

West Virginia's Changing Climate: Future Projections

Alex Bryan

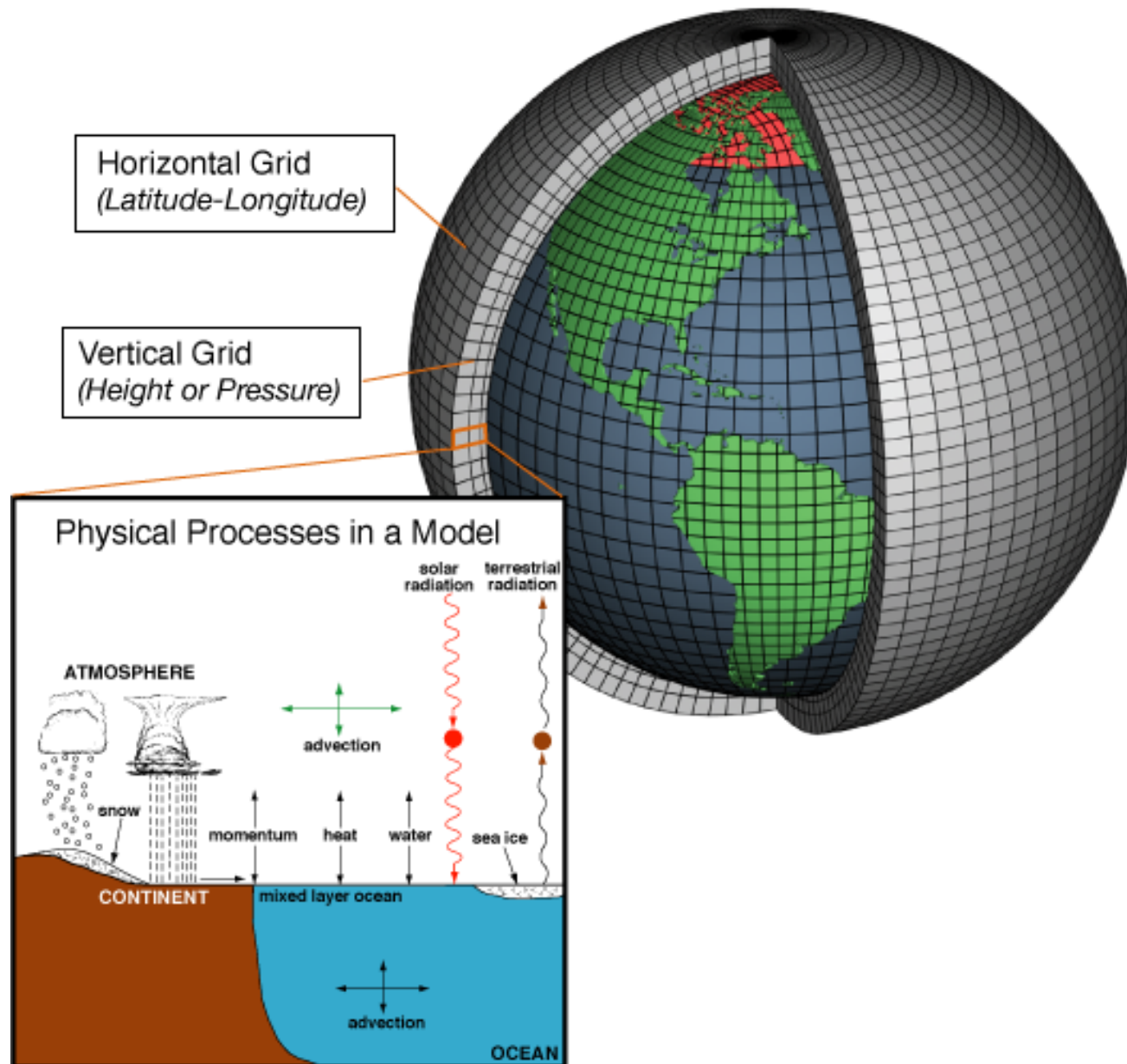


WV-FAPP

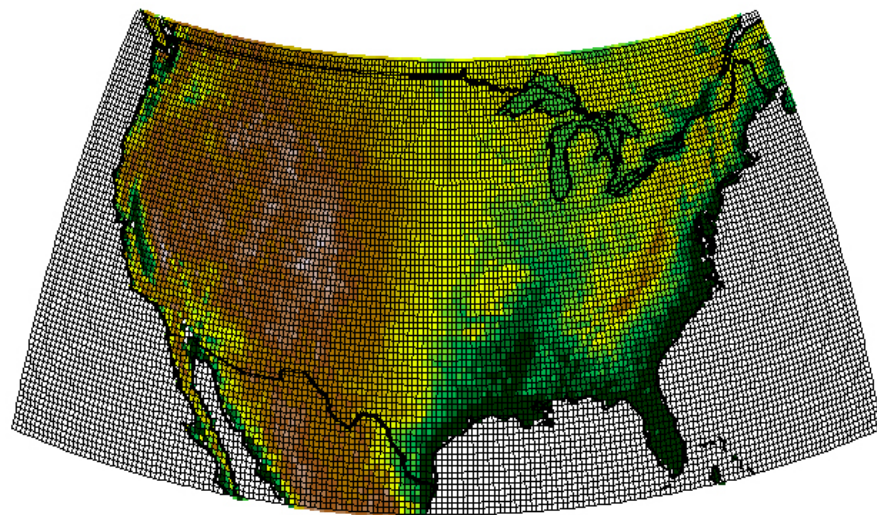
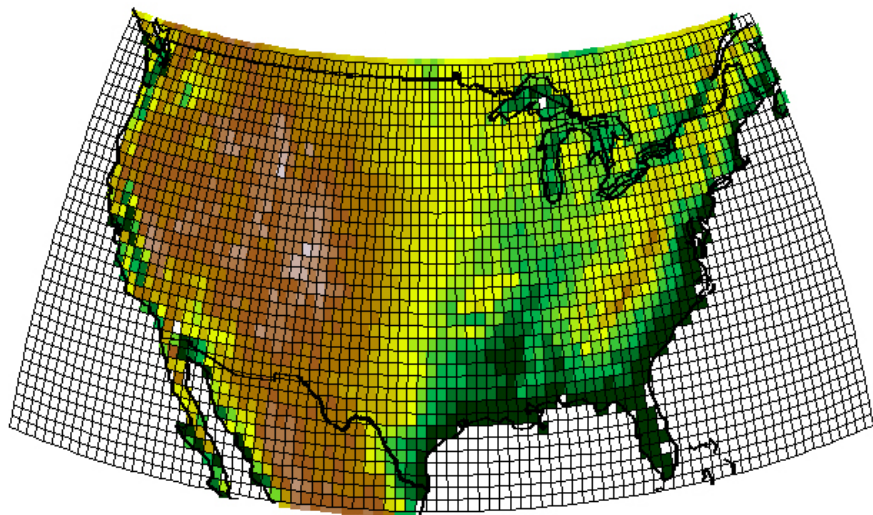
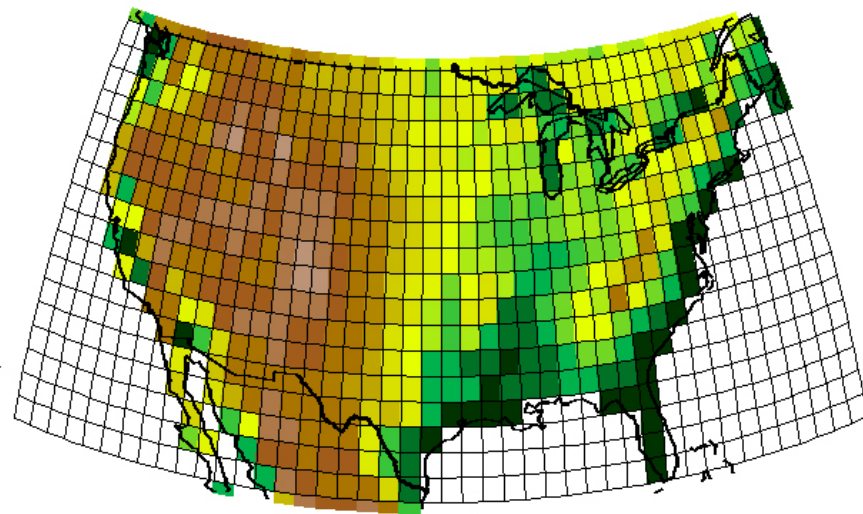
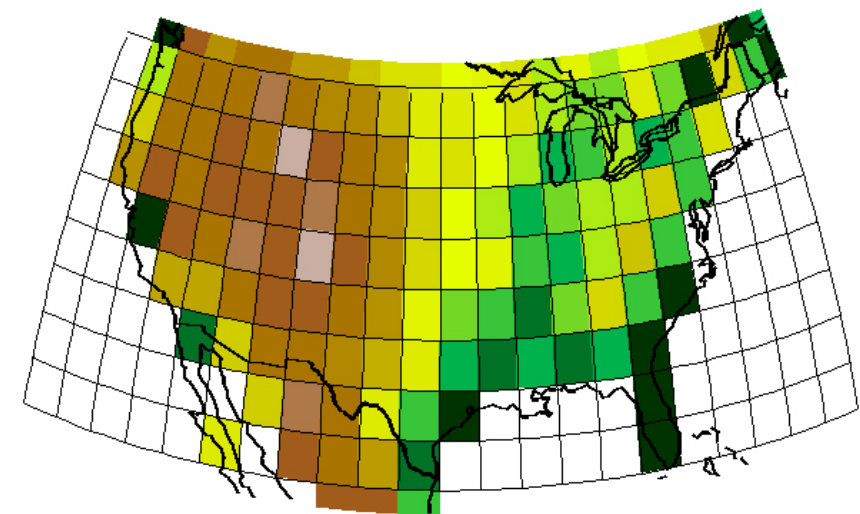
4.14.2015



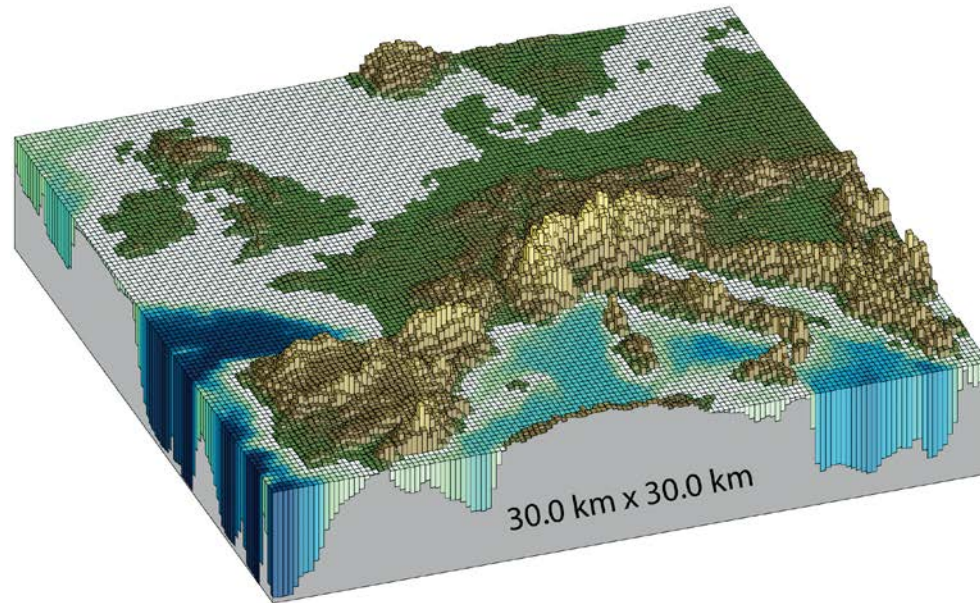
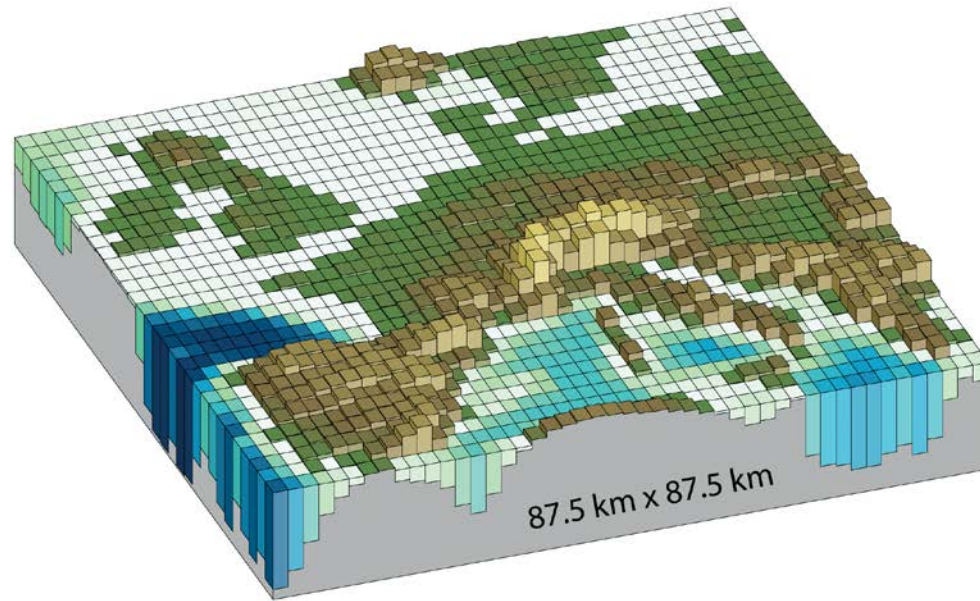
General circulation models



Why downscale?

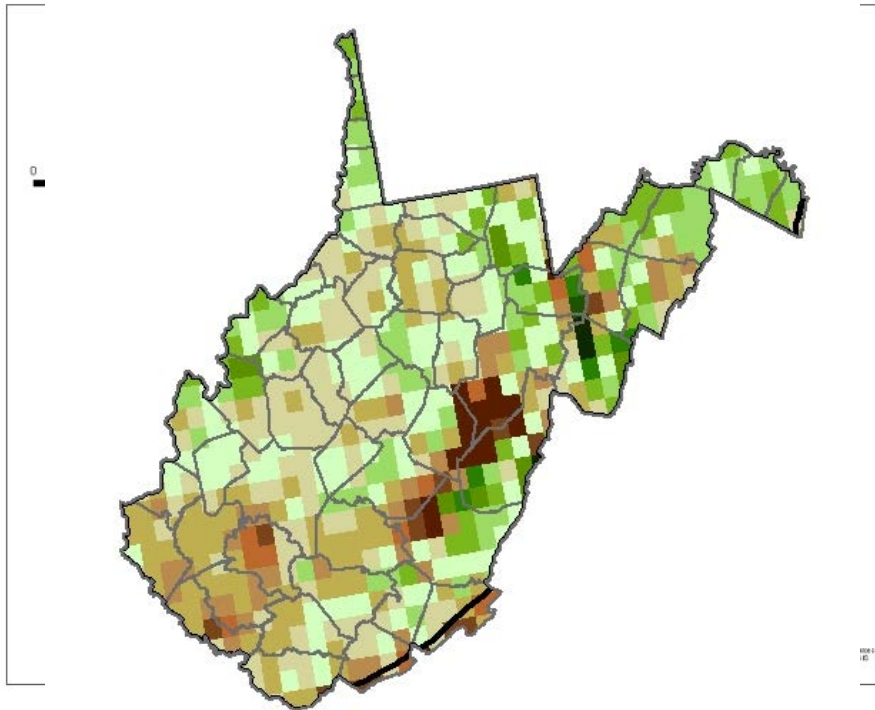


Why downscale?

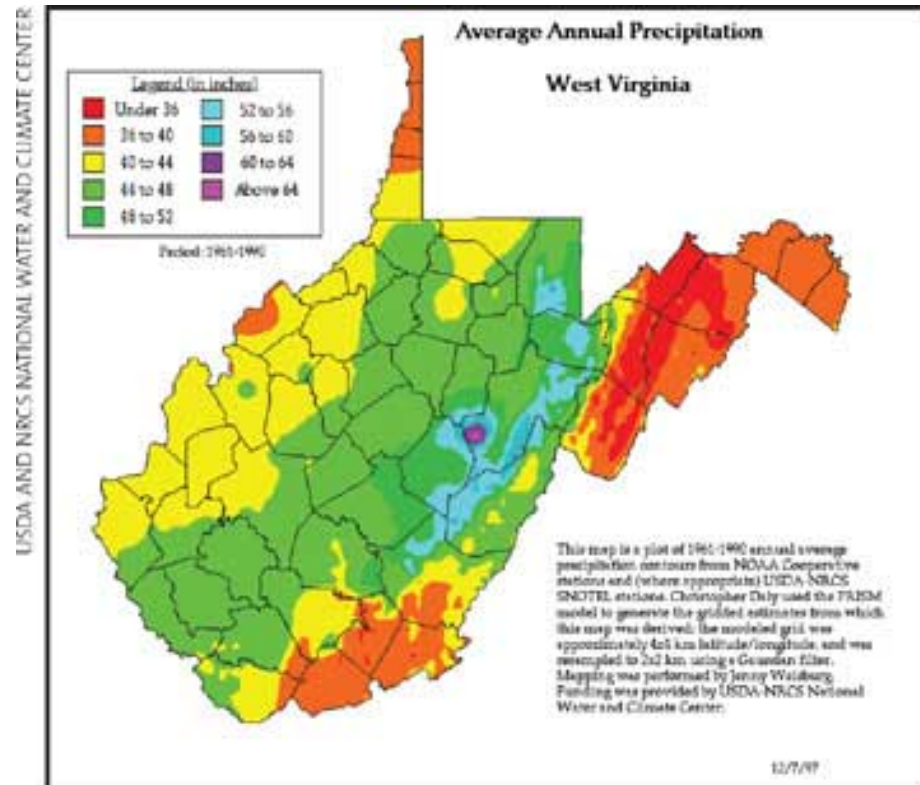


Why downscale?

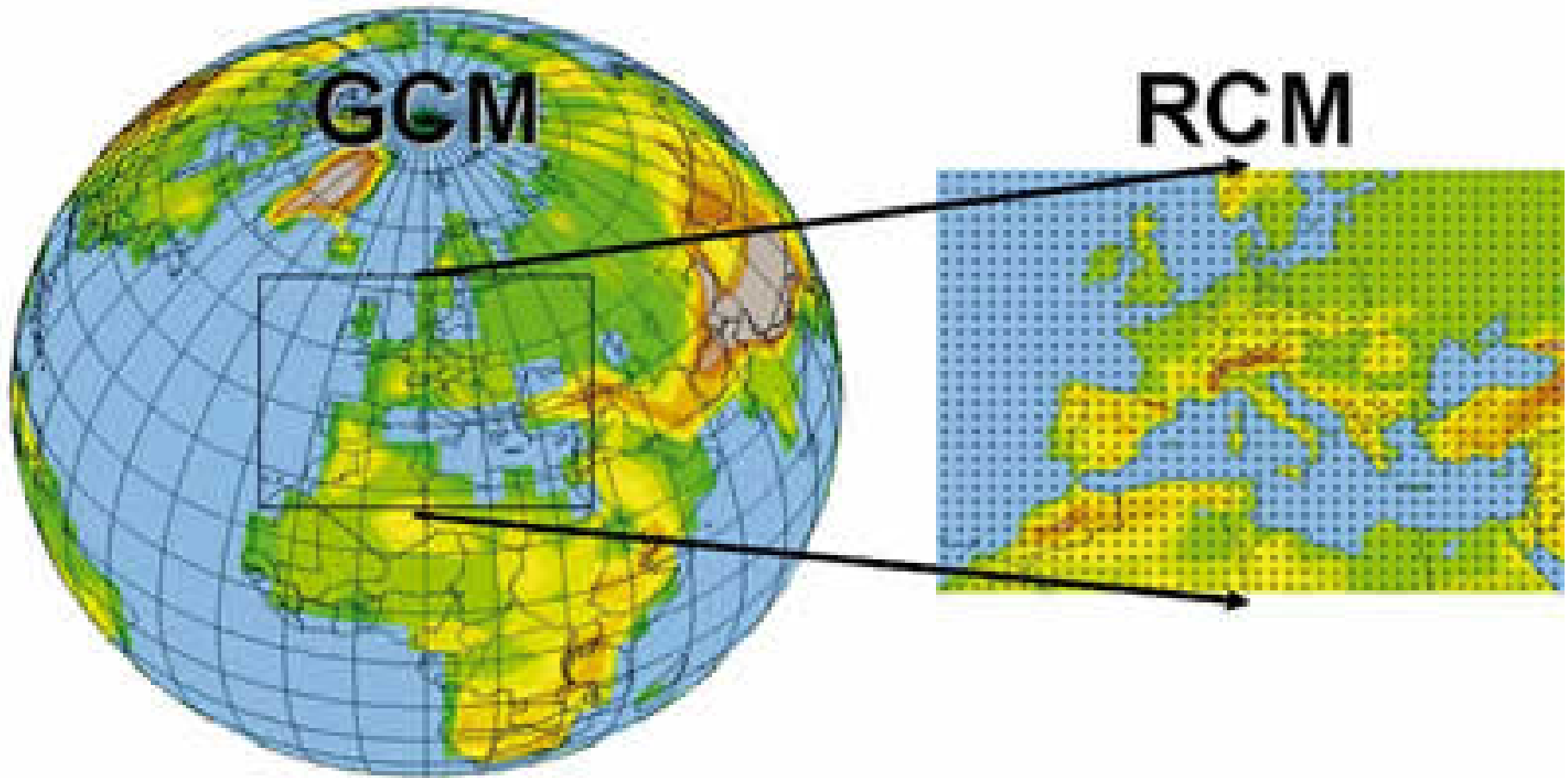
Modeled Precipitation



Precipitation

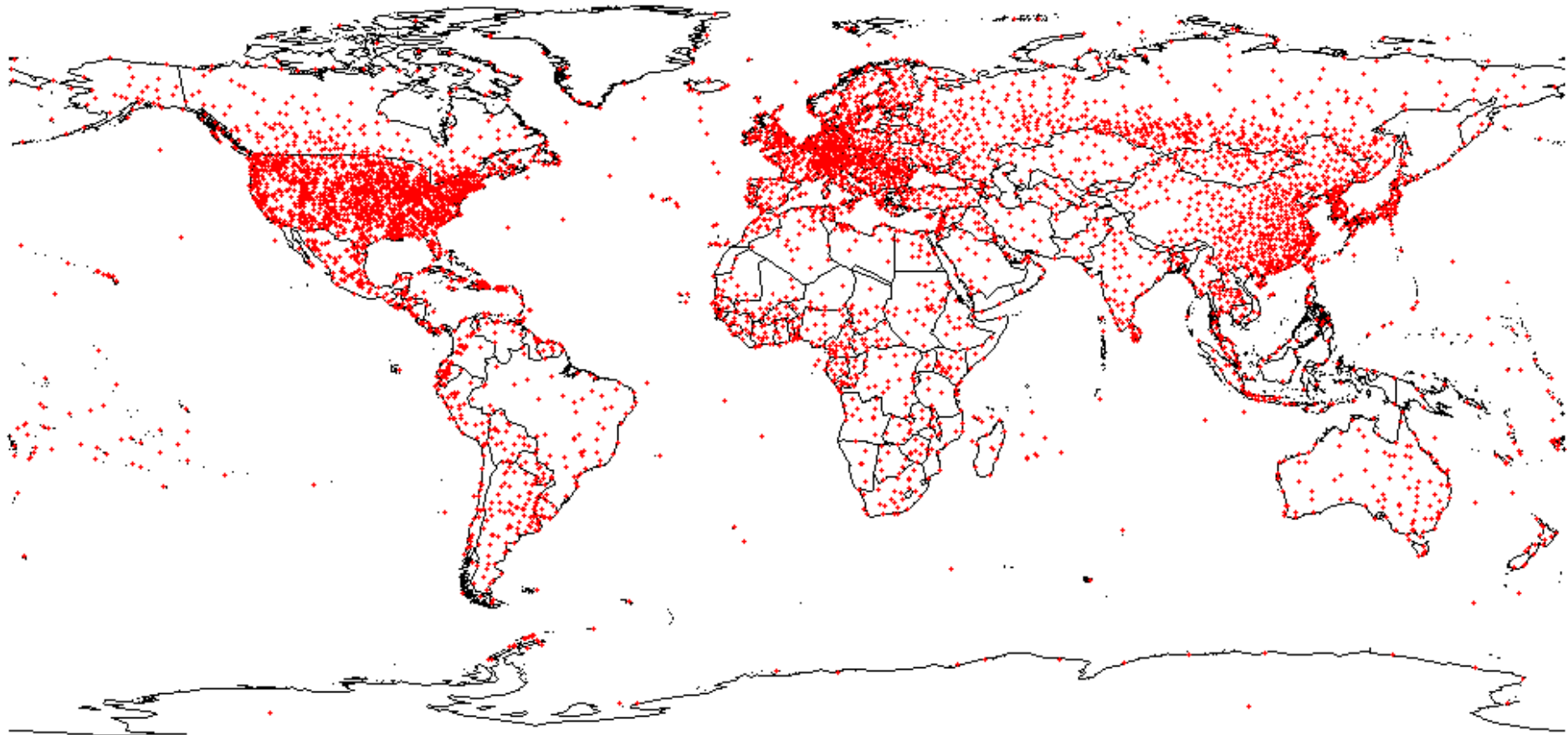


Dynamic downscaling



Statistical downscaling

GHCN Version 1 Temperature Stations



So, which one should I use?

Dynamical

Pros

Captures local microclimate

Many, many, many variables

Cons

Requires lots of supercomputer time

Statistical

Pros

Cheap, cheap, cheap!

Cons

Model-observation relationships held constant

Few variables (T + P only!)

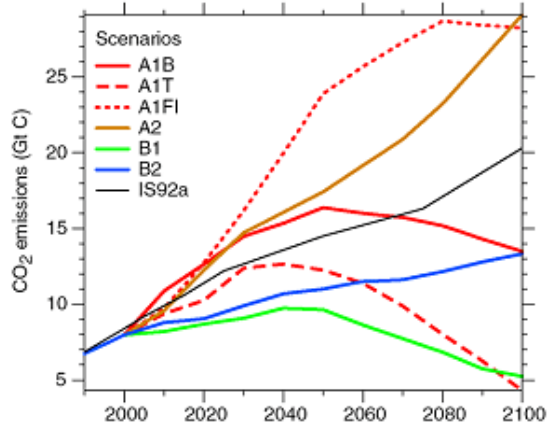
Limited regions

Misses small-scale processes (e.g., orographic lift)

Well, what do you want to use it for?

*Managing forests for large-scale shifts in climate... **statistical downscaling***

Emission Scenarios

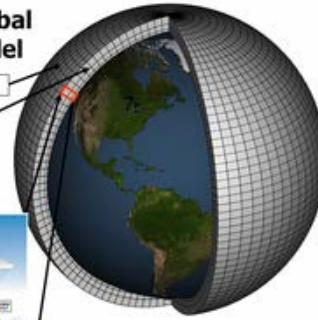


General Circulation Models

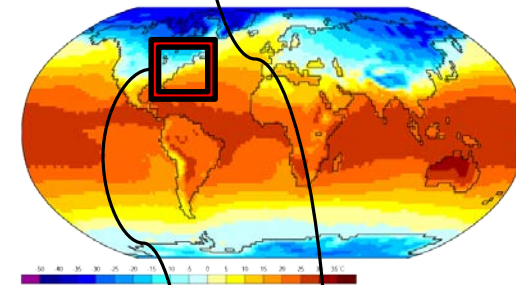
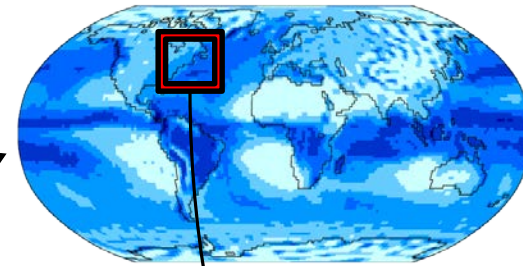
Schematic for Global Atmospheric Model

Horizontal Grid (Latitude-Longitude)

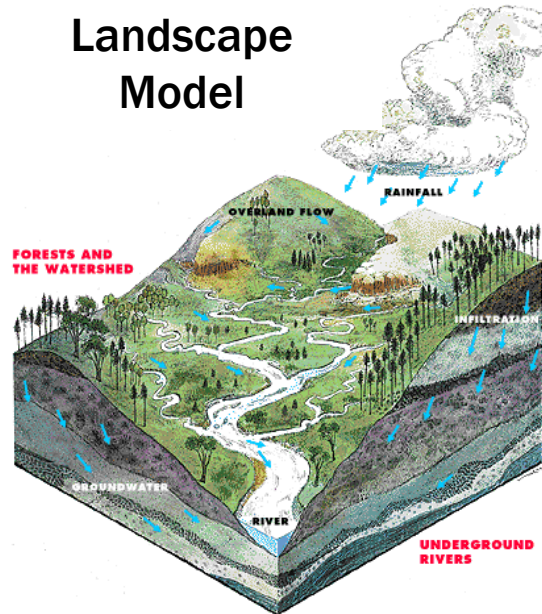
Vertical Grid (Height or Pressure)



Geography Department, U. Oregon

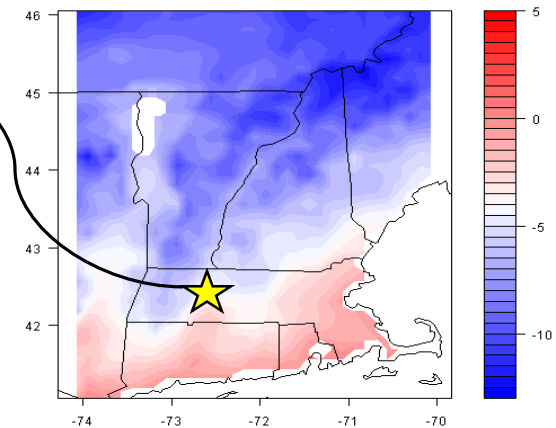


Landscape Model



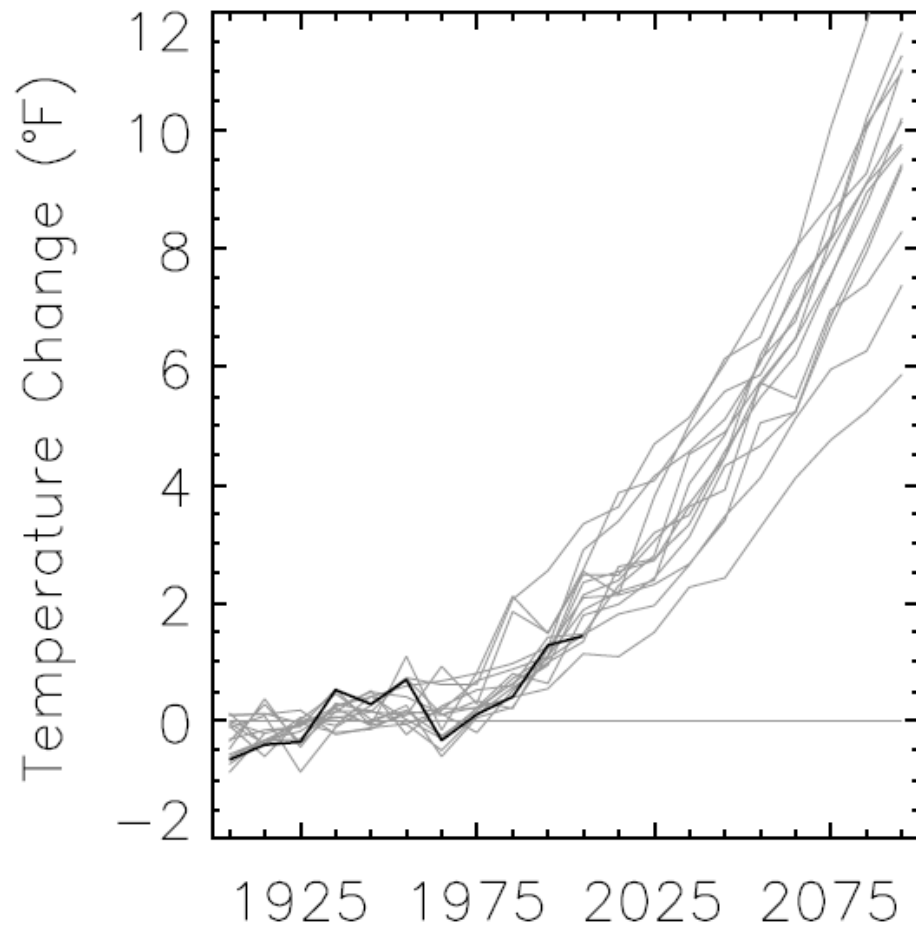
**Forest Abundances
Under Future
Climate Scenarios**

Bias Correction and Downscaling

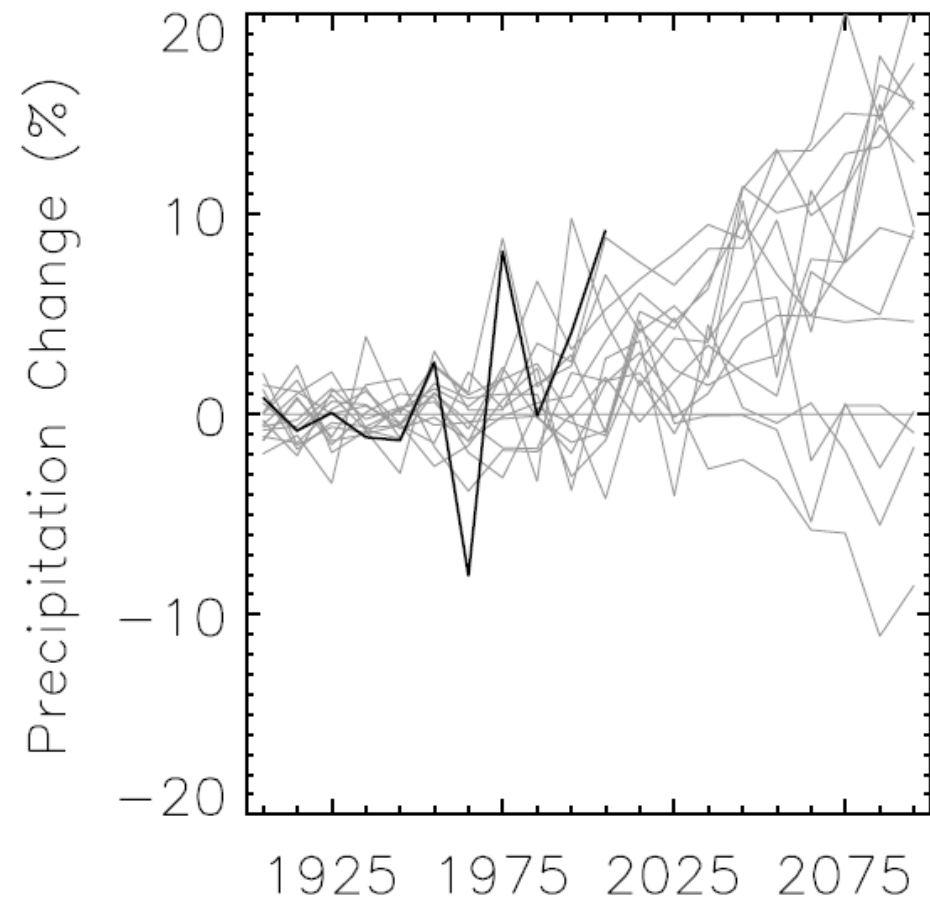


Model variability & consistency!

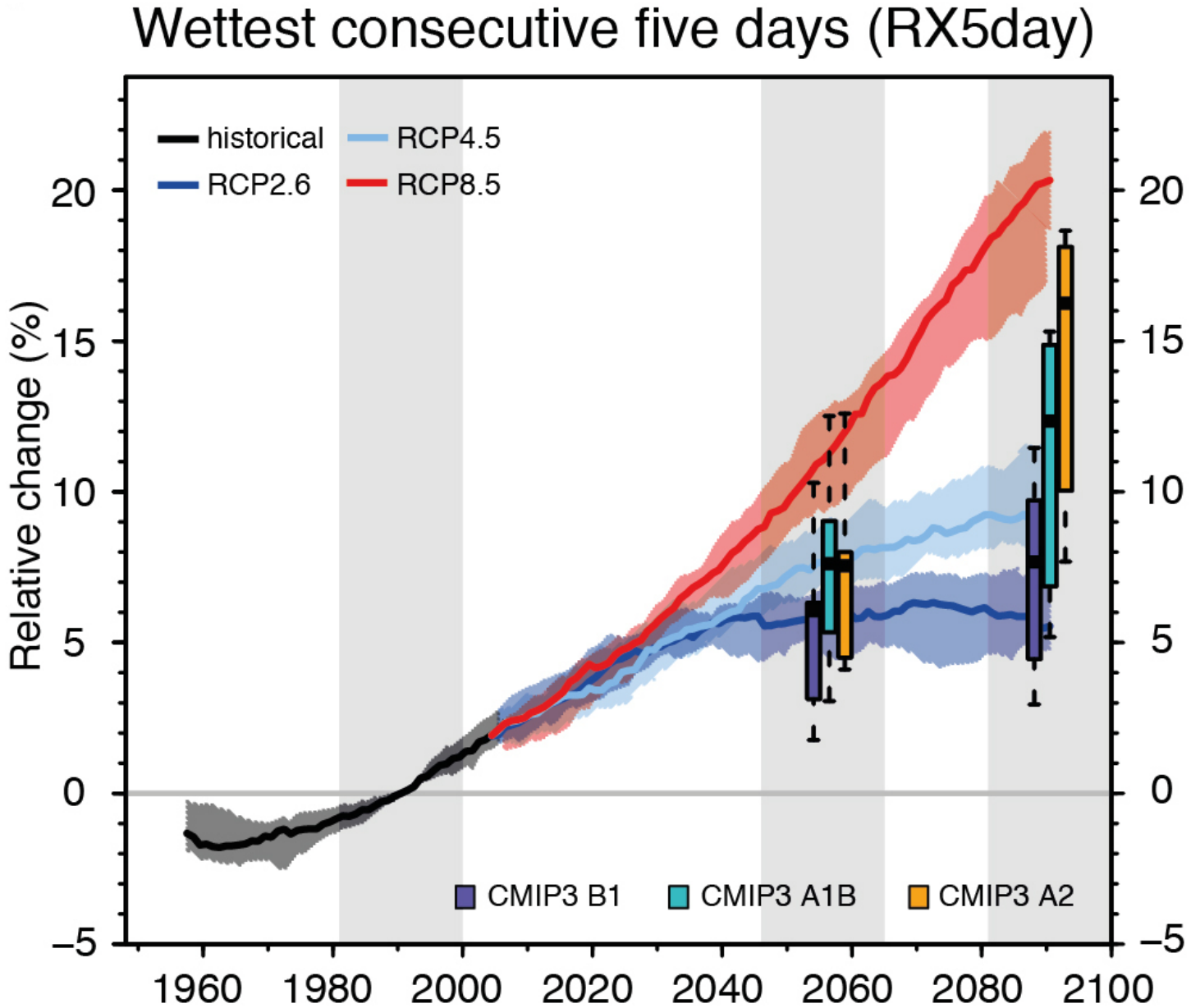
Temperature



Precipitation



Model variability & consistency!





FUTURE PROJECTIONS FOR WEST VIRGINIA

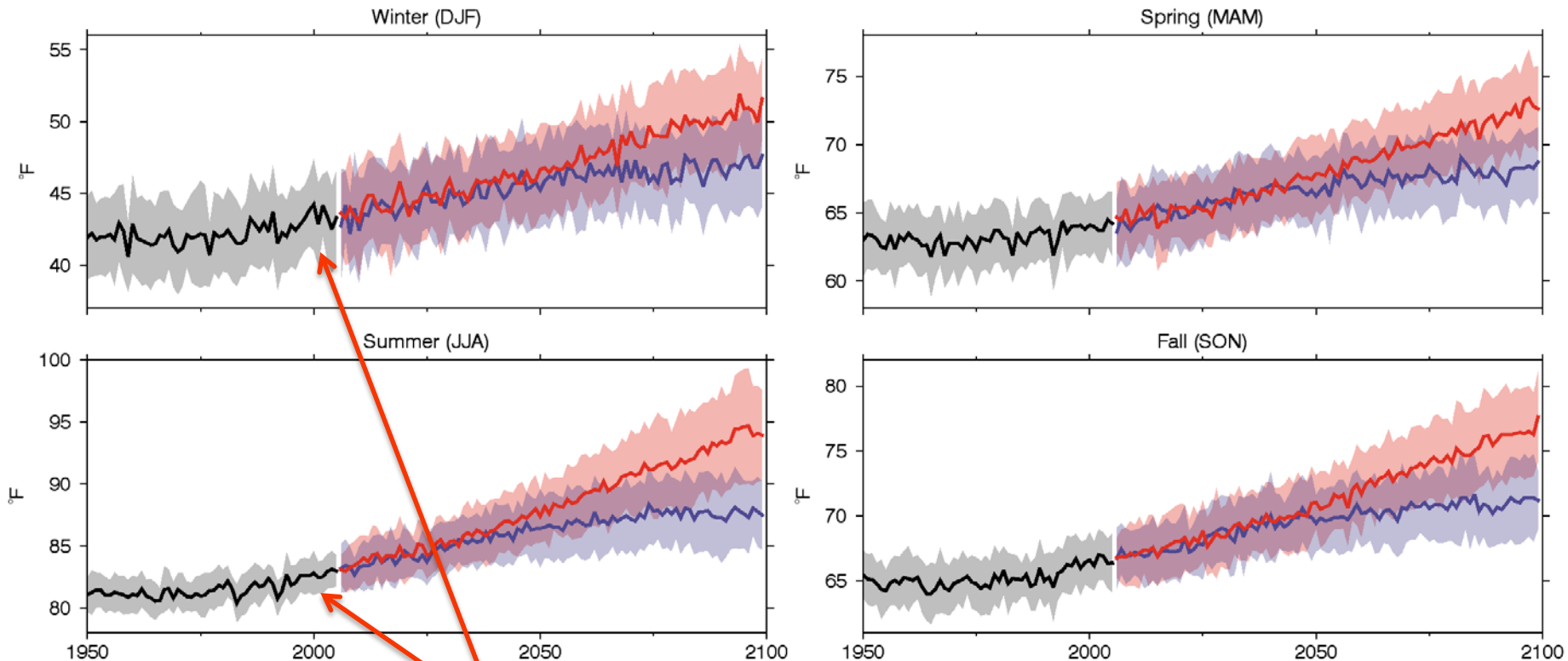
Future temperatures

Statewide warming in every season

Observations

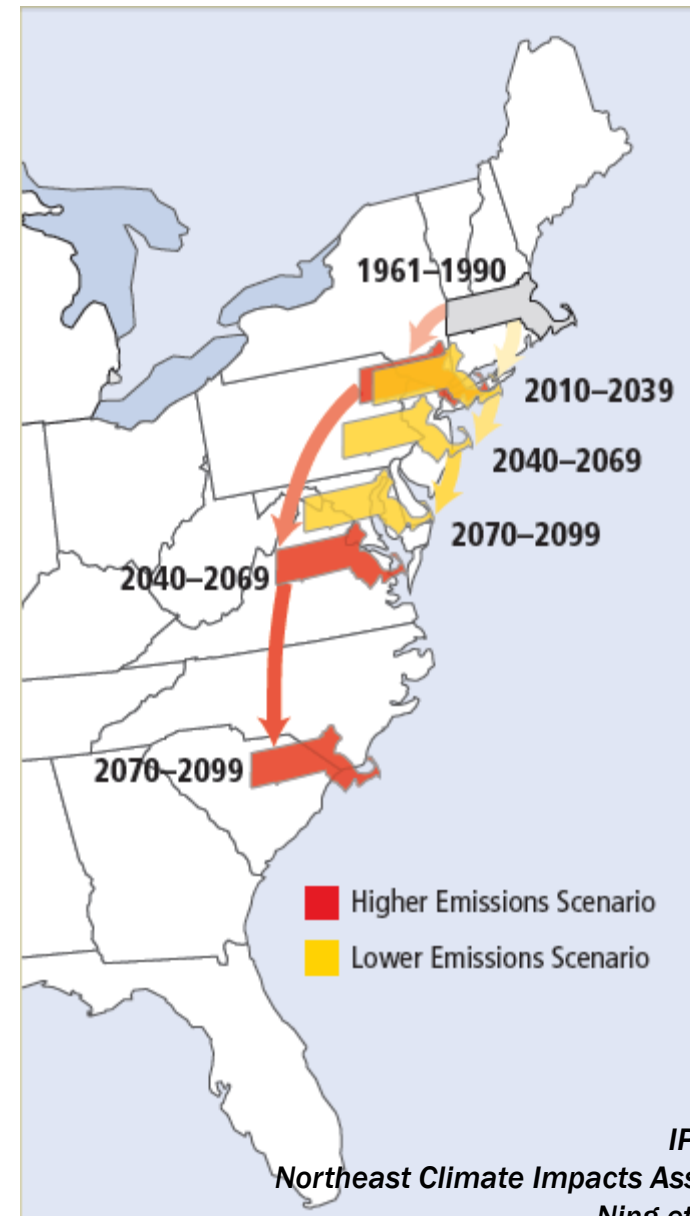
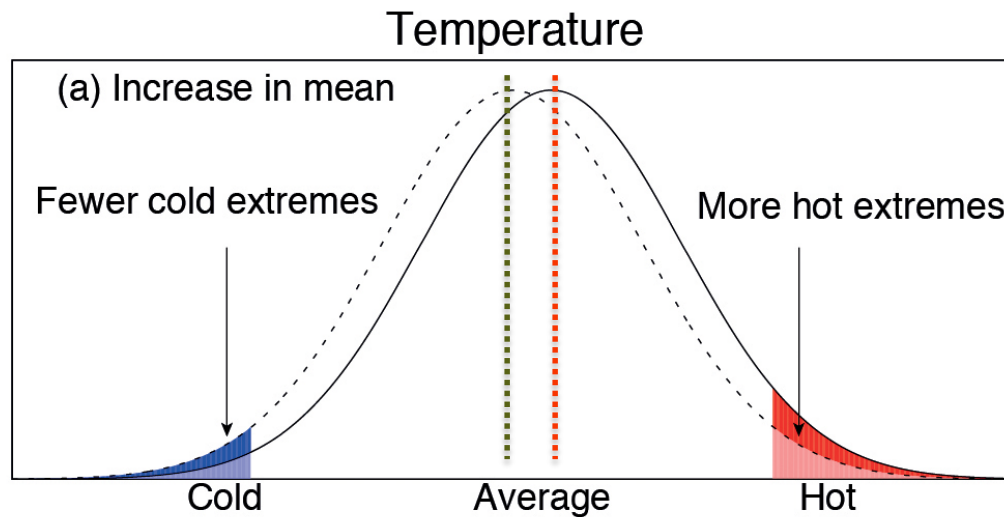
Low emission scenario

High emission scenario



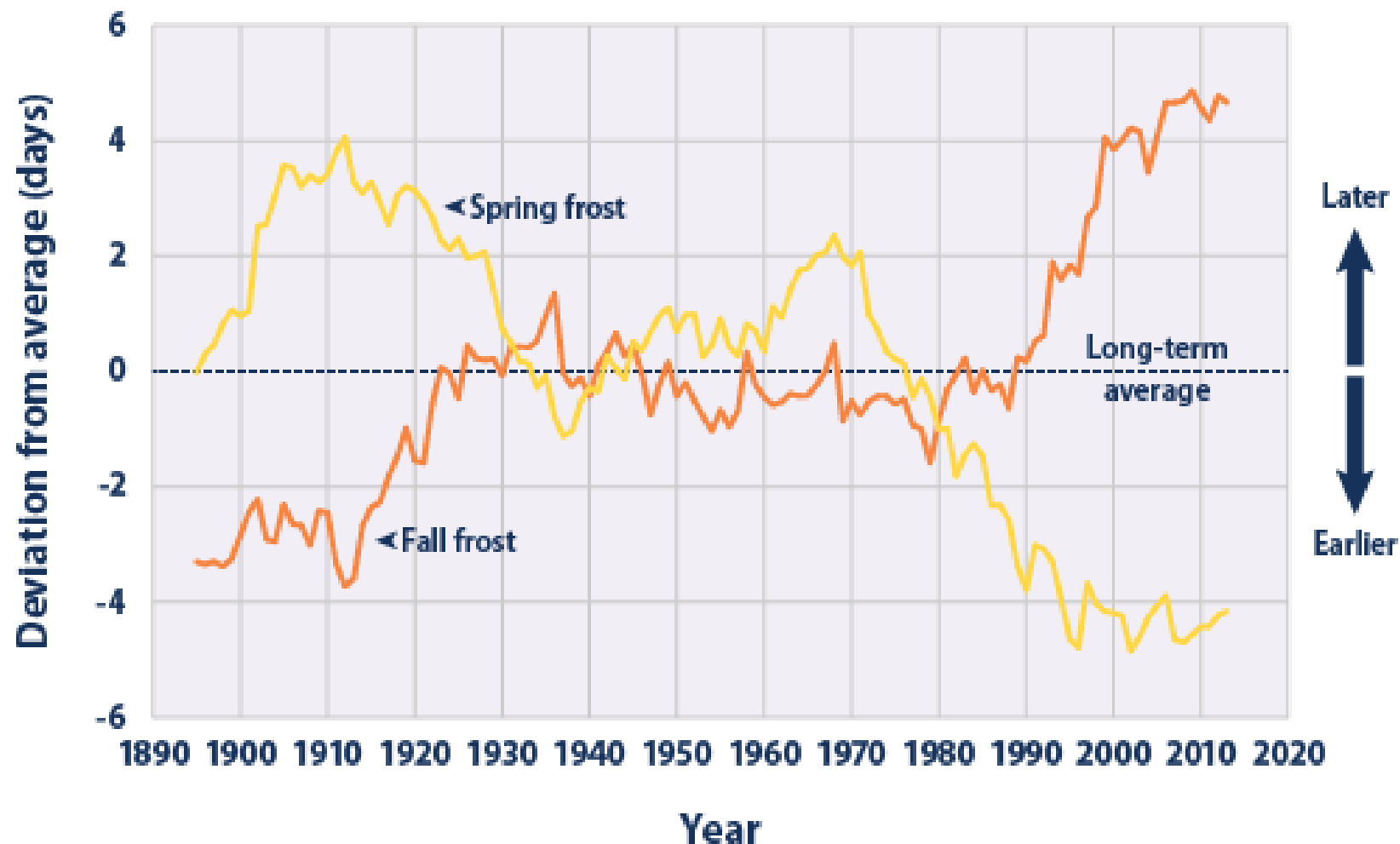
Warming trends already observed

What difference does 5° make?



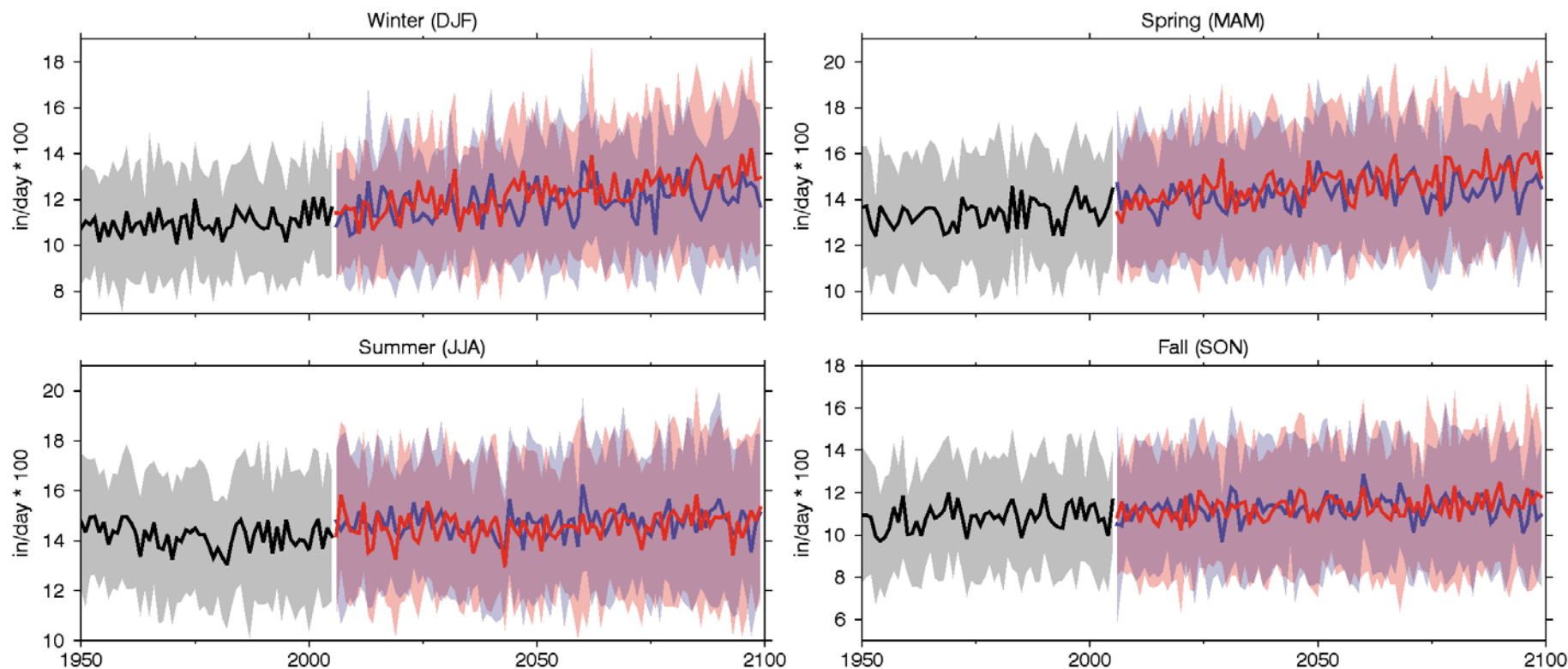
Longer growing season

Figure 3. Timing of Last Spring Frost and First Fall Frost in the Contiguous 48 States, 1895–2013



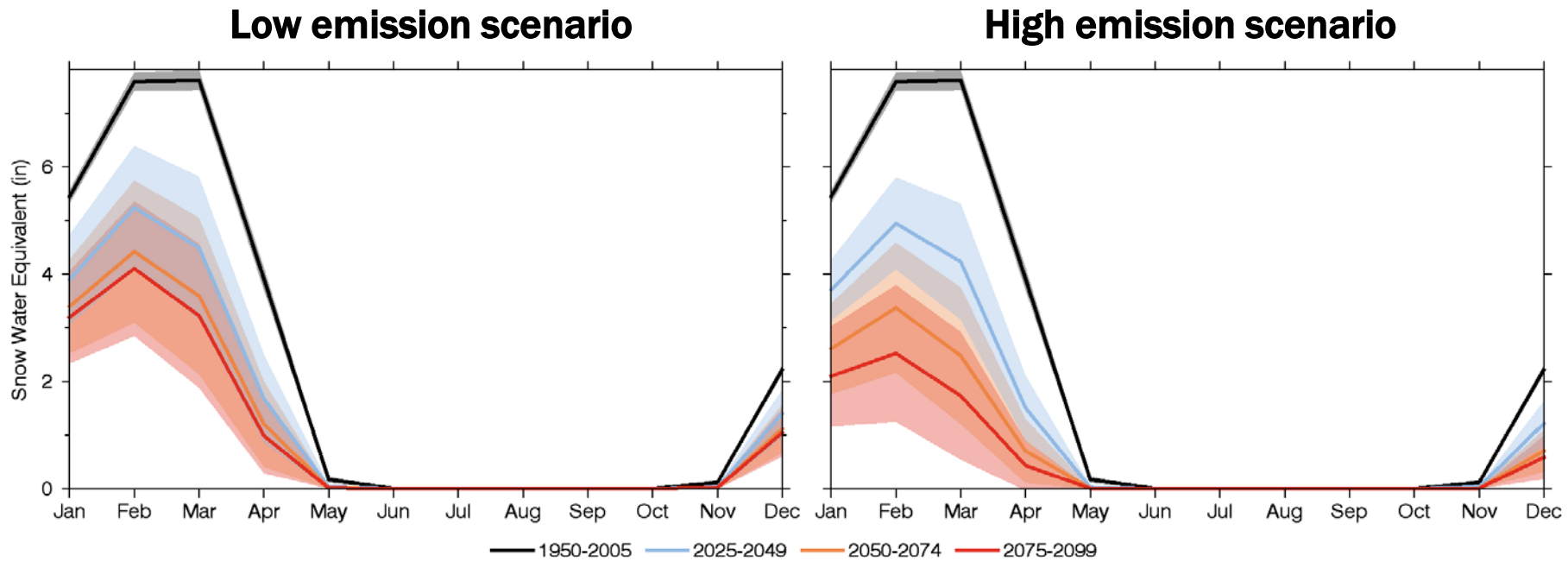
Future precipitation

Slightly higher winter and spring totals



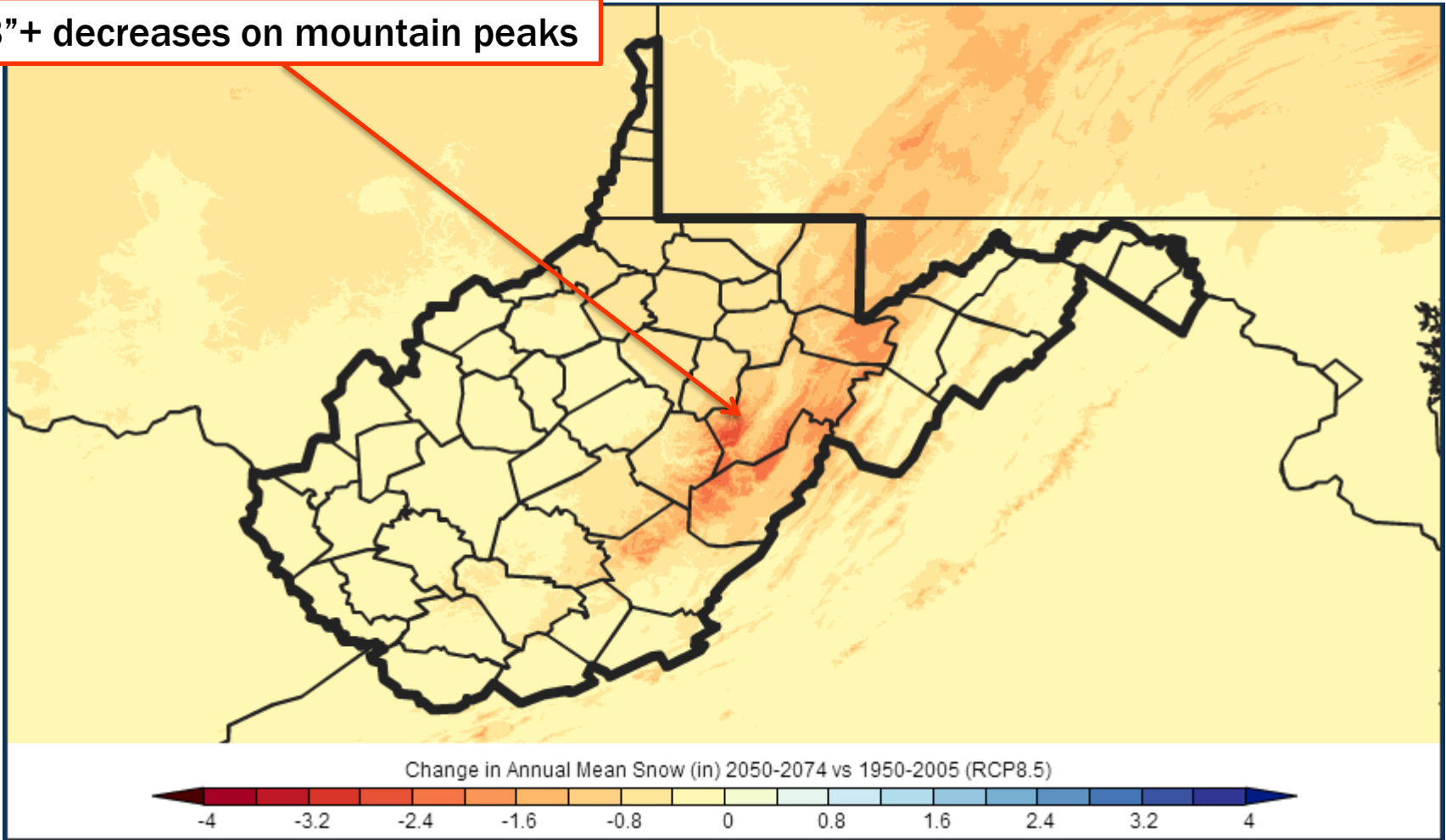
Little change in summer and fall totals

Snow → rain

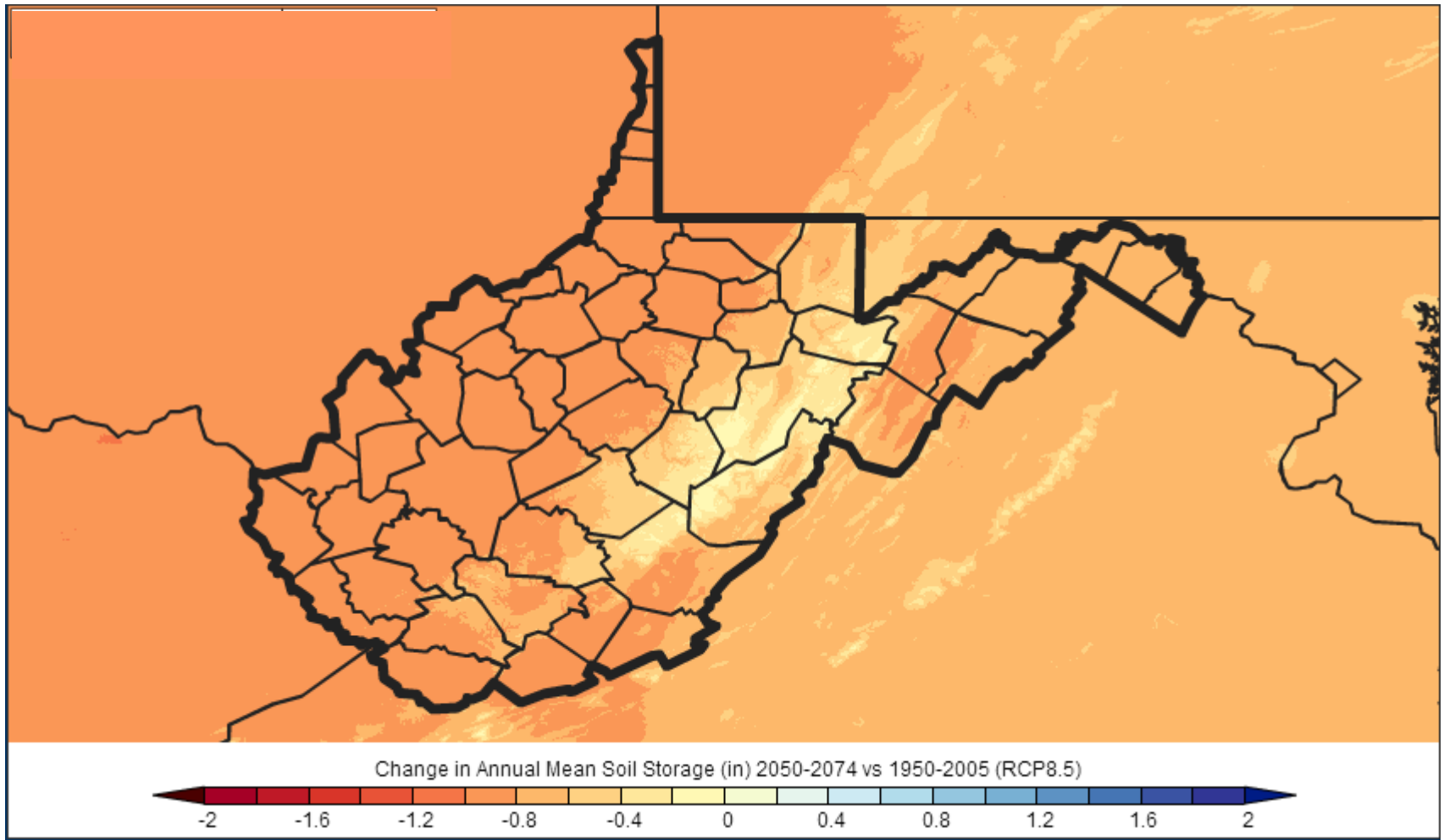


Greater snow loss at higher elevations

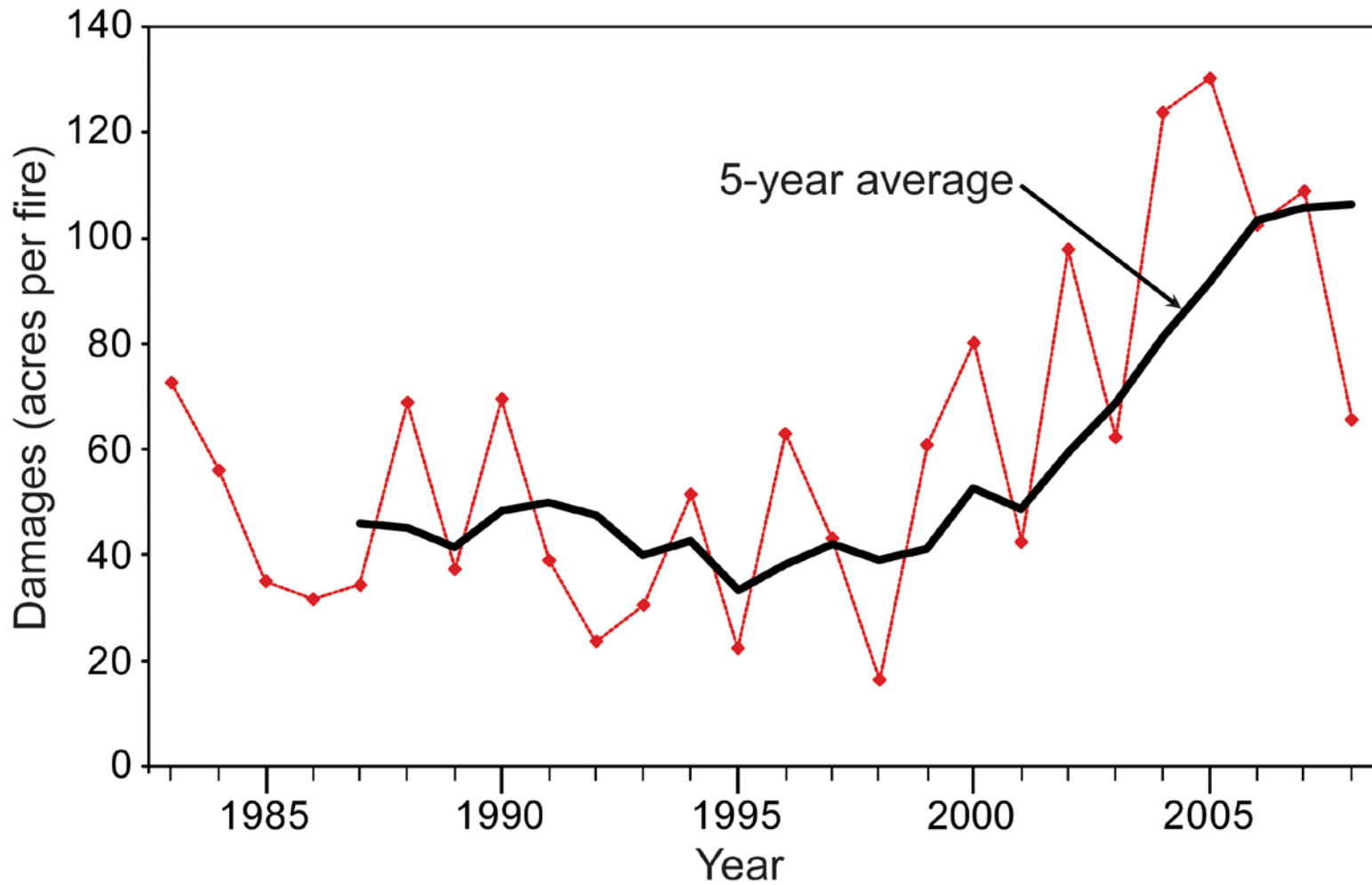
3"+ decreases on mountain peaks



Less drying at higher elevations



Wildfires



National Interagency Fire Center²⁵⁰

Data on wildland fires in the United States show that the number of acres burned per fire has increased since the 1980s.

Take-aways

- 1. Downscaling is a necessary step for management applications**
 - Type of downscaling depends on your purpose**
- 2. Models are consistent with many parameters, variable with others**
- 3. Slight warming can lead to large climatic changes**
 - Some changes vary with elevation**

Summary of end-of-century projections

Parameter	Trend	Magnitude	Certainty
Carbon dioxide	More	Factor of 1/3 to 2	High
Temperature	Warmer More extremes	6 – 11 °F	High
Growing season	Longer	Up to 1 month	High
Snow	Less	50 – 75%	Medium
Precipitation	Wetter (winter only) More extremes	Varies	Medium-Low
Soil moisture	Increase	25 – 50%	Medium-Low



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