Using Graphs to Communicate Aspects of Climate

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Outline

- The challenge of communicating about climate
- Perspective on recent historical climate
- Perspective on projected future climate
- Discussion

Goals of a State Climatologist

- To be knowledgeable of all aspects of your state's climate
- To be an engaged listener and observer
- To be an effective communicator

Communication Scenarios

- Conversation
- Public speaking
- Media interview
- Graphics

Thinking about Climate

- The distinction between weather and climate is unclear.

- Climate is less tangible than weather.

- Cognitive biases affect perceptions of climate.

Weather and Climate

NASA

The difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere "behaves" over relatively long periods of time.

(http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html)

University Corporation for Atmospheric Research

Weather is the mix of events that happen each day in our atmosphere including temperature, rainfall and humidity. … Climate is the average weather pattern in a place over many years.

(http://www.eo.ucar.edu/basics/index.html)

A Statistical Perspective

"Climate is what you expect, weather is what you get."

- A simplified definition with a foundation in statistical probability, where *expectation* is associated with *average*.

- A more complete statistical definition addresses aspects of the *variability* of possible weather that could be experienced.

Average: 44.3

41.4   43.8   46.3
50.7   48.2
39.1
47.5   39.6   41.4
45.0
49.4   44.9
42.2

40.6
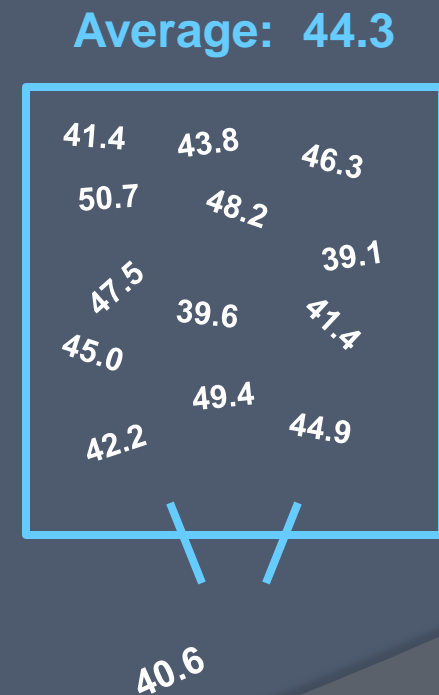
Summary of Recent Winters in Bowling Green, Kentucky

- ◉ 2011-12   43.0°F   1   1.4"
  Warmer than normal, below normal snowfall.

- ◉ 2010-11   35.0°F   17   21.2"
  Colder than normal, above normal snowfall.

- ◉ 2009-10   34.8°F   16   15.4"
  Colder than normal, above normal snowfall.

- ◉ 2008-09   38.1°F   8   3.7"
  Normal temperature, below normal snowfall.

*Values are mean temperature, number of days with maximum temperature ≤ 32°F, total snowfall.*

Designing a Graphic

- Who's the audience?
- What are the key points to be communicated?
- How does the mind subconsciously perceive graphs?
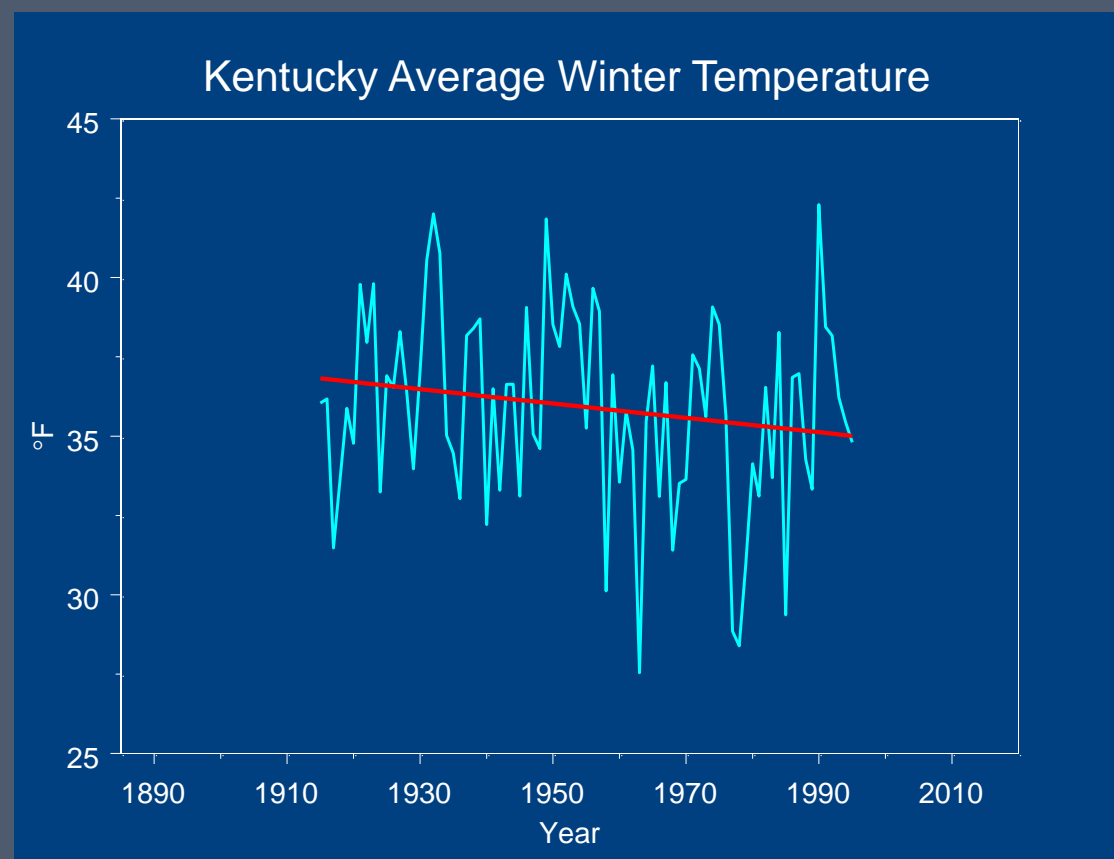- How does the mind consciously analyze and interpret graphs?

Interpreting Climatic Time Series
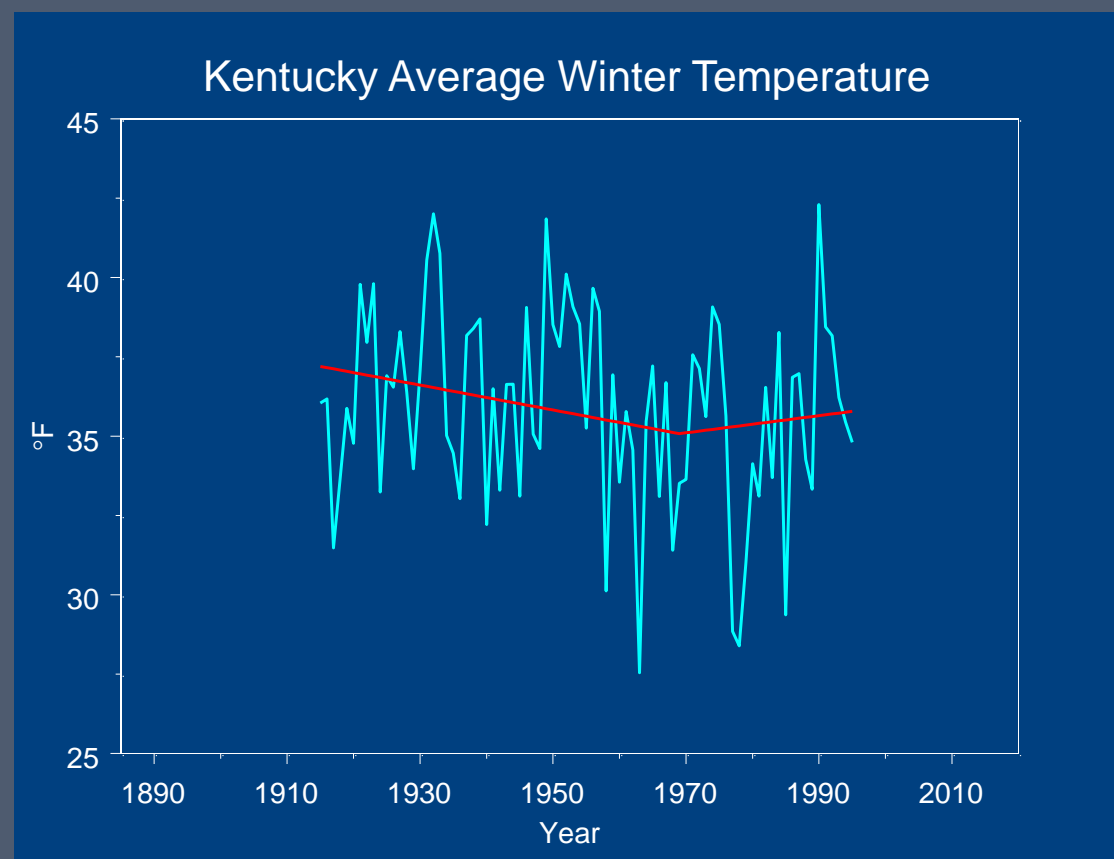## *Low Signal-to-Noise Ratio*

Kentucky Average Winter Temperature
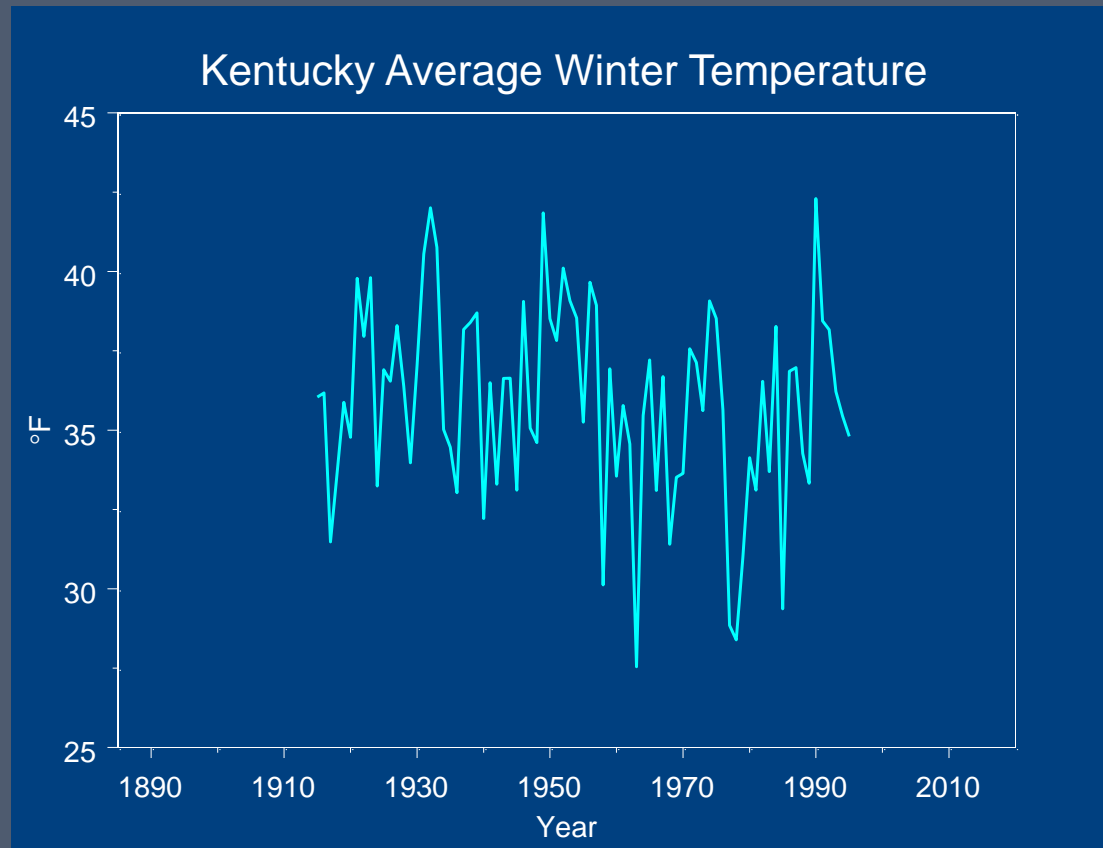
Interpreting Climatic Time Series
Imposing Linear Structure

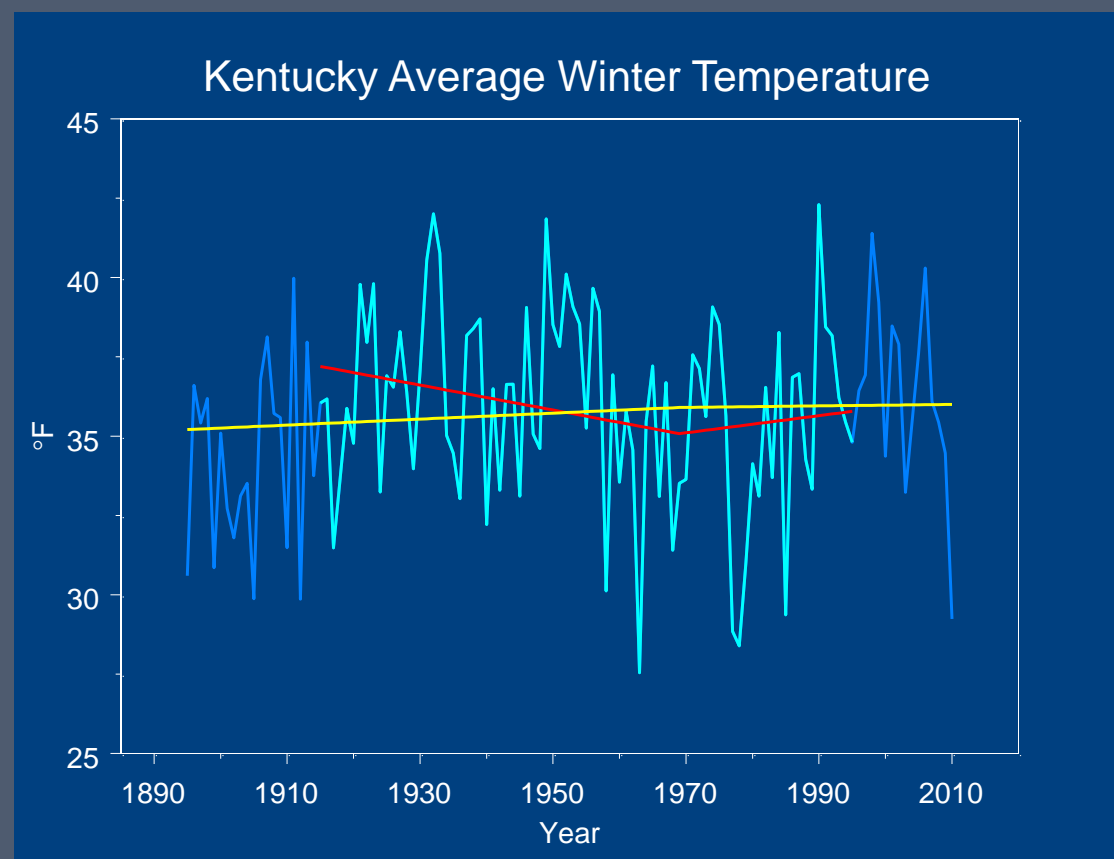# Interpreting Climatic Time Series
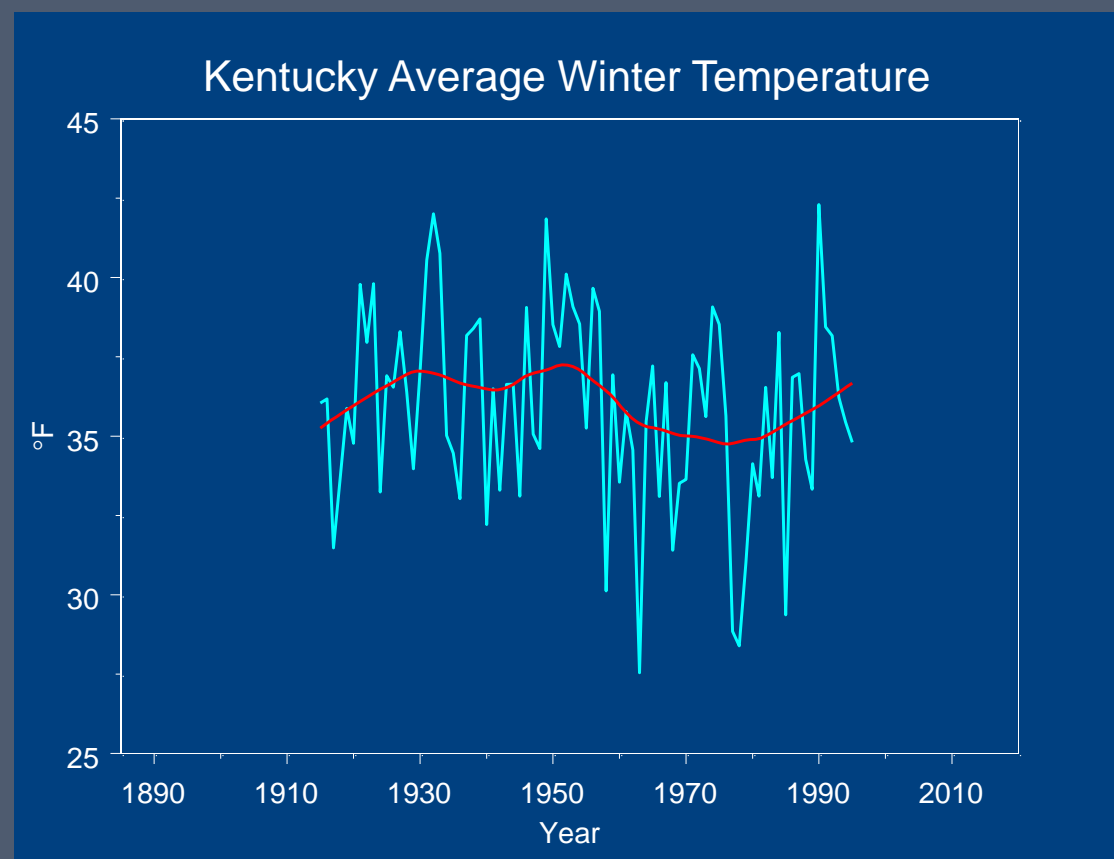*Imposing Linear Structure with a Ramp Change*

Interpreting Climatic Time Series
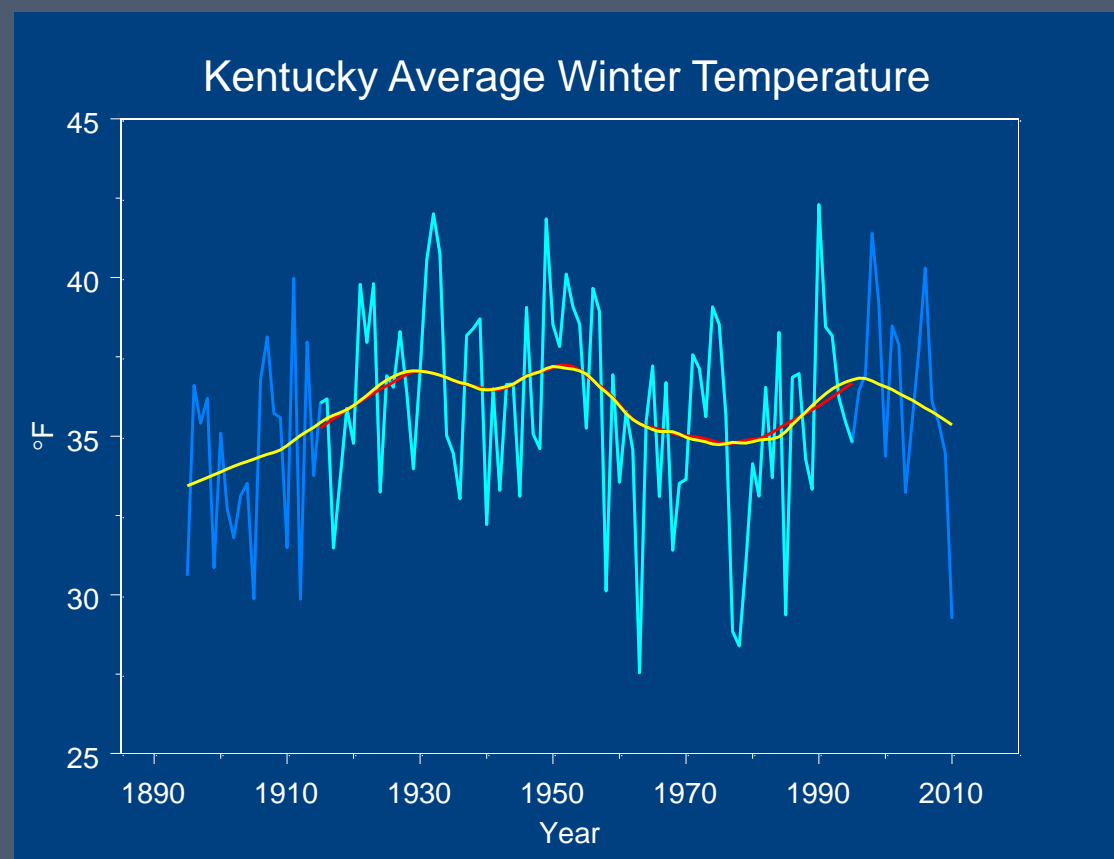*Sensitivity to the Length of the Series*
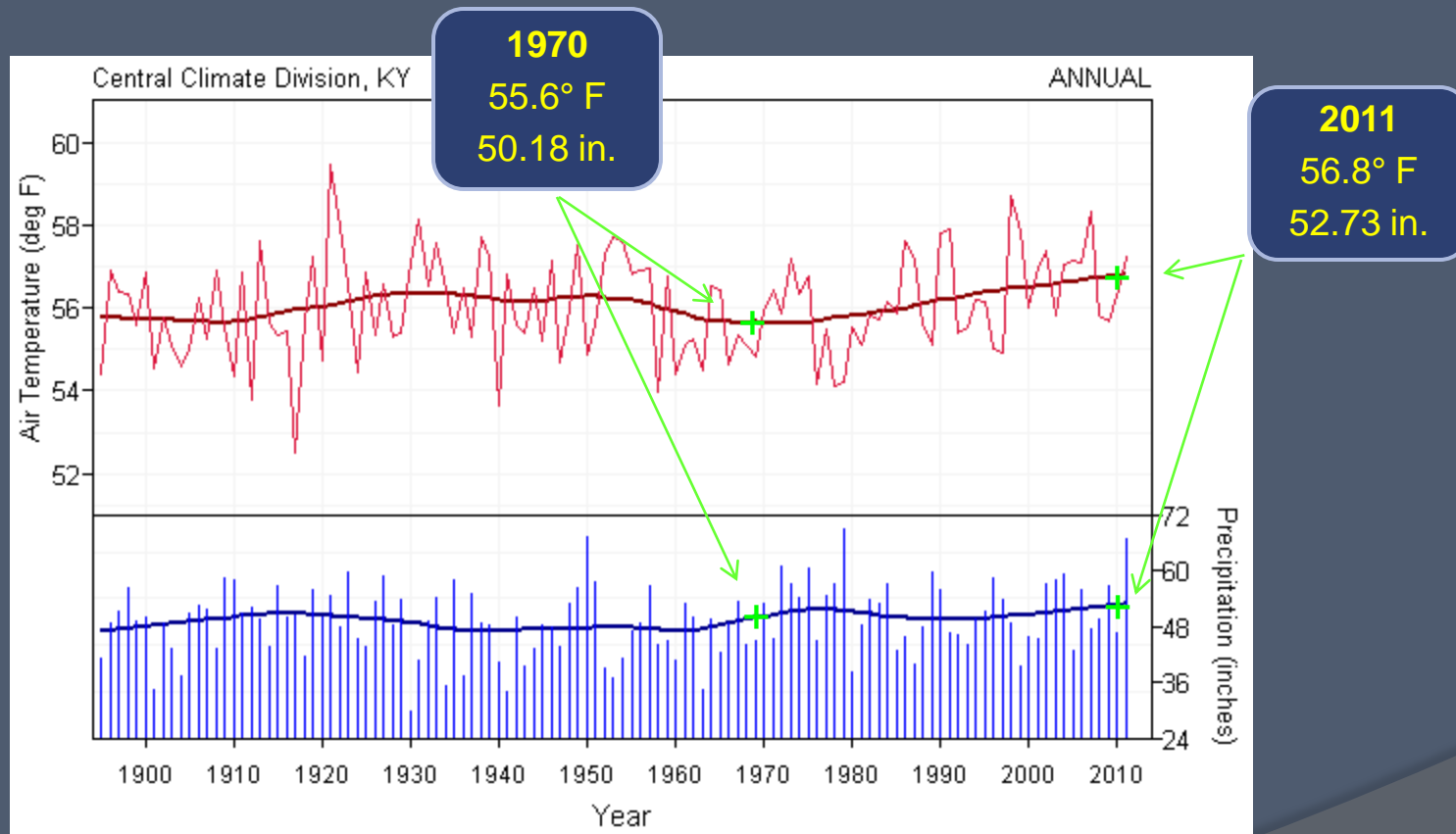
Interpreting Climatic Time Series
Smoothing Models

Kentucky Average Winter Temperature

Interpreting Climatic Time Series
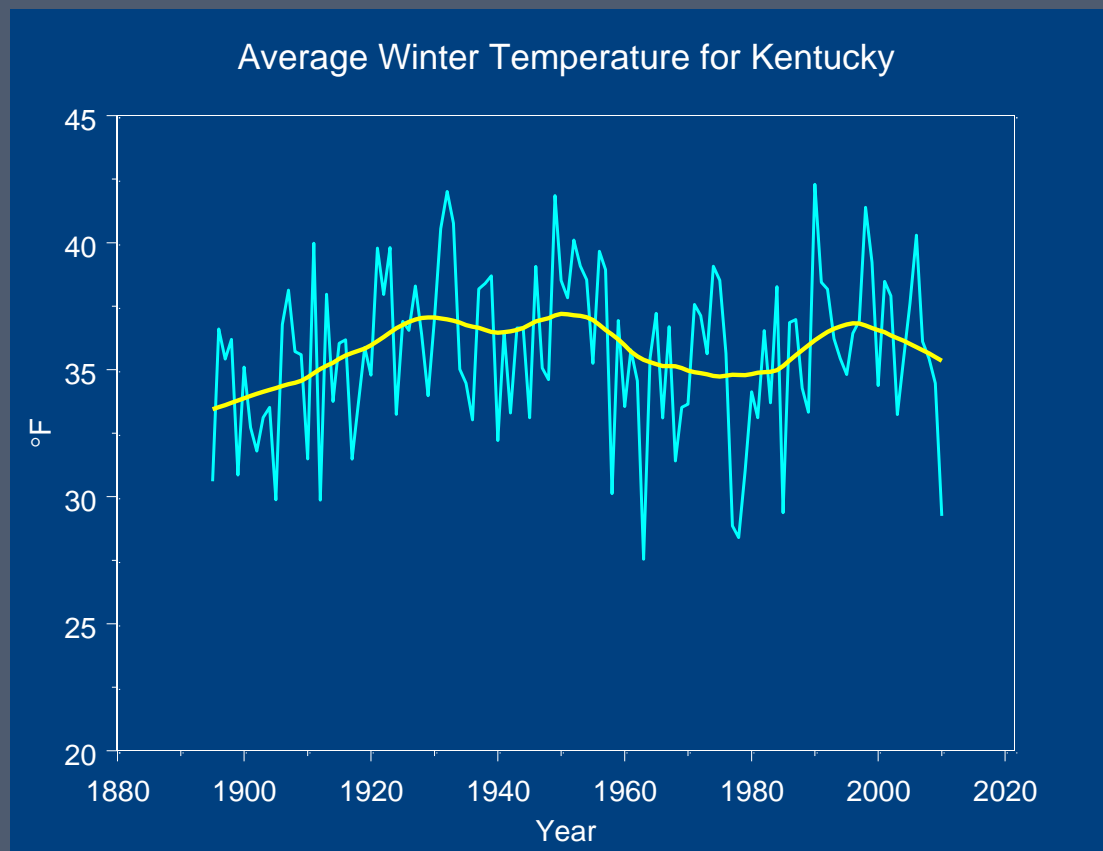## *Ephemeral Trajectories*

Kentucky Average Winter Temperature

Climate Trends: Annual
Central Climate Division

Average Winter Temperature

Average Winter Temperature for Kentucky

Variability or Change?
Winter

LOESS Smoothing of Average Winter Temperature

Yellow reflects observed data. Orange reflects simulated data.
Simulations based on sample mean, variance and autocorrelation.

Average Summer Temperature
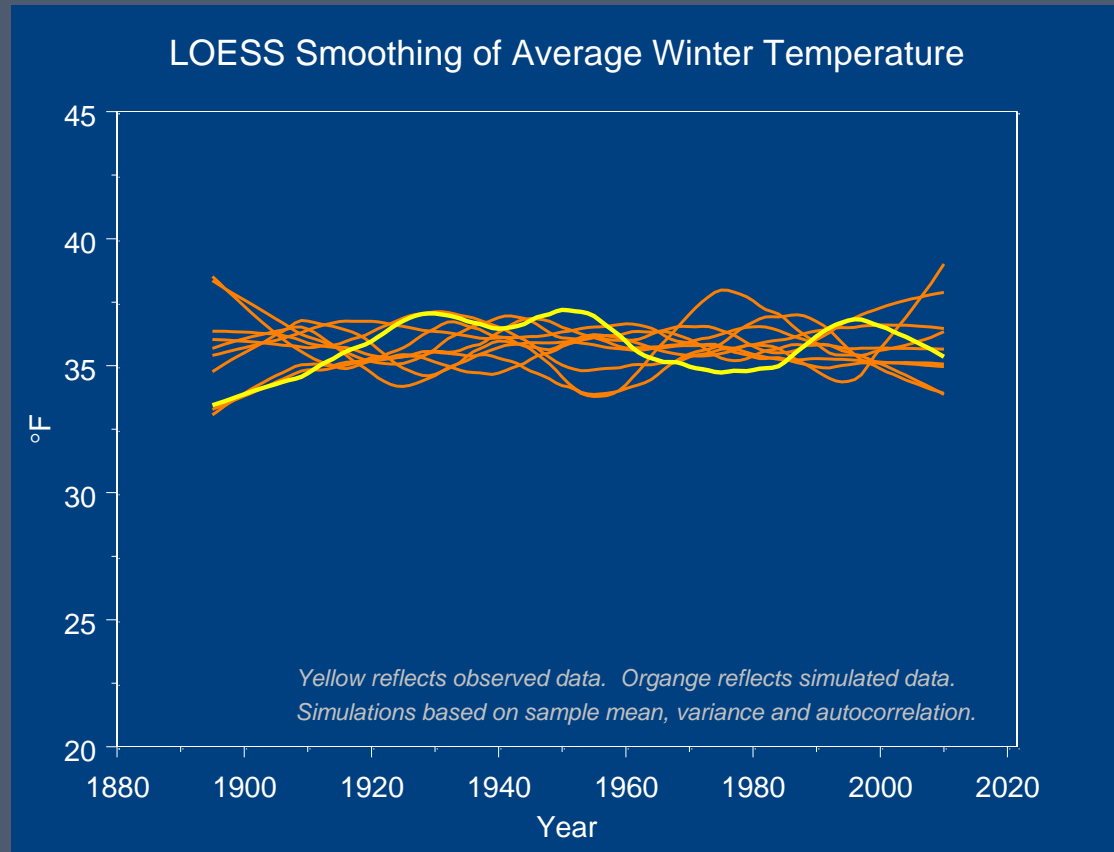
Average Summer Temperature for Kentucky
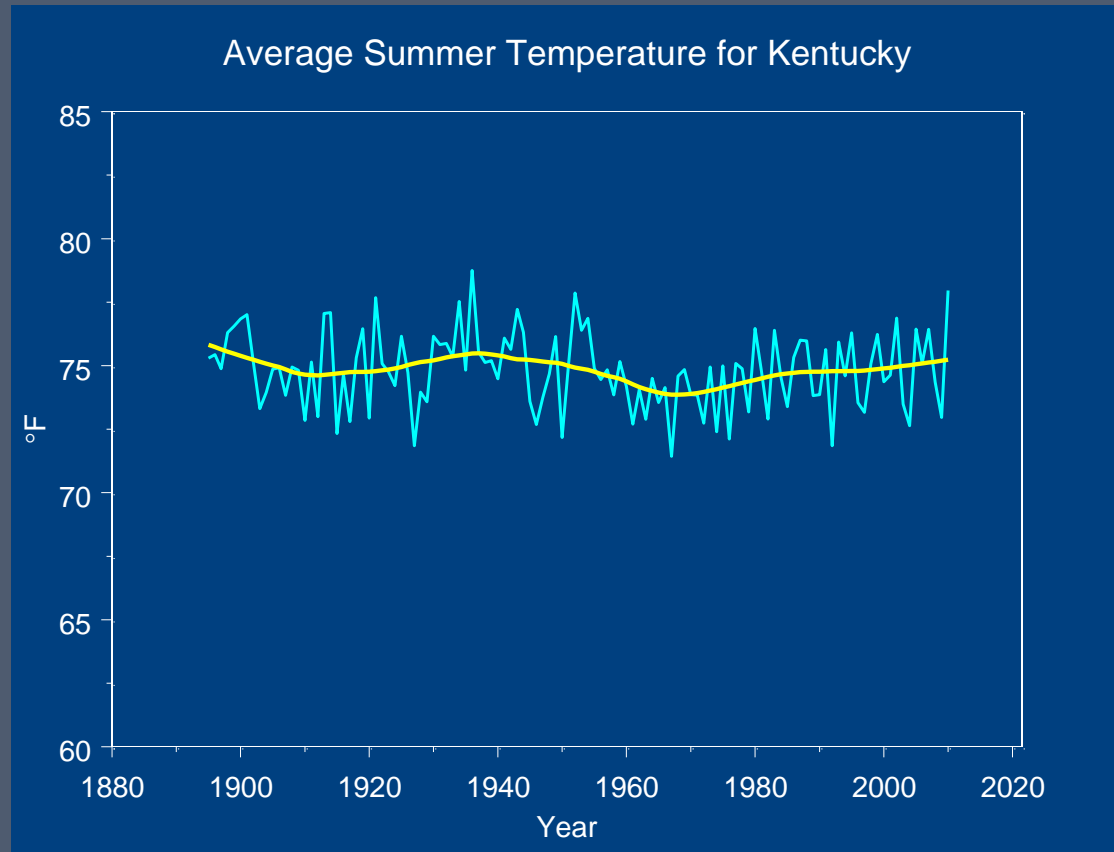
Variability or Change?

Summer

LOESS Smoothing of Average Summer Temperature

Yellow reflects observed data. Orange reflects simulated data.
Simulations based on sample mean, variance and autocorrelation.
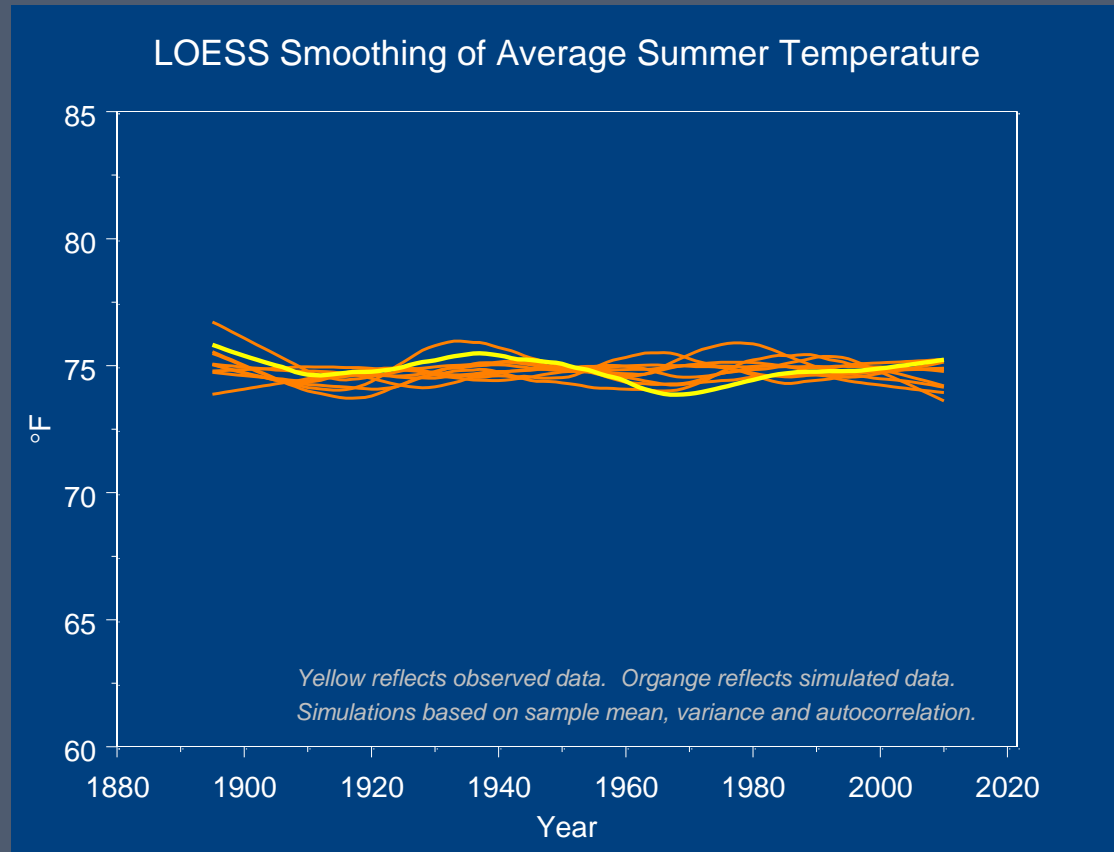
Example Future Scenario
Winter Temperature

Example of Simulated Average Winter Temperature for Kentucky
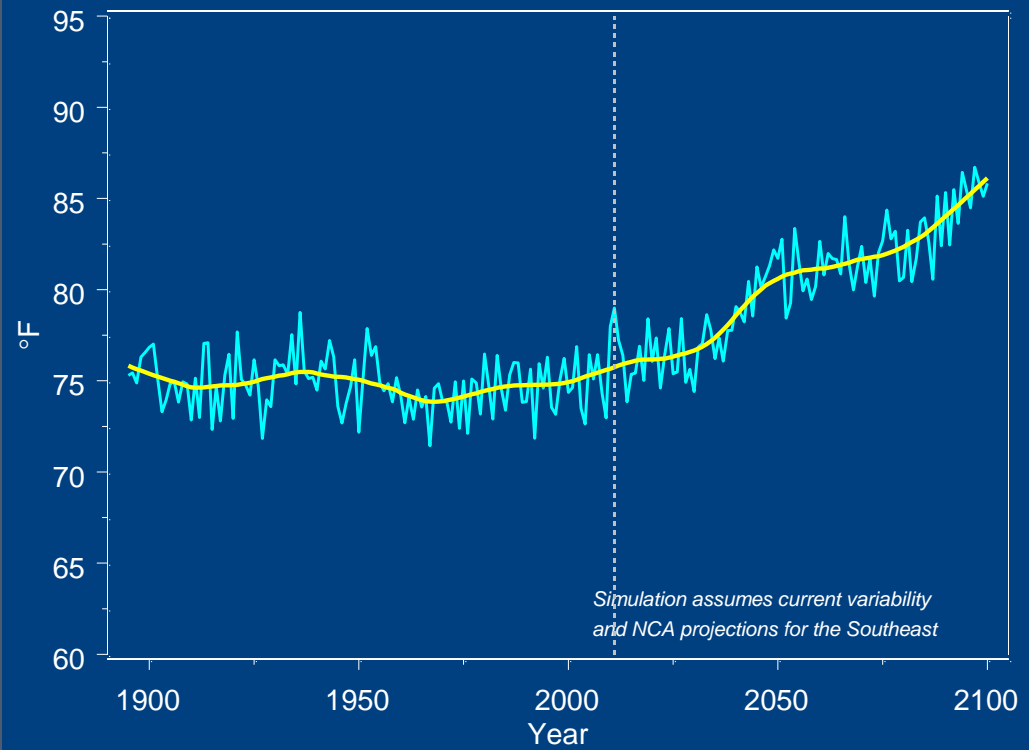
Simulation assumes current variability and NCA projections for the Southeast
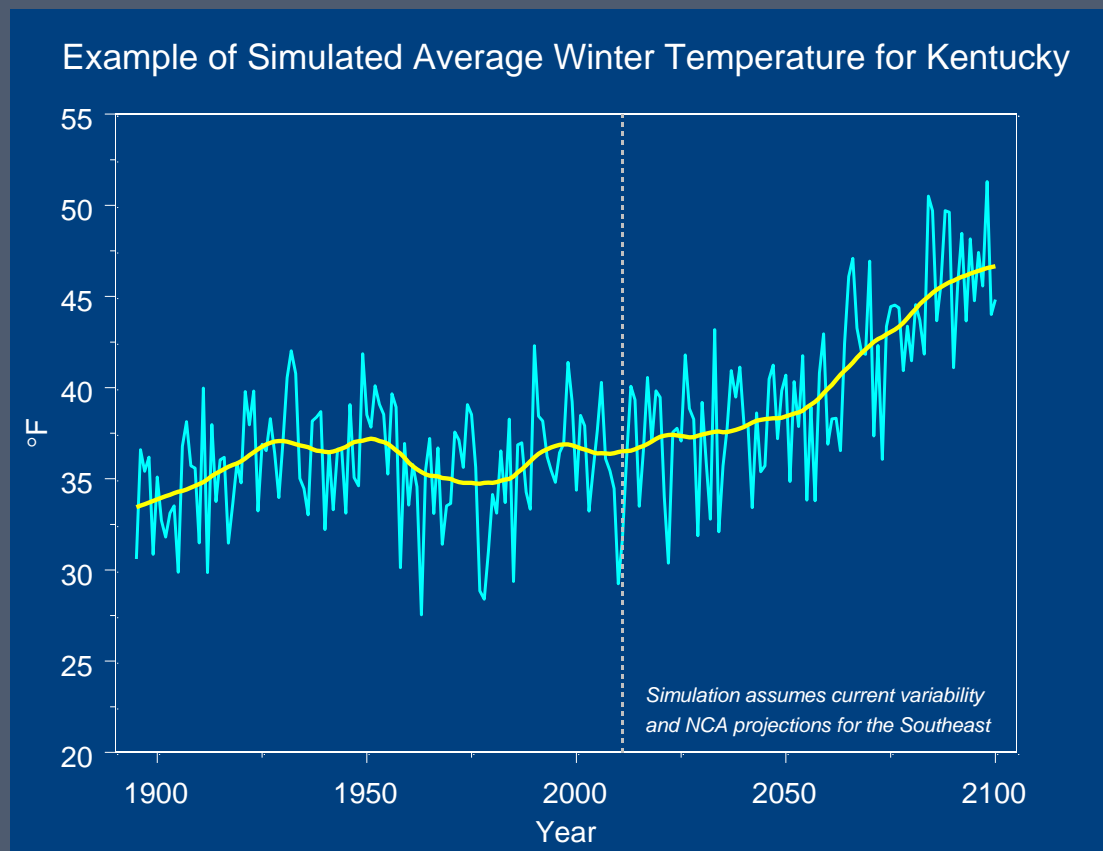
Example Future Scenario
Summer Temperature

Example of Simulated Average Summer Temperature for Kentucky

Simulation assumes current variability and NCA projections for the Southeast

Summary and Points for Discussion

- Let the data speak
- Portray variability
- Highlight ephemeral trajectories
- Provide context for future projections in terms of historical observations

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