RUTGERS UNIVERSITY
New Jersey Agricultural Experiment Station

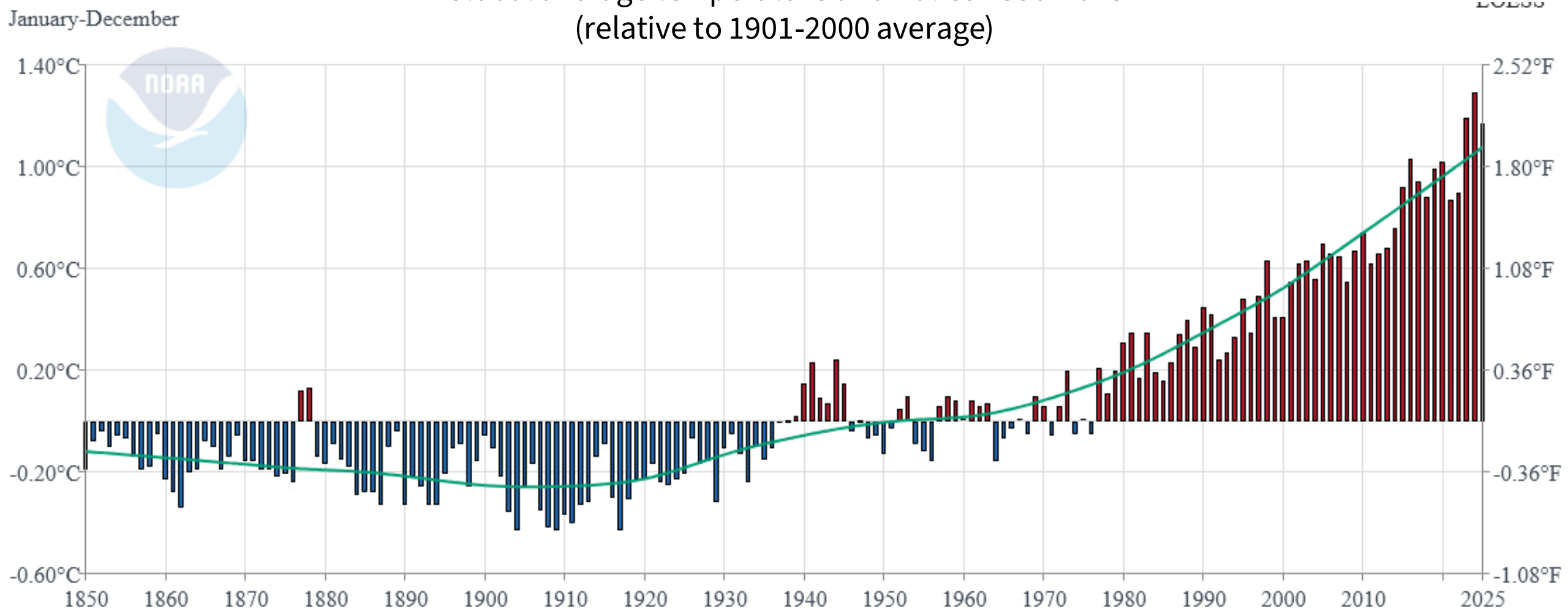
Climate, Extreme Weather, and NJ Agriculture

Anthony J. Broccoli
Distinguished Professor of Atmospheric Science
Department of Environmental Sciences

February 11, 2026

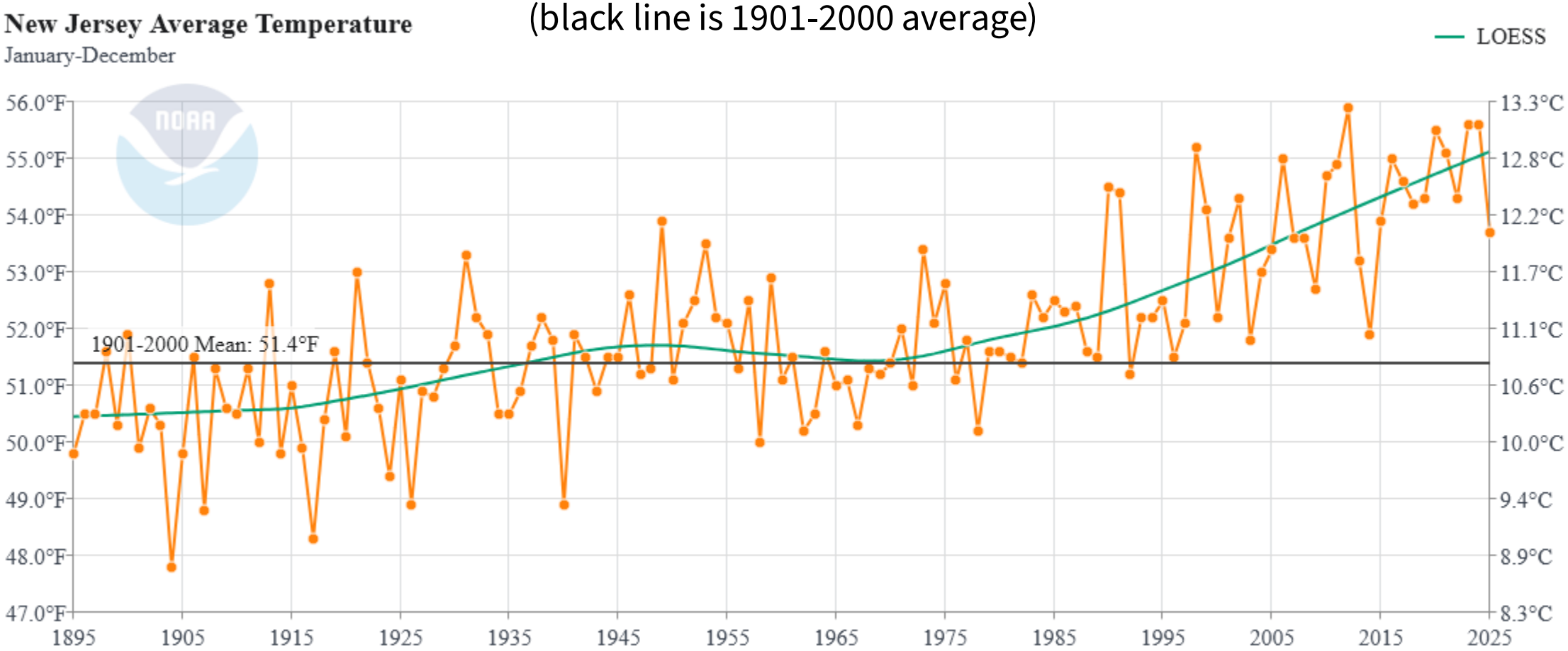
Earth is warming…

Global average temperature anomalies 1850-2025
(relative to 1901-2000 average)



…and so is New Jersey

Statewide average temperature 1850-2025
(black line is 1901-2000 average)



Monthly temperatures in NJ since 2001

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Jan																									
Feb																									
Mar																									
Apr																									
May																									
Jun																									
Jul																									
Aug																									
Sep																									
Oct																									
Nov																									
Dec																									

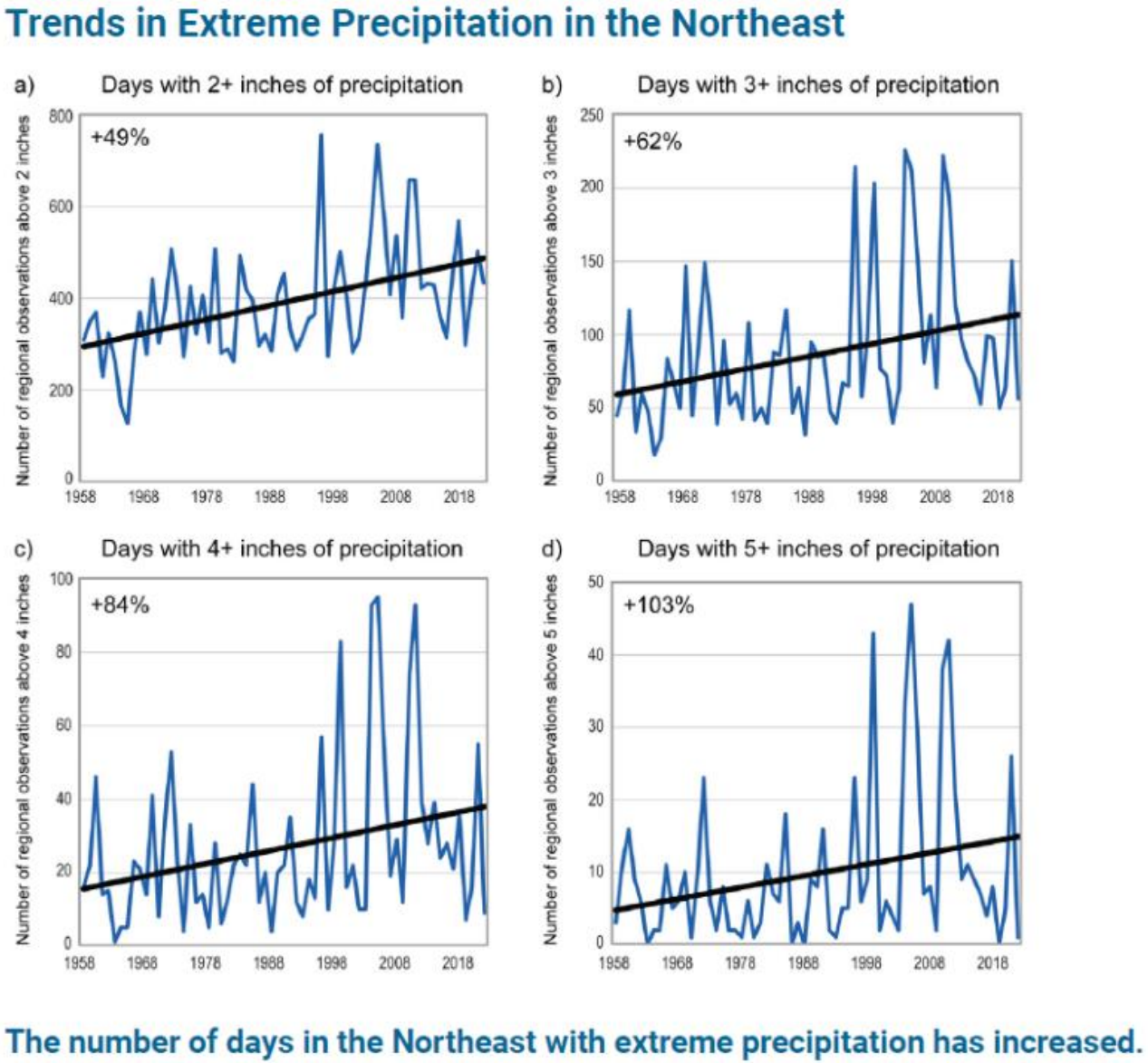
Monthly temperatures in NJ since 2001

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Jan						4																	1		
Feb																	1	2		3			3		
Mar												1				4									
Apr										2							1		5				3		
May				3								5			1			4							
Jun								5		1														3	
Jul											4									1					5
Aug					4											2		3			5	1			
Sep					3										2	5		3							
Oct							1										3				2				
Nov						2			3						1					3				5	
Dec	5					2									1						3		3		

- Unusually warm and cold months are defined as the five warmest and coldest for each calendar month
- Since 2001, there have been 44 unusually warm months and 0 unusually cold months, with 28 unusually warm months in the last 10 years.

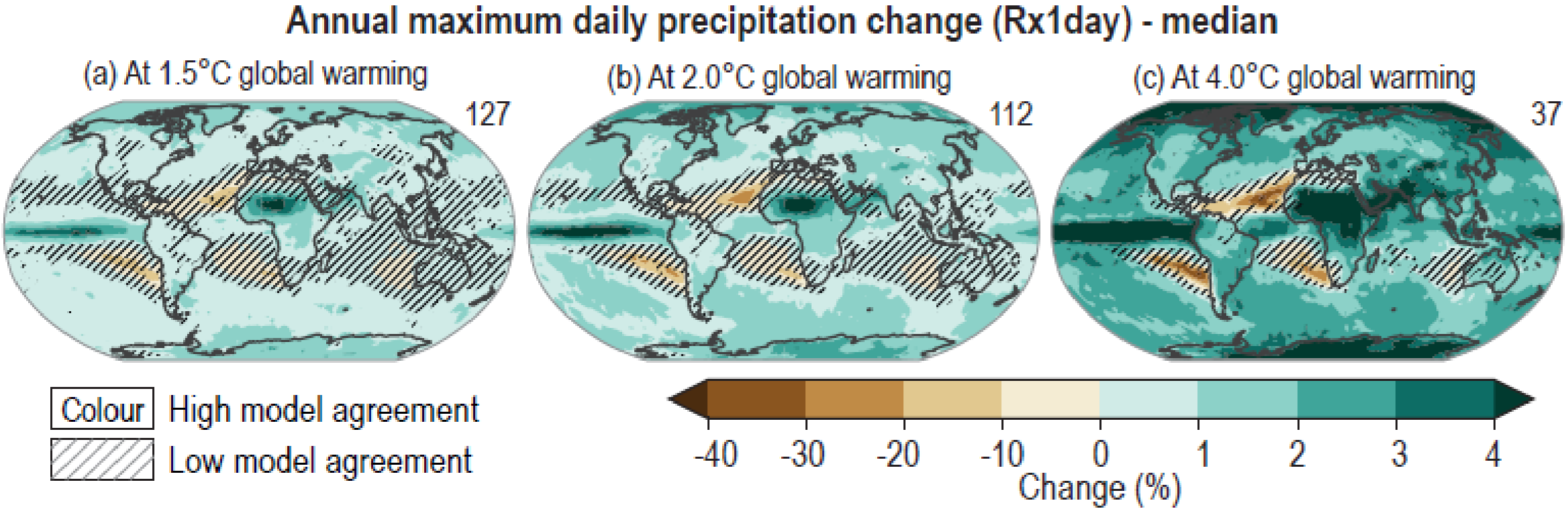
Heavy rains are getting more intense

- A warmer atmosphere has the capacity to contain more water vapor.
- In a warming climate, when meteorological conditions are conducive to producing heavy rains, more moisture is available.
- This trend is projected to continue.



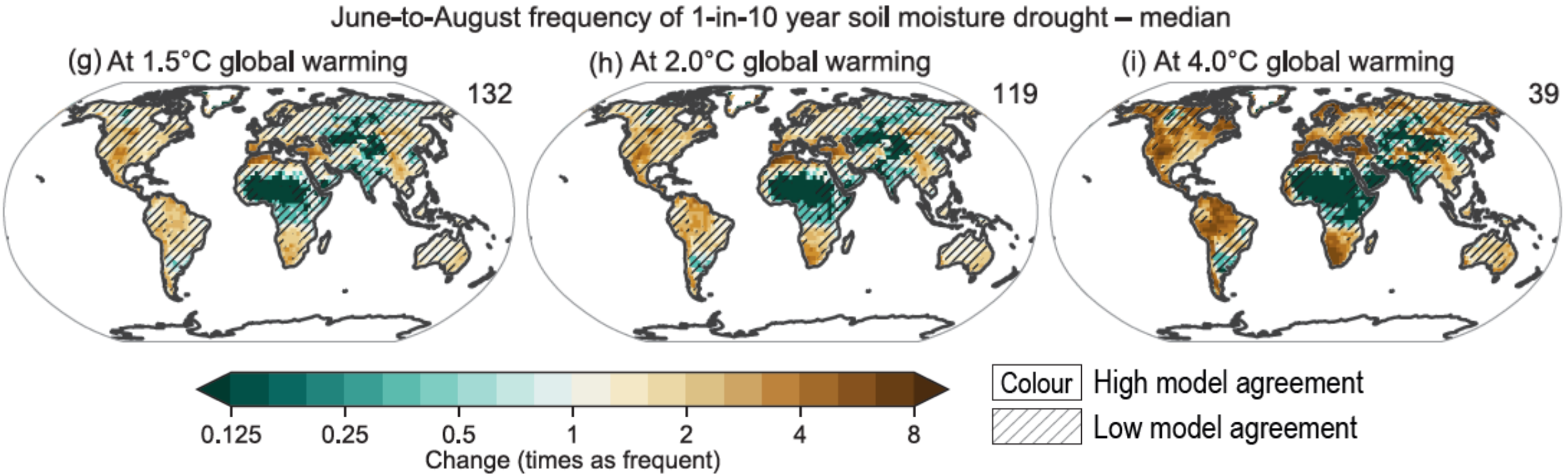
(Source: Fifth National Climate Assessment)

The trend in intense rains is expected to continue



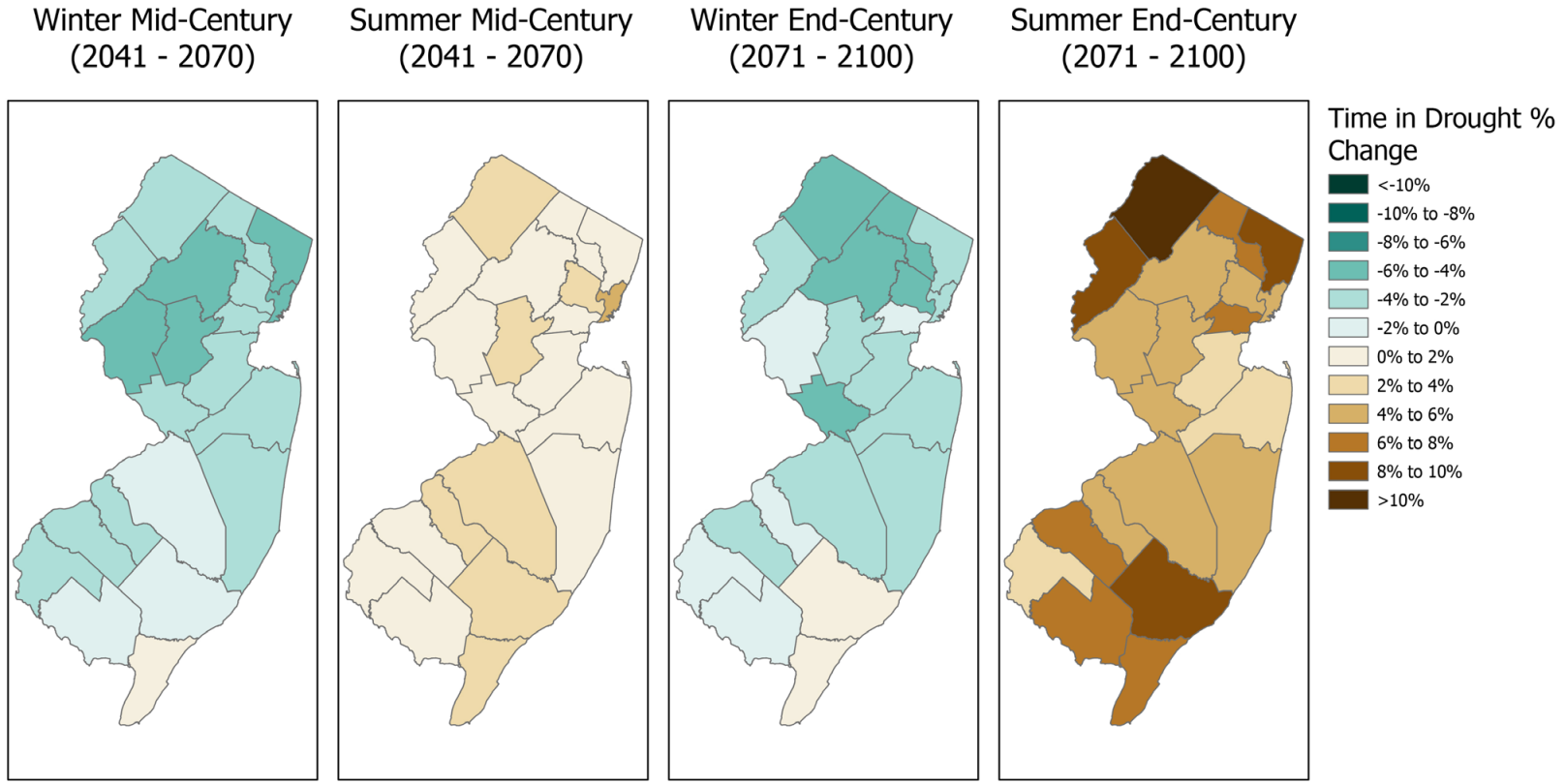
Source: *Climate Change 2021: The Physical Basis*, IPCC

The likelihood of summer drought is expected to increase as the climate warms



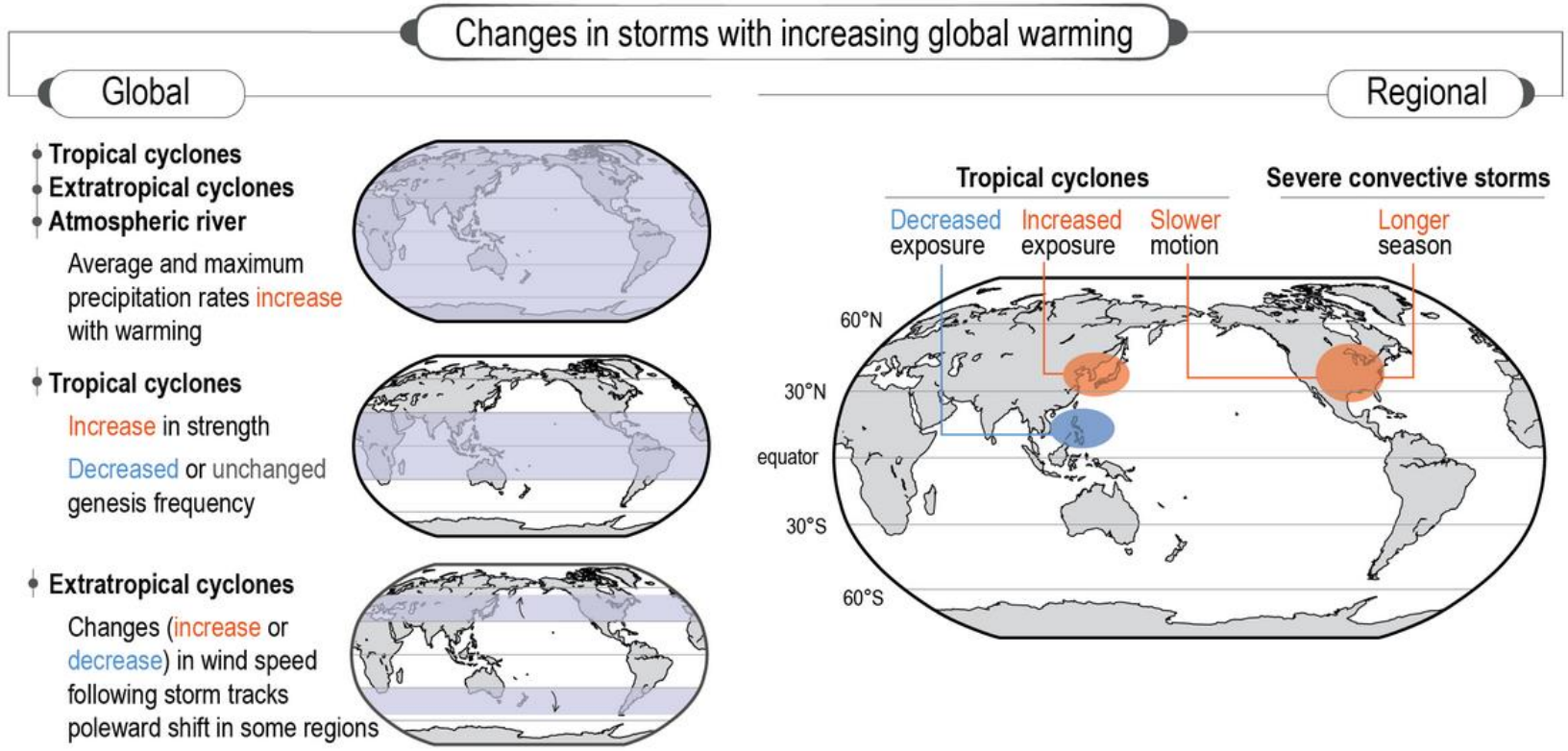
Source: *Climate Change 2021: The Physical Basis*, IPCC

The likelihood of summer drought is expected to increase as the climate warms



Source: *State of the Climate New Jersey 2024*

What about hurricanes, tornadoes, and severe thunderstorms?



Source: *Climate Change 2021: The Physical Basis*, IPCC

When an extreme weather event happens, was it caused by climate change?

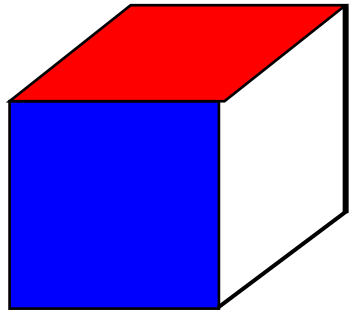
This is not the best way to frame the question.

- The right question to ask about climate change is whether it has **altered the probabilities** of experiencing certain kinds of weather or climate events.
- Dr. James Hansen, formerly of NASA and now at Columbia University, has developed an excellent analogy involving dice.

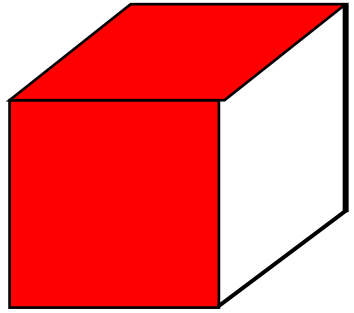
Jim Hansen's climate dice

- Let's use temperature as an example

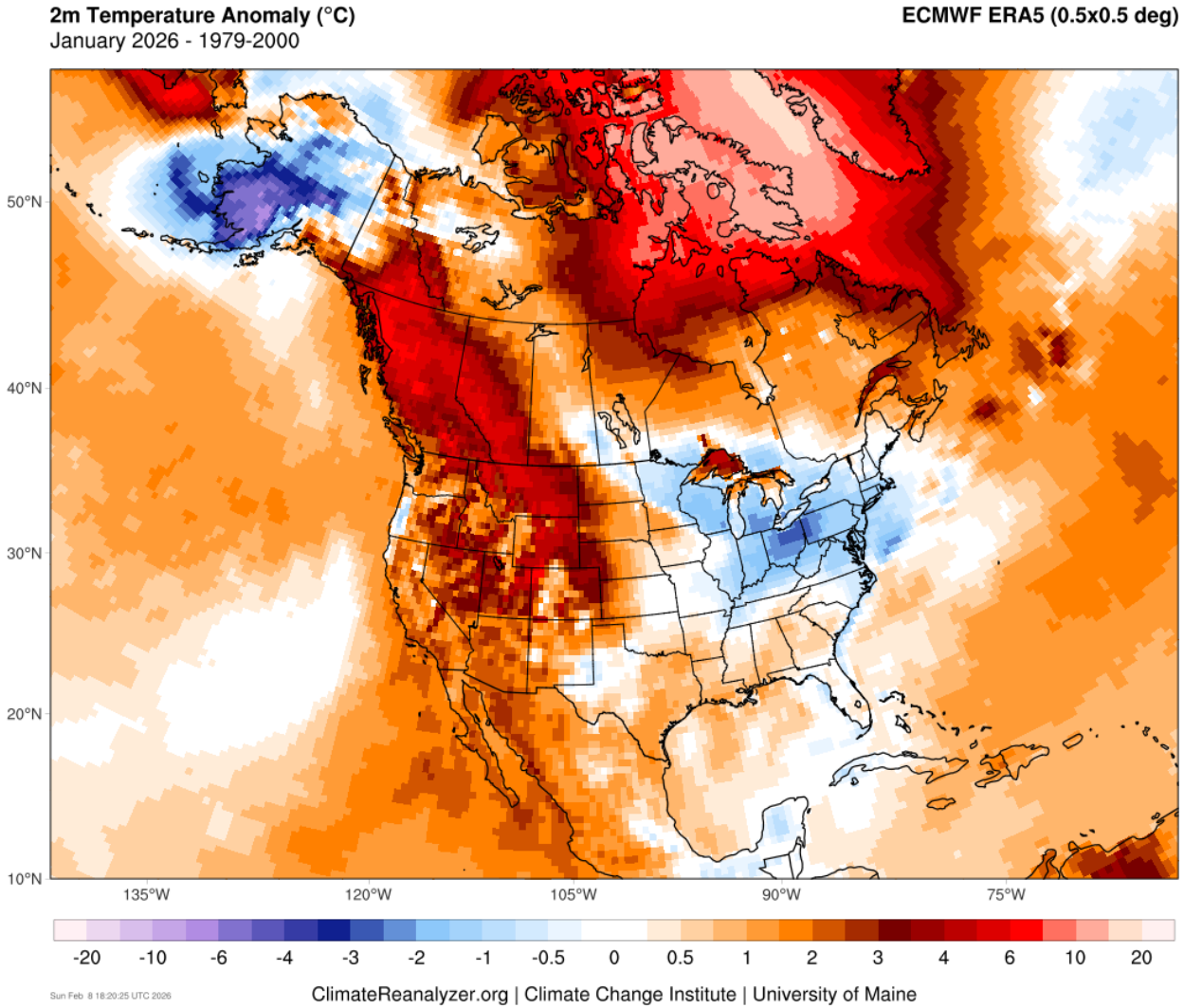
Before climate change:
2 blue faces (cold), 2 white faces (average),
and 2 red faces (warm)

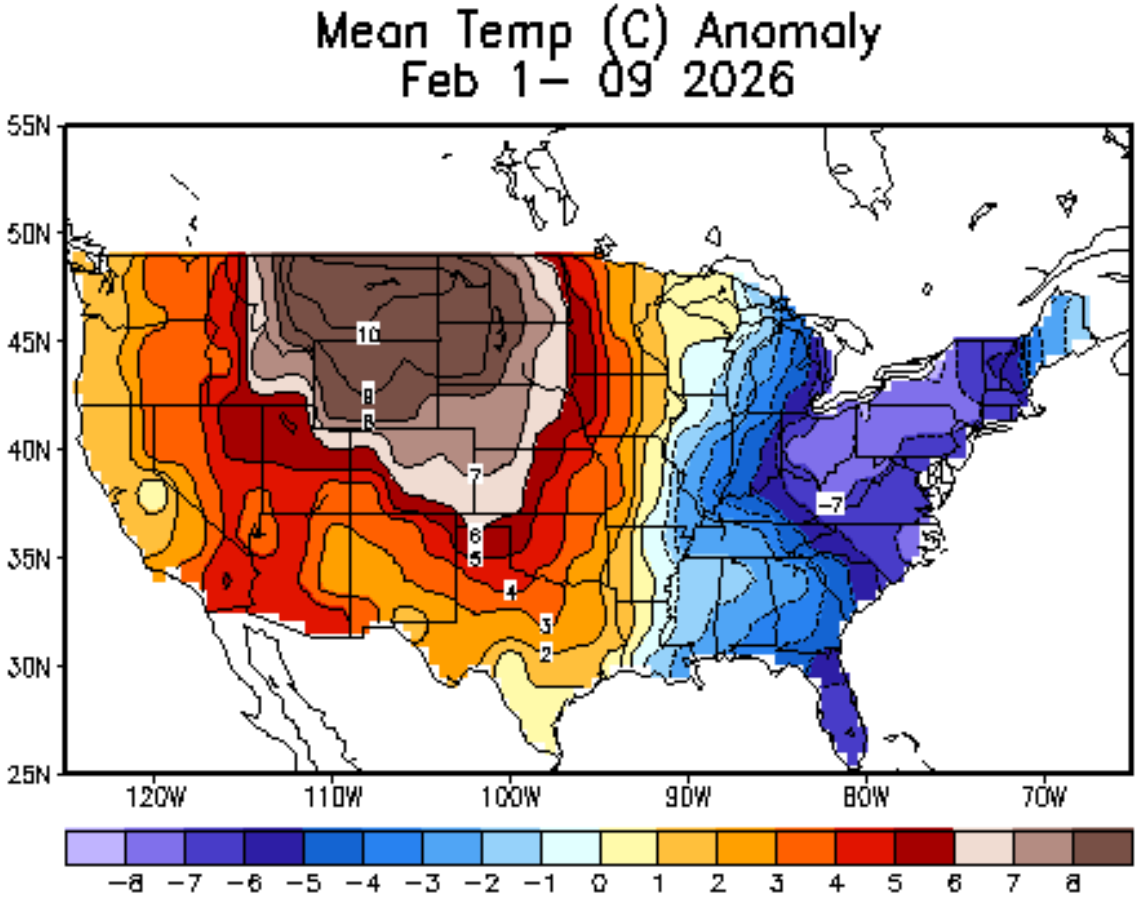


After climate change:
1 blue face (cold), 2 white faces (average),
and 3 red faces (warm)



But it's been cold lately…





Future changes in extreme weather

- More hot days
- Fewer cold days
- Heavy rains increase in intensity
- Reduced summer soil moisture
- Stronger and wetter hurricanes
- Longer severe thunderstorm season

RUTGERS UNIVERSITY
New Jersey Agricultural Experiment Station