

THINKING ABOUT OUR FUTURE CLIMATE

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1. WHAT DETERMINES OUR FUTURE CLIMATE?

2. MODELING AS A MODE OF INQUIRY

3. FROM GLOBAL TO LOCAL: IMPLICATIONS

4. CONCLUSIONS

1. WHAT DETERMINES OUR FUTURE CLIMATE?

Existing Natural Variability:

Weather (including extremes)

Sub-seasonal variability (MJO)

Annual Cycle

ENSO (Interannual Variability)

Pacific Decadal Oscillation (PDO-Decadal)

Atlantic Multidecadal Variability (AMO~50years)

Human Alterations:

Global Long Term Trends ($\sim .08^{\circ}\text{C}/\text{decade}$)

Changes to each mode of natural variability

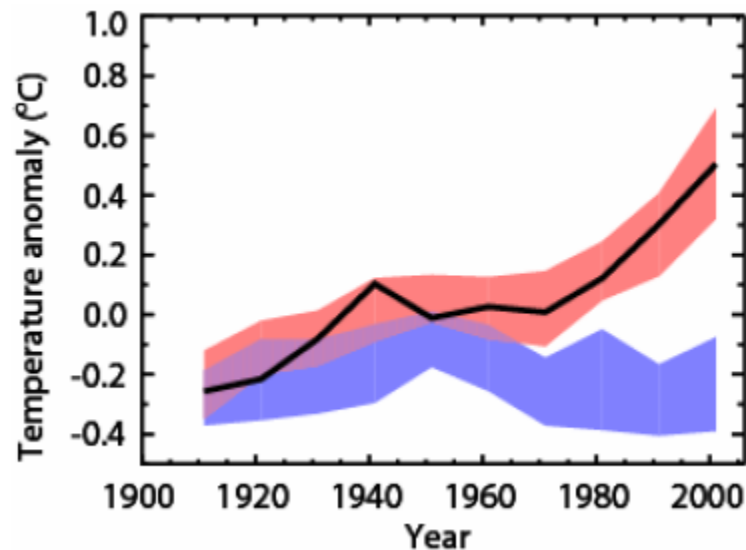
Changes in weather factors (location and strength of Jet Streams, etc.)

Note: Human alterations of climate are produced by emissions of CO₂, CH₄, CFCs, NO₂, etc. all of which **heat** the surface and aerosols, most of which **cool** the surface.

- ▶ The future (global) climate partly depends on how humanity chooses to deal with future emissions (both amount and mix).
- ▶ Local climate looks very different than global climate (as we will see).
- ▶ The way to think about future global and local climate is through climate models.

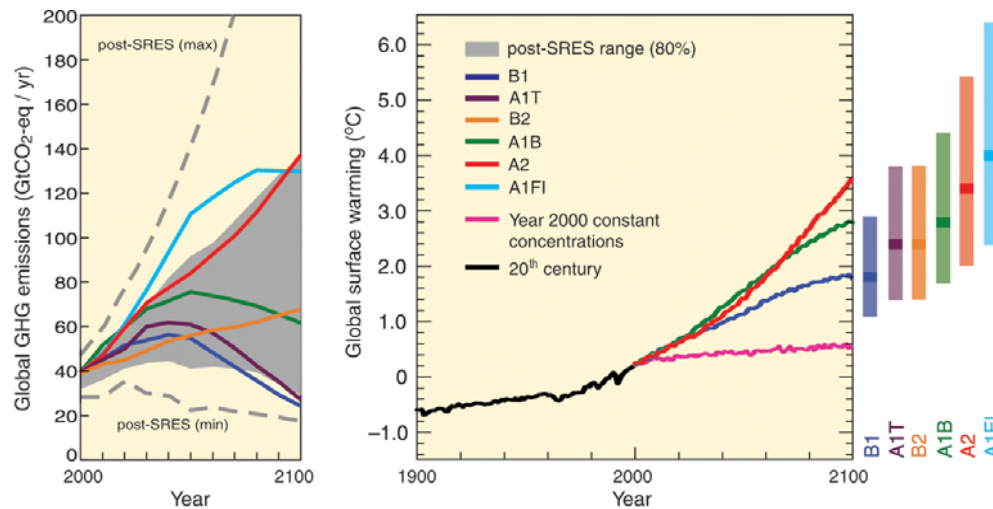
2. MODELING AS A MODE OF INQUIRY

- ▶ Geoscience is **NOT** an experimental science.
- ▶ Therefore the **ONLY** way of definitively describing causal relationships is through climate models.



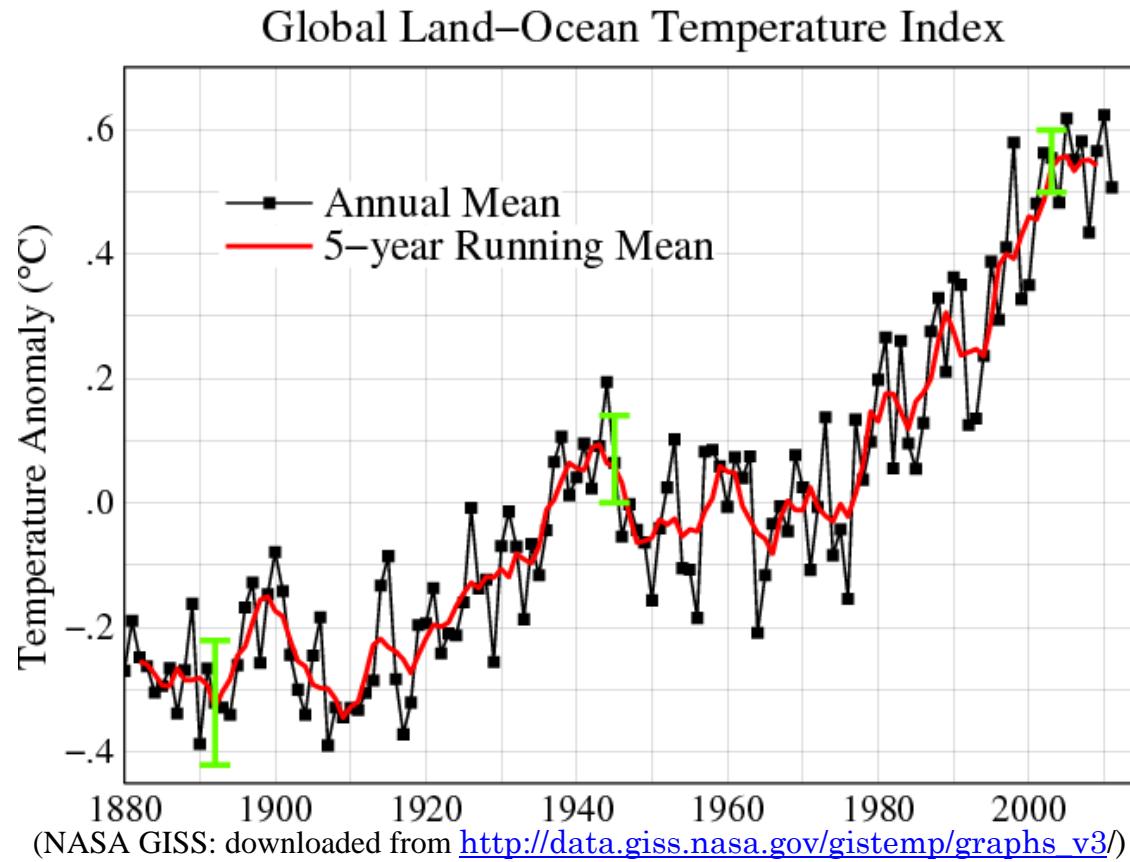
IPCC, AR4

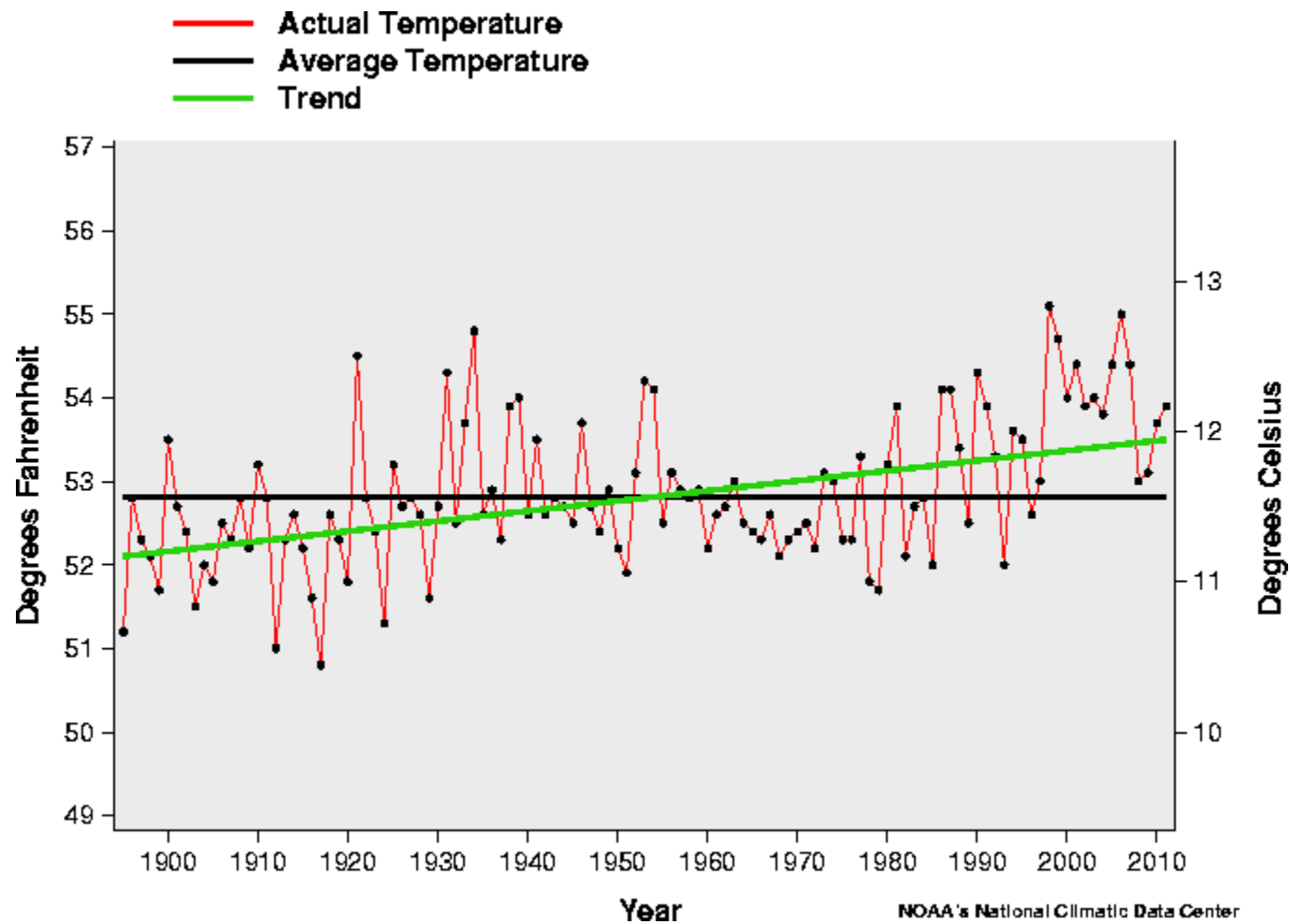
► **Climate models can also be used to be used to predict near term climate and calculate the response to predictions of future emissions.**



IPCC, AR4

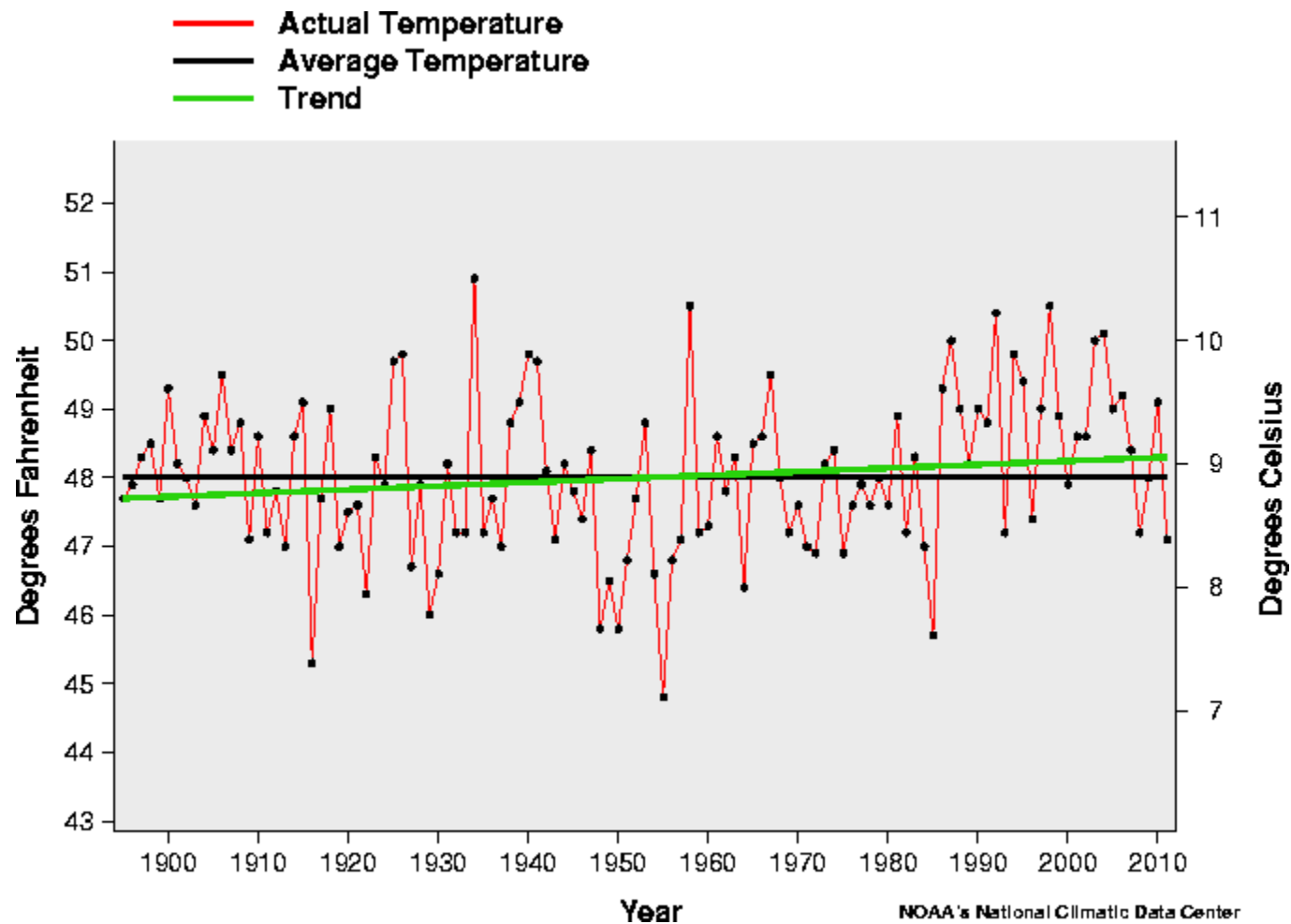
3. FROM GLOBAL TO LOCAL: IMPLICATIONS





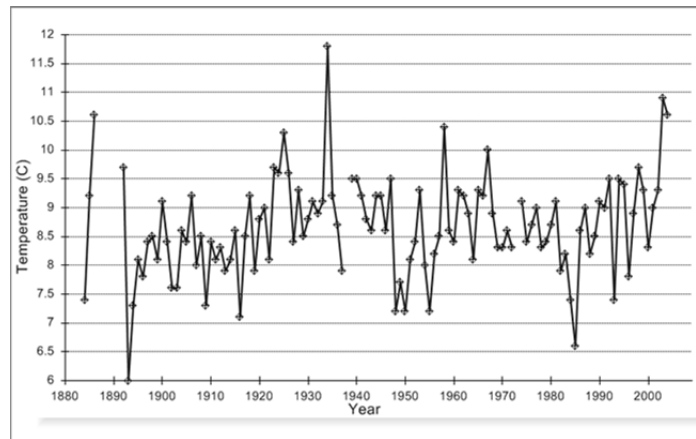
Contiguous US Surface T

(From NOAA: plotted and downloaded from <http://www.ncdc.noaa.gov/oa/climate/research/cag3/cag3.html>)

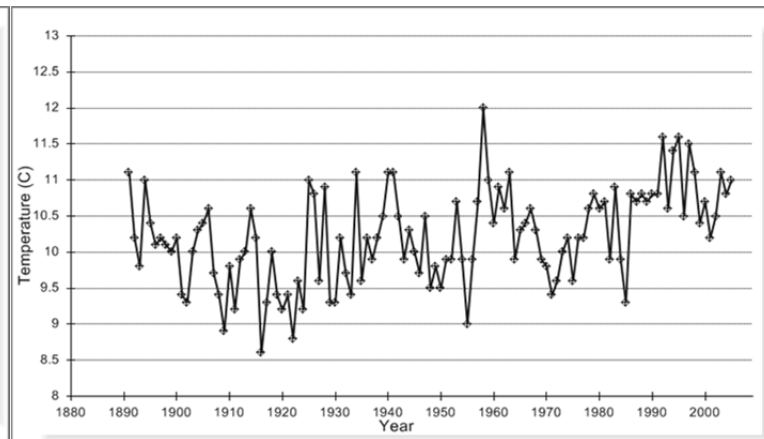


State of Washington Surface T

Plotted and downloaded from the NOAA NCDC site: www.ncdc.noaa.gov/oa/climate/research/cag3/cag3.html

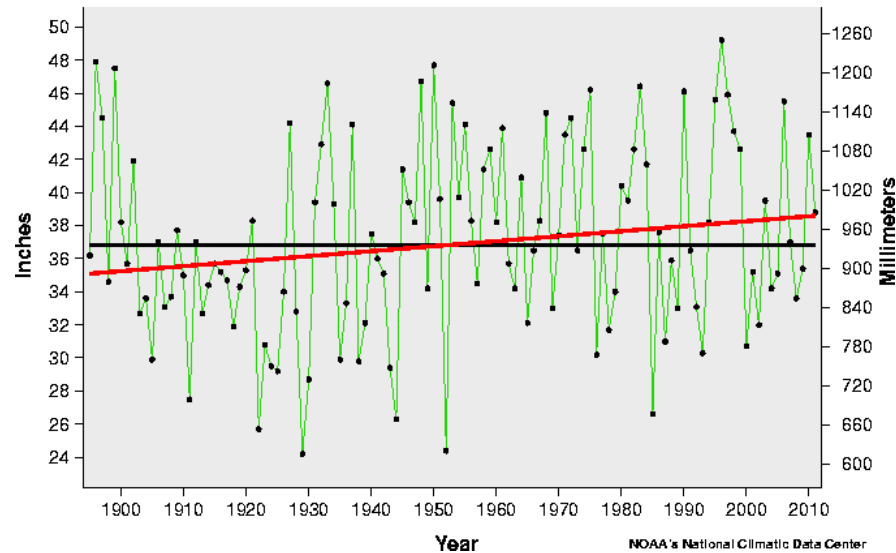


Ellensburg, Washington



Aberdeen, Washington

- Actual Precipitation
- Average Precipitation
- Trend



State of Washington Precip.

Plotted and downloaded from the NOAA NCDC site: www.ncdc.noaa.gov/oa/climate/research/cag3/cag3.html

▶ **Variability increases as we contract to local scales.**

▶ **In a local region, next year's T and P is more clearly a problem than global warming.**

▶ **Because the decision calendar is one year (planning, budgets, etc.) next year's T and P is important even when planning on the 50 year time scale. [We get to 50 years one year at a time.]**

▶ **On local space scales, adaptation is more clearly important than mitigation.**

[Adaptation consists of ameliorating the effects of damaging climate and taking advantage of the effects of beneficial climate.]

4. CONCLUSIONS

- ▶ Mitigation is global and is mostly about trends.**
- ▶ Adaptation is local and is mostly about variability.**
- ▶ Even if there were no global warming, it would make societal sense to locally adapt to next year's climate.**
- ▶ The basic tool of local adaptation to next year's climate is short range climate prediction.**