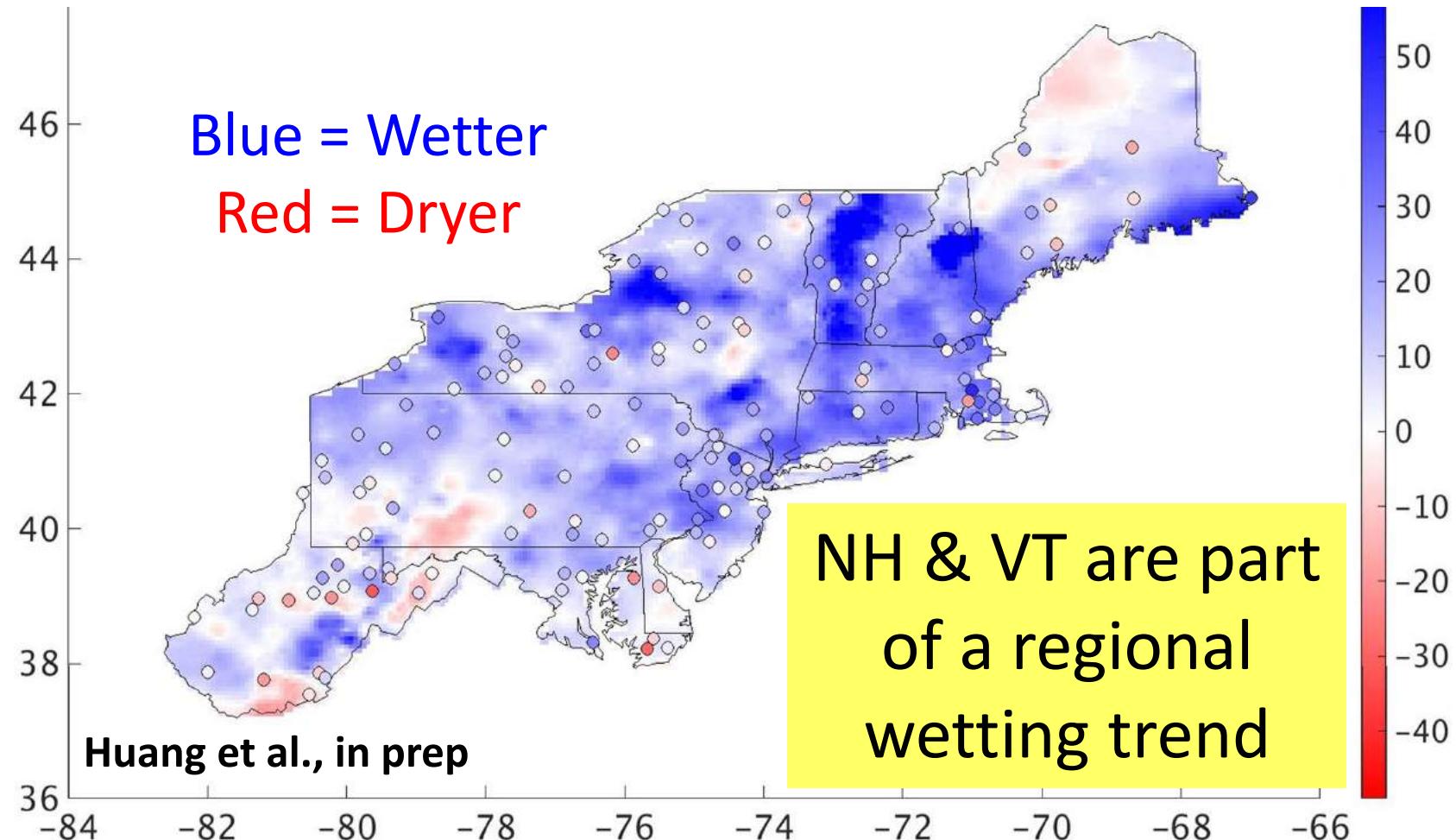
Reported Cases of Lyme Disease



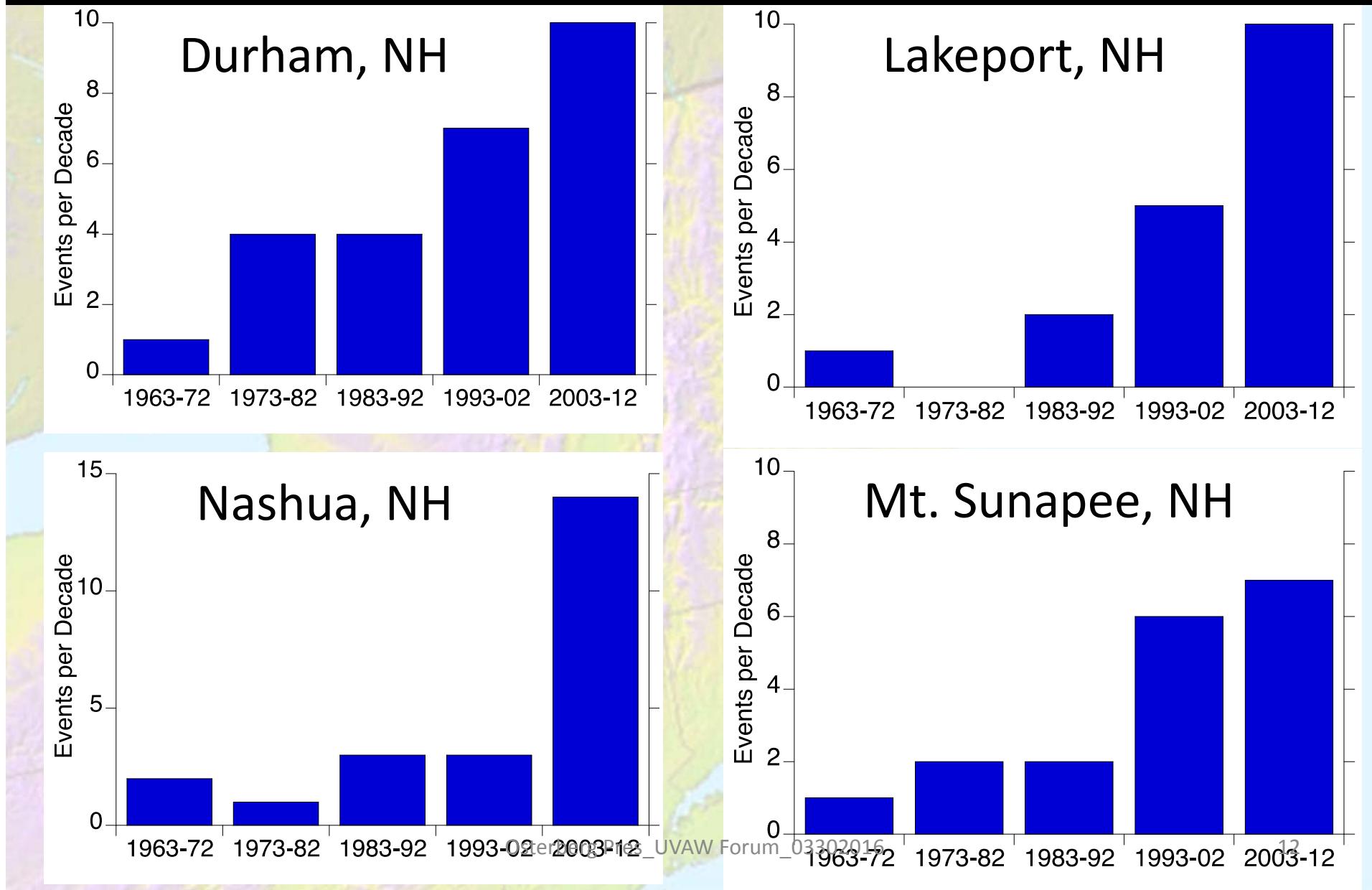
Centers for Disease Control and Prevention  
Osterberg Pres. UVAW Forum 03302016  
CDC 24/7: Saving Lives. Protecting People™

# The Northeast is Already Getting Wetter (5-15%)

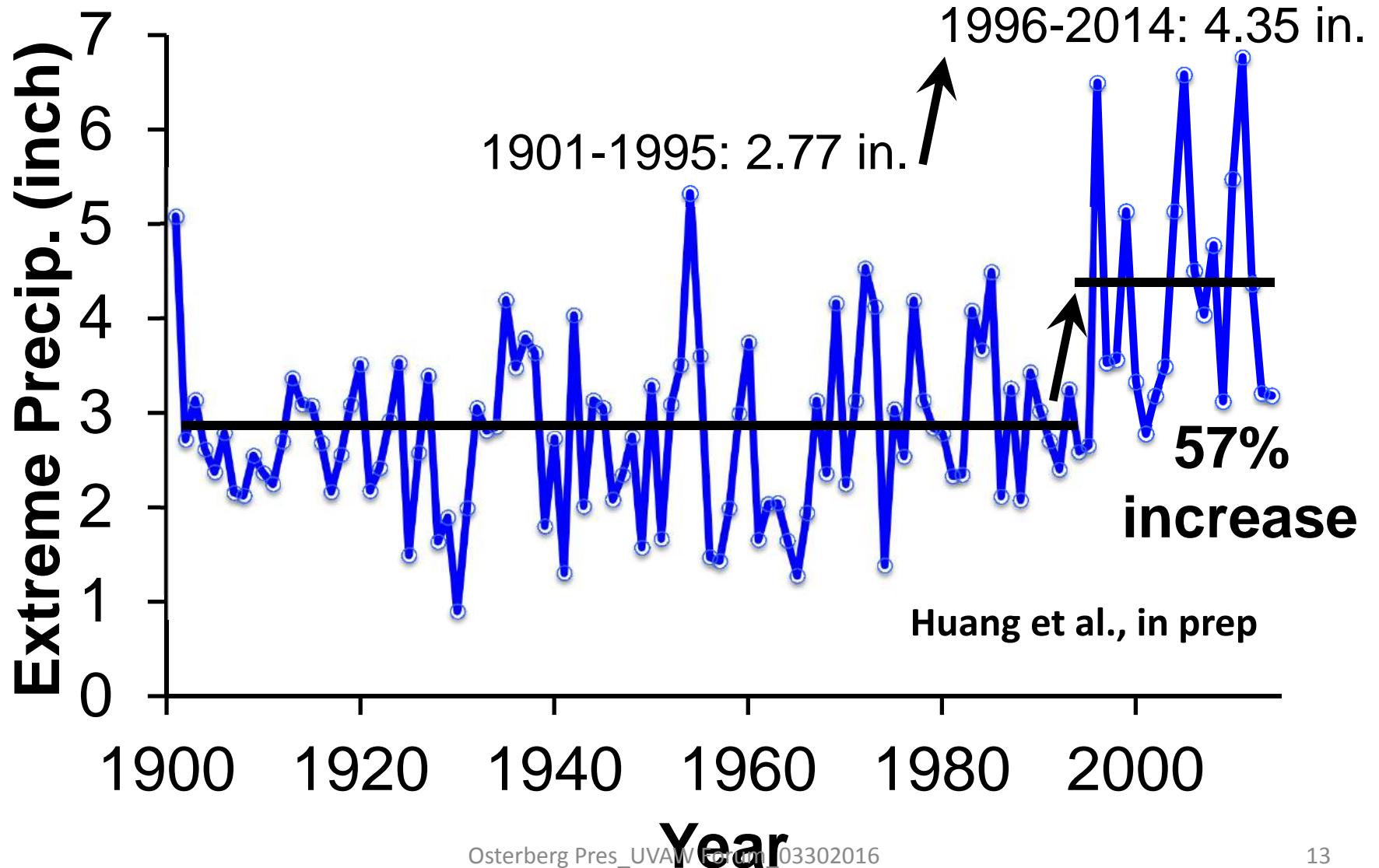
Trends in Total Annual Precipitation from 1901-2011



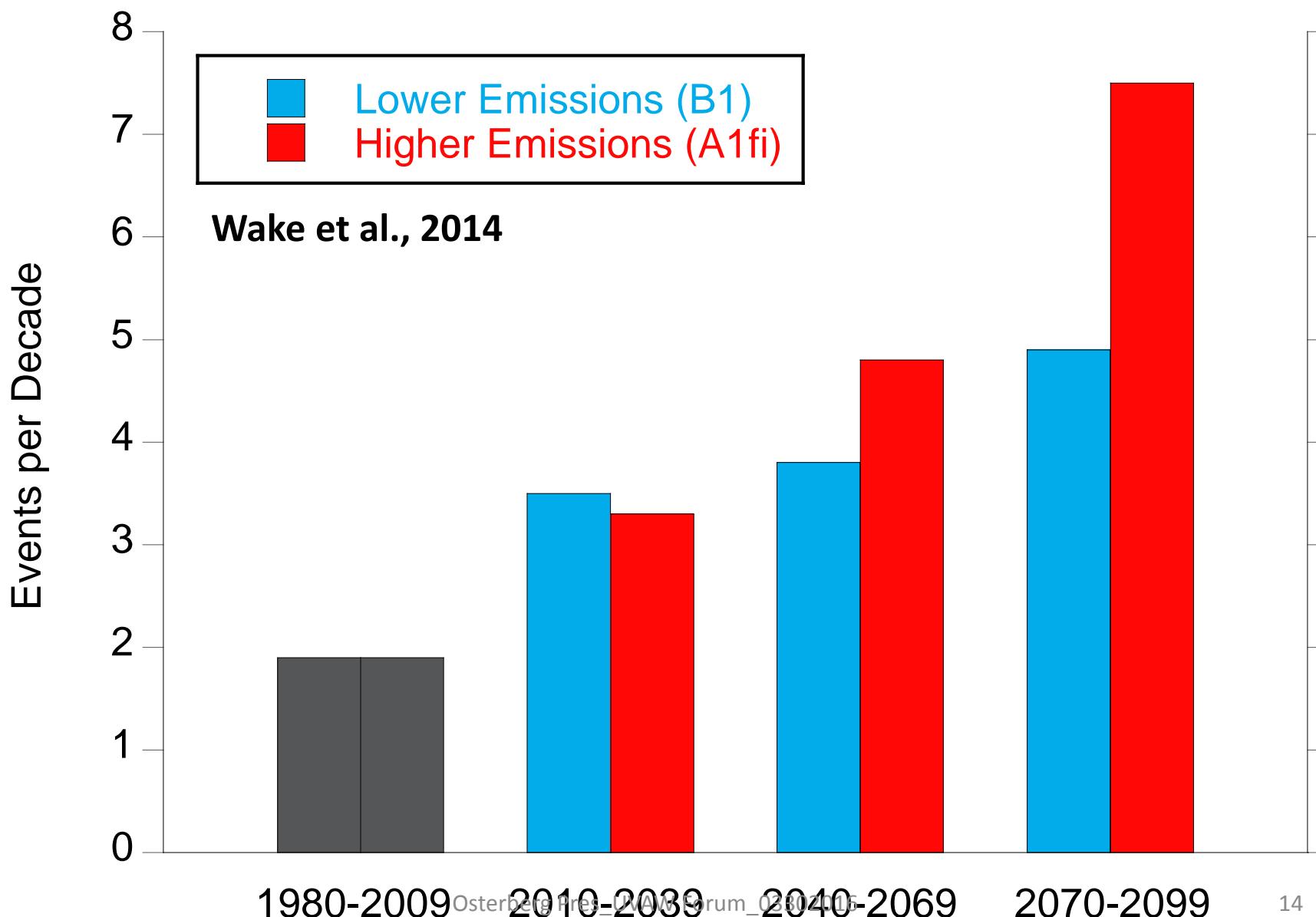
# Extreme Rainfall Events are Becoming More Frequent (Extreme is >4" in 48 Hours) Wake et al., 2014



Extreme Rainfall from 1996-2014 was  
~50% higher than from 1901-1995



# The Future: More Extreme Storms (like recently)



# Lebanon NH – July 2, 2013 Thunderstorms

3.5" Rain at Lebanon Airport



Osterberg Pres\_UVAW Forum\_93302016.

Courtesy M. Goodwin

# Lebanon NH – July 2, 2013 Thunderstorms

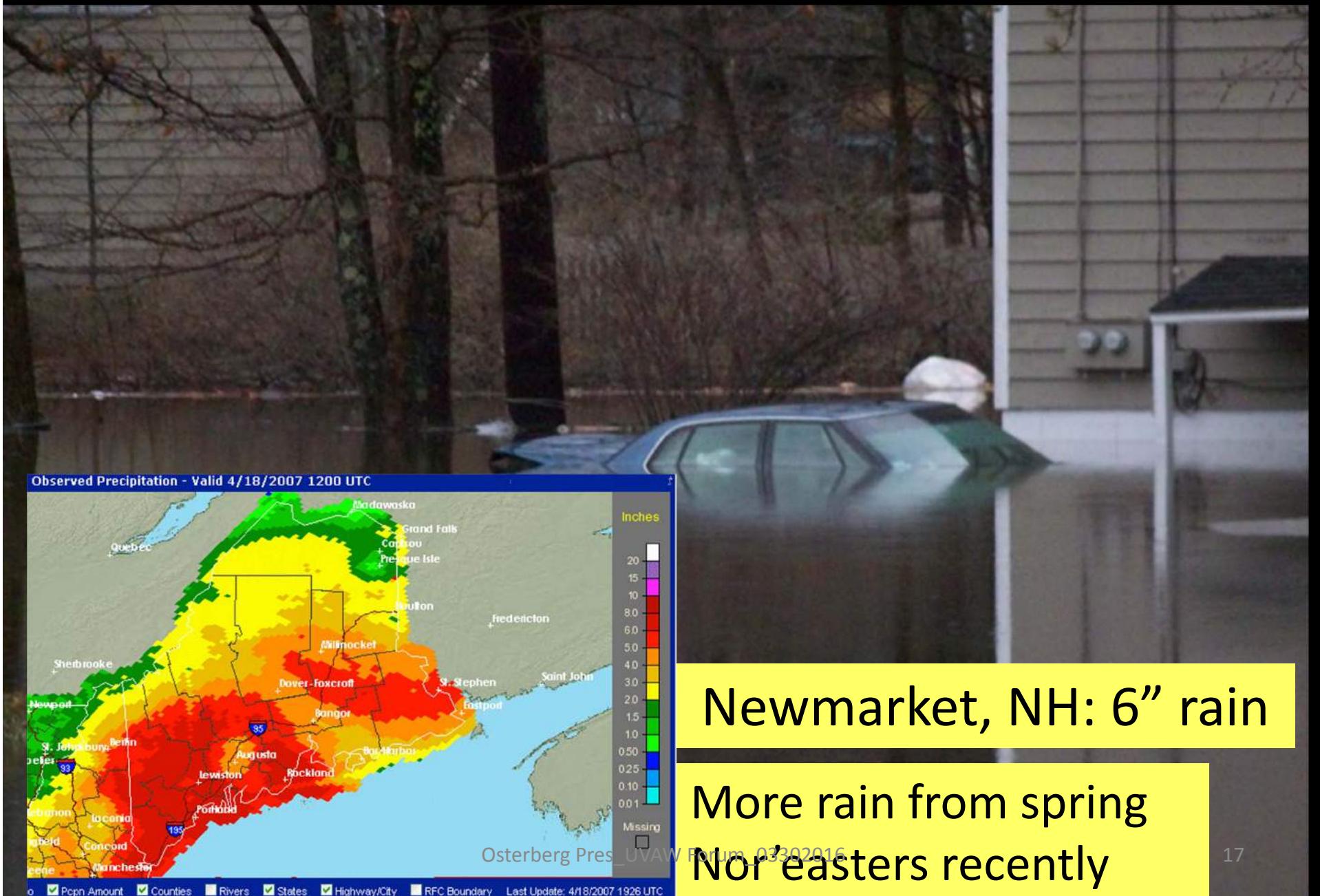


3.5" Rain at  
Lebanon Airport

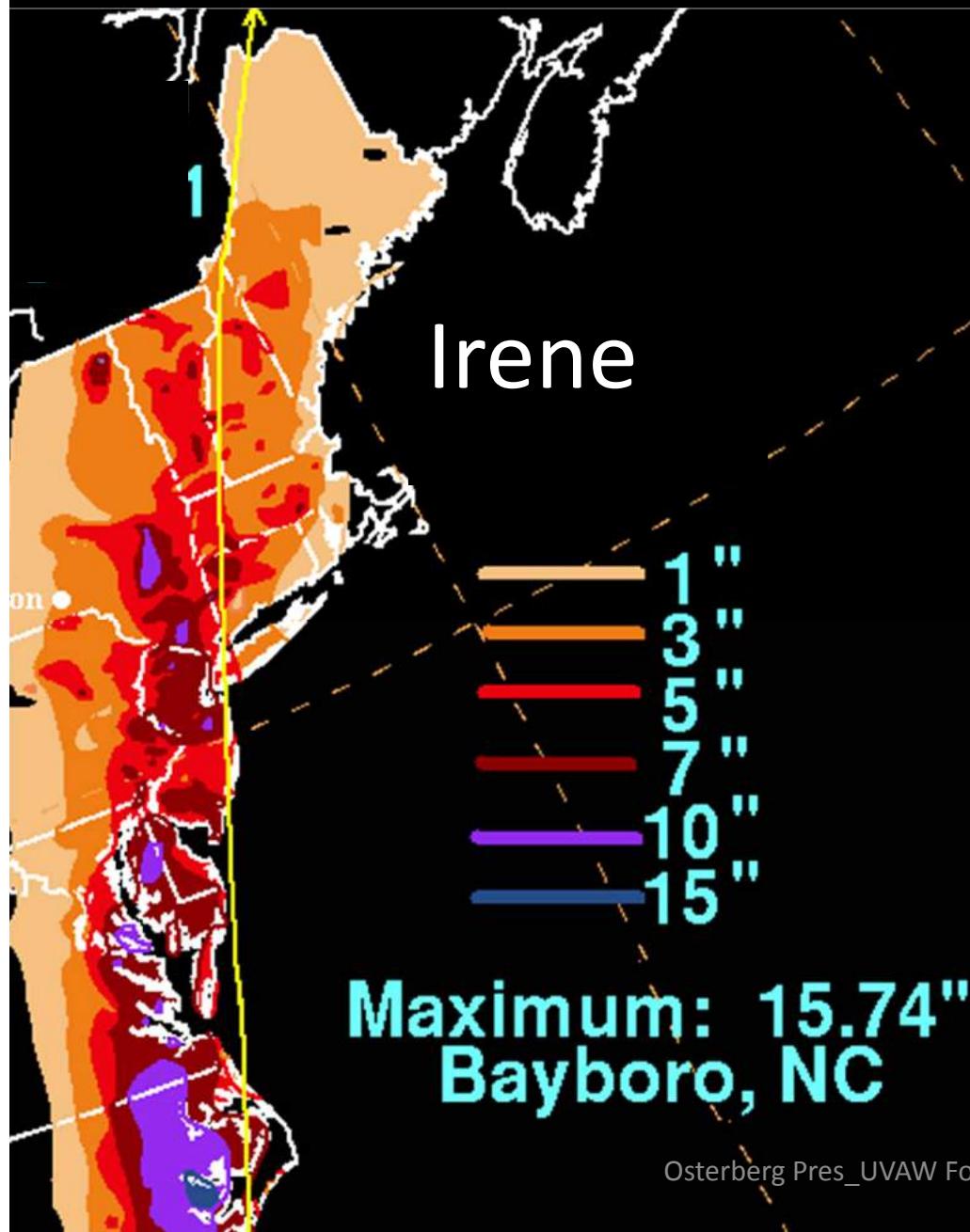


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# President's Day 2007 Nor'easter



# Hurricane Irene: August, 2011



# Hurricane Irene: August, 2011

\$800 Million in NH & VT

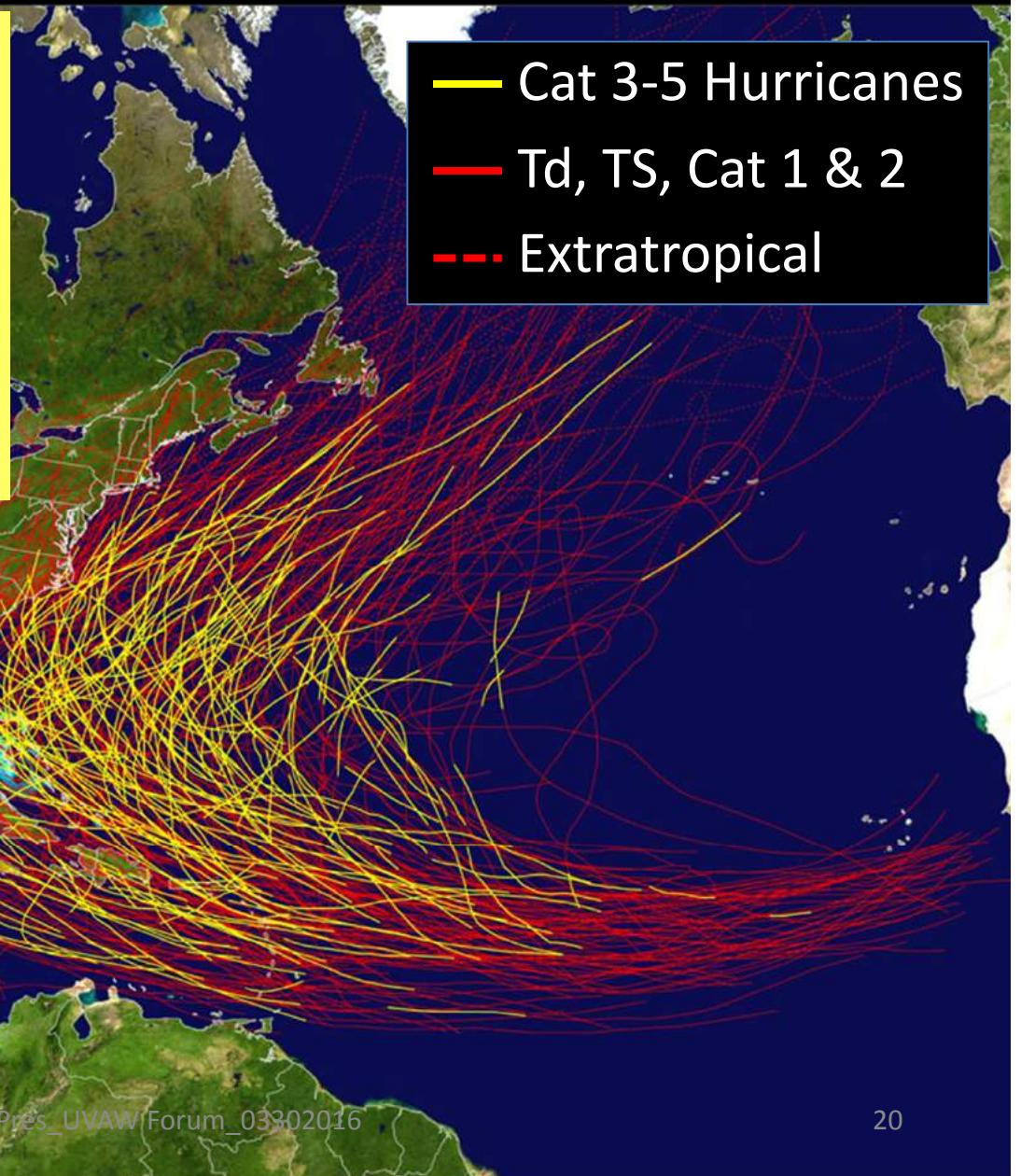


# The Future: Fewer but MORE Powerful Hurricanes

## The Future:

Possibly FEWER weak  
Hurricanes (jury still out)

But likely MORE strong  
Hurricanes (Category 3-5)



## Climate Change in Southern New Hampshire

PAST, PRESENT, AND FUTURE

A PUBLICATION OF THE SUSTAINABILITY INSTITUTE AT THE UNIVERSITY OF NEW HAMPSHIRE



## Climate Change and Human Health in New Hampshire

AN IMPACT ASSESSMENT

A PUBLICATION OF THE SUSTAINABILITY INSTITUTE AT THE UNIVERSITY OF NEW HAMPSHIRE



**Dr. Cameron Wake**  
**University of New Hampshire**



osborne@unh.edu | 03302016

climate  
solutions  
new england

# New England Climate Assessments

ClimateSolutionsNE.org

## Climate Change in Northern New Hampshire

PAST, PRESENT, AND FUTURE

A PUBLICATION OF THE SUSTAINABILITY INSTITUTE AT THE UNIVERSITY OF NEW HAMPSHIRE



# Summary

- NH & VT have been warming (2-4°F since 1895) and getting wetter (~8-15% since 1900), with more extreme storms (~50% higher recently)
- By 2100, projections show:
  - 5-9°F warmer (largest in winter)
  - 2-7 weeks more extreme heat each summer
  - Extreme storms similar to 2000's (or more?)
- Largest local health impacts likely to be:
  - Heat injuries and mortality
  - Flooding injuries and mortality, mental health, and pathogens and chemicals
  - Vector-borne disease