The difference between weather and climate

What The Science Says:
Weather and climate are different; climate predictions do not need weather detail.

Climate Myth: Scientists can't even predict weather
...Since modern computer models cannot with any certainty predict the weather two weeks from now, how can we rely upon computer models to predict what the Earth's climate might be like a hundred years from now? They can't! Yet people like Al "Carbon-Credit" Gore want you to believe that these models can predict the future. I bet I can do at least as well with a crystal ball (source: Kowabunga)

This claim is based more on an appeal to emotion than fact. The inference is that climate predictions, decades into the future, cannot be possibly right when the weather forecast for the next day has some uncertainty.

In spite of the claim in this myth, short term weather forecasts are highly accurate and have improved dramatically over the last three decades. However, slight errors in initial conditions make a forecast beyond two weeks nearly impossible.

Atmospheric science students are taught "weather is what you get and climate is the weather you expect". This is why this common skeptical argument doesn't hold water. Climate models are not predicting day to day weather systems. Instead, they are predicting climate averages.

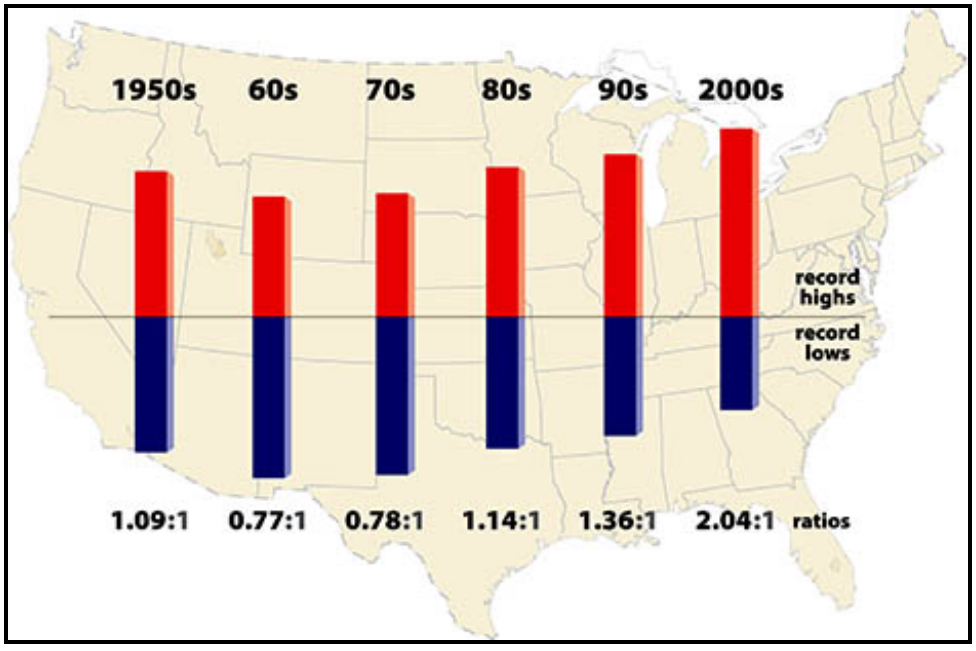

*Figure 1: Record highs are an example of extreme weather, but an increase in record highs versus record lows is a symptom of a changing climate. From Meehl et al.**

A change in temperature of 7º Celsius from one day to the next is barely worth noting when

you are discussing weather. Seven degrees, however, make a dramatic difference when talking about climate. When the Earth's AVERAGE temperature was 7ºC cooler than the present, ice sheets a mile thick were on top of Manhattan!

A good analogy of the difference between weather and climate is to consider a swimming pool. Imagine that the pool is being slowly filled. If someone dives in there will be waves. The waves are weather, and the average water level is the climate. A diver jumping into the pool the next day will create more waves, but the water level (aka the climate) will be higher as more water flows into the pool.

In the atmosphere the water hose is increasing greenhouse gases. They will cause the climate to warm but we will still have changing weather (waves). Climate scientists use models to forecast the average water level in the pool, not the waves. A good basic explanation of climate models is available in *Climate Change- A Multidisciplinary Approach by William Burroughs.*

Source: AMS Policy Statement on Weather Analysis and Forecasting. Bull. Amer Met. Soc., 79, 2161-2163

*Image source: Meehl, G. A., C. Tebaldi, G. Walton, D. Easterling, and L. McDaniel (2009), Relative increase of record high maximum temperatures compared to record low minimum temperatures in the U.S., *Geophys. Res. Lett.*, 36, L23701, doi:10.1029/2009GL040736.

Basic rebuttal written by dansat

Update July 2015:

Here is a related lecture-video from Denial101x - Making Sense of Climate Science Denial

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Skeptical Science explains the science of global warming and examines climate misinformation through the lens of peer-reviewed research. The website won the Australian Museum 2011 Eureka Prize for the Advancement of Climate Change Knowledge. Members of the Skeptical Science team have authored peer-reviewed papers, a college textbook on climate change and the book Climate Change Denial: Heads in the Sand. Skeptical Science content has been used in university courses, textbooks, government reports on climate change, television documentaries and numerous books.