



State of Predicting Climate Variability and Change

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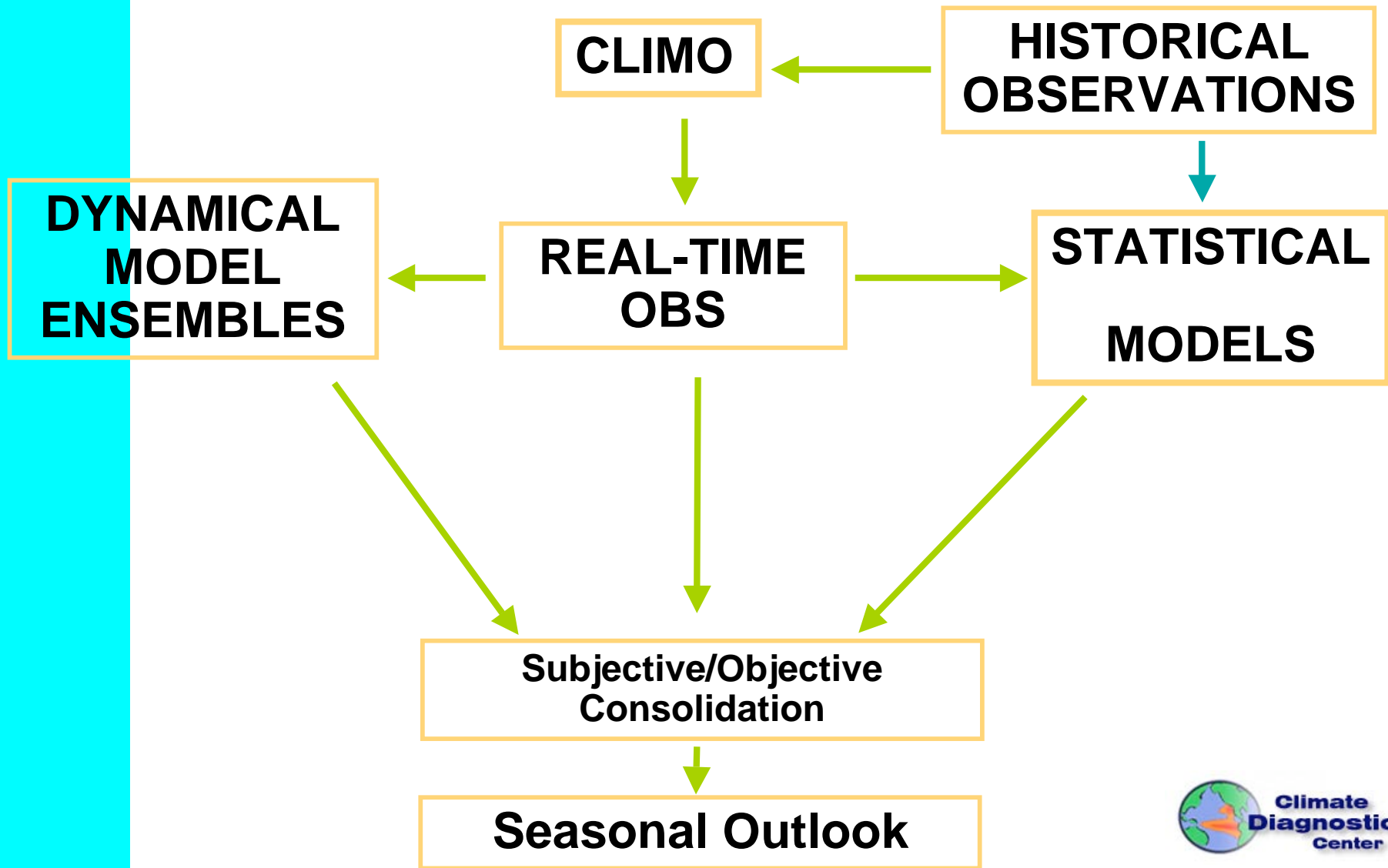


Current status of seasonal predictions

- *Official seasonal predictions made every month by National Centers for Environmental Prediction.*
- *Seasonal forecasts, for next 13 consecutive seasons, released by mid-month.*
- *Operational seasonal forecasts made since 1995.*
- *Forecast methodology is advancing to include dynamical modeling tools.*

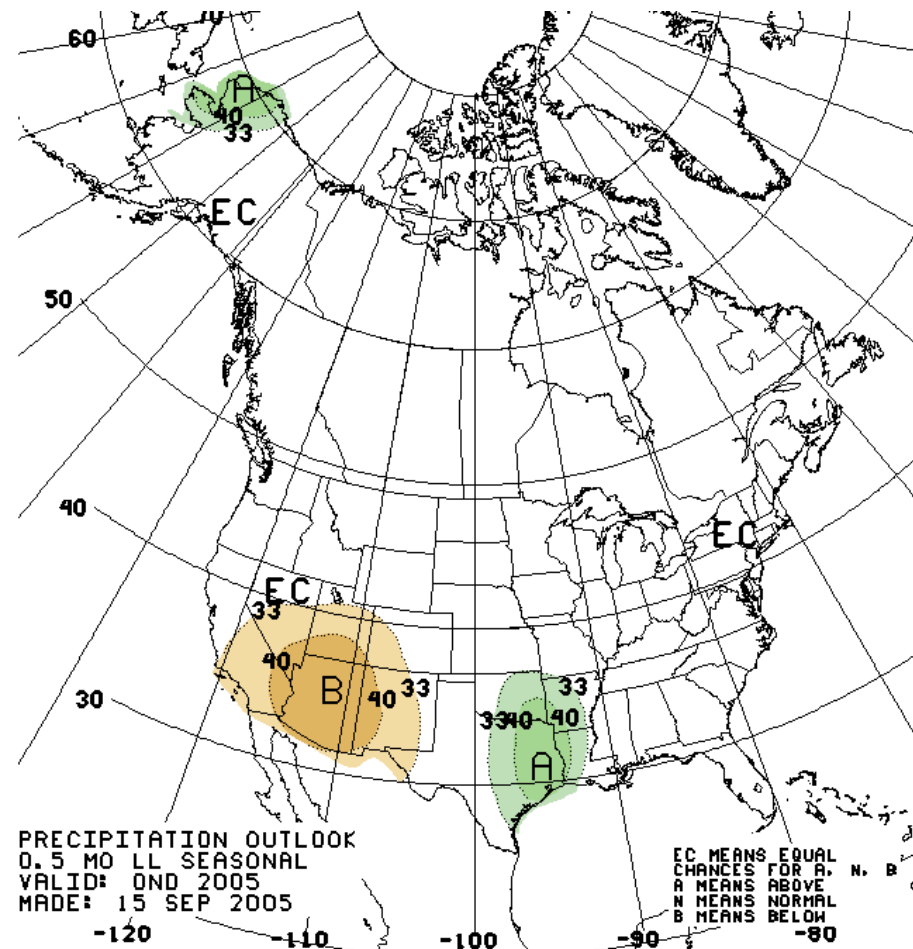
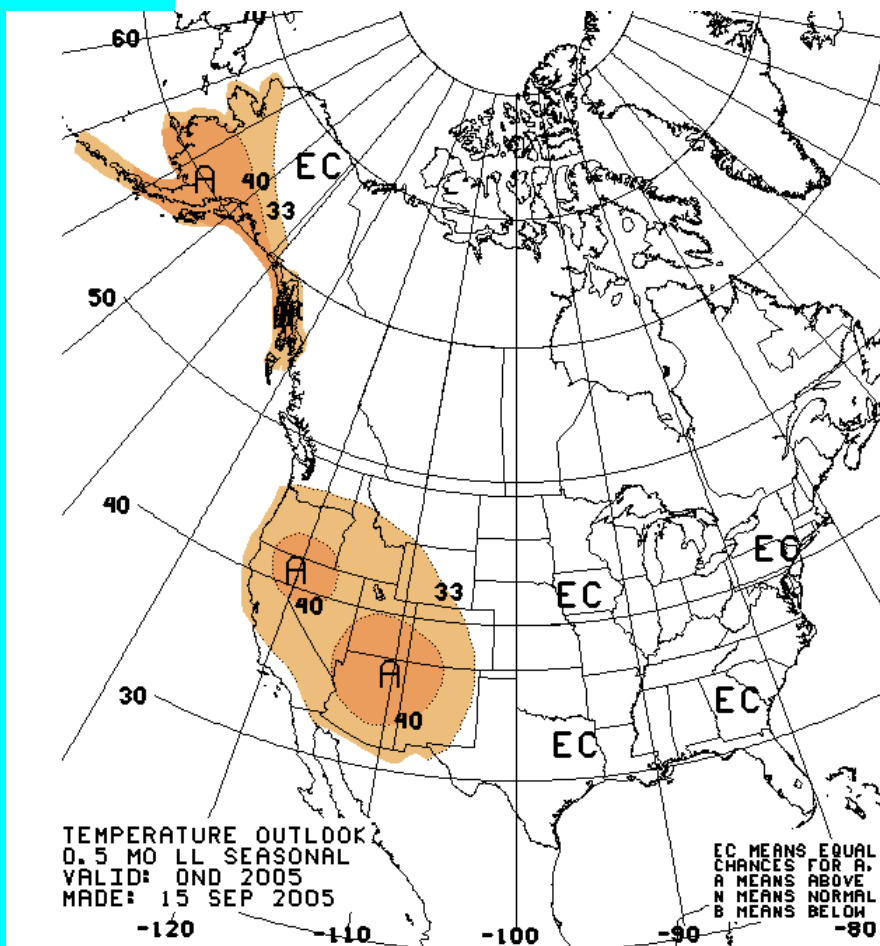


How are seasonal predictions made?



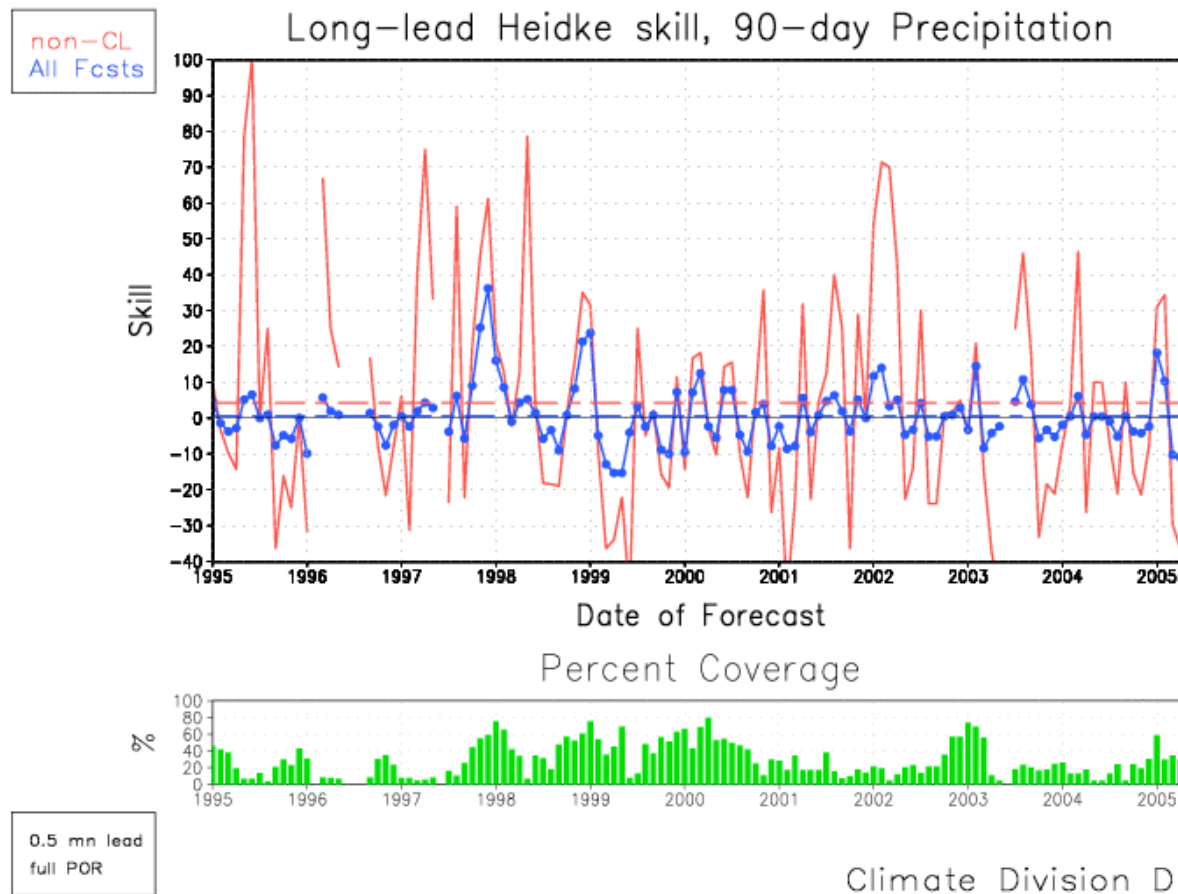


How are seasonal predictions presented?





How skillful are seasonal predictions?



Climate Division Data





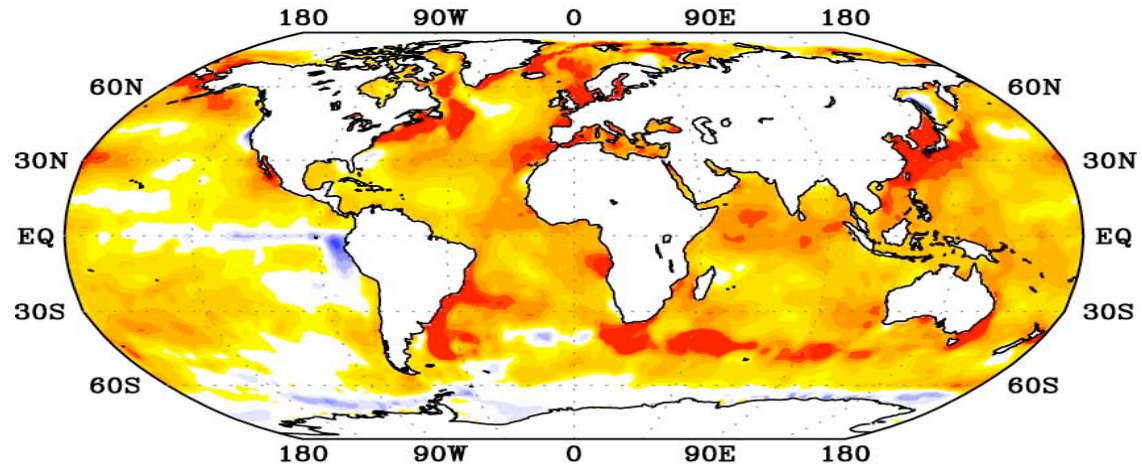
Current status on detection/attribution of climate variations & change

- *Accurate monitoring of current and past climate states requires observing systems, assimilation, and Reanalysis.*
- *Explaining the “state of the climate” is now a key element in the suite of climate information.*
- *Distinguishing “natural variations” from “change” is of great importance.*
- *Dynamical modeling capability core to attribution science.*

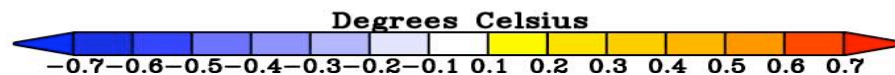
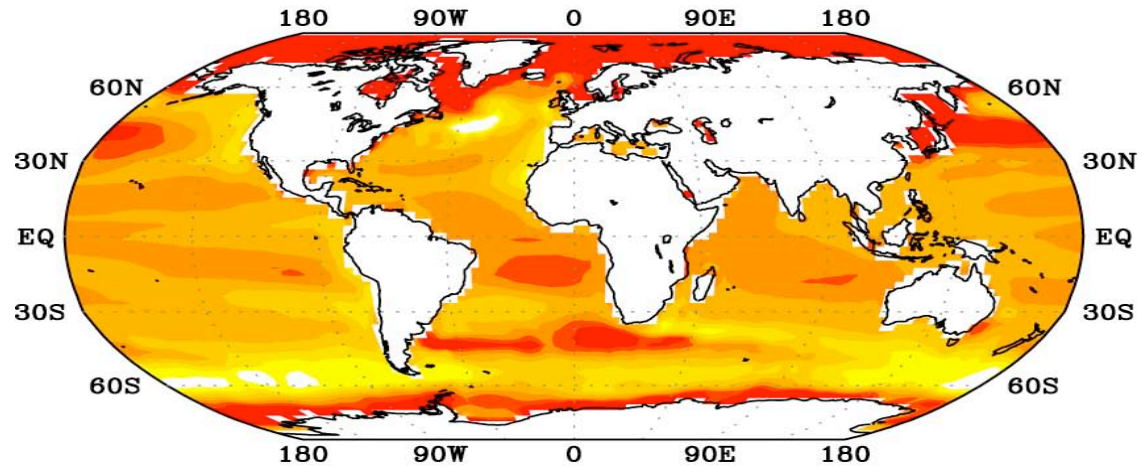




Observed SST Departure (2000-04) minus (1895-00)



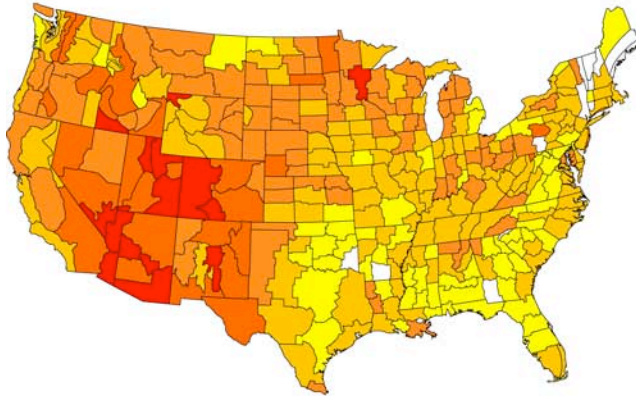
Simulated Temperature (GHG) Departure (2000-04) minus (1895-00)





U.S. Annual Temperature Departure (2000–04) minus (1961–90)

Observed



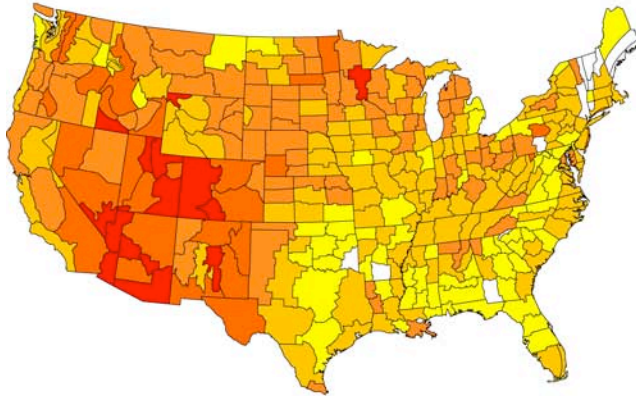
Degrees Celsius



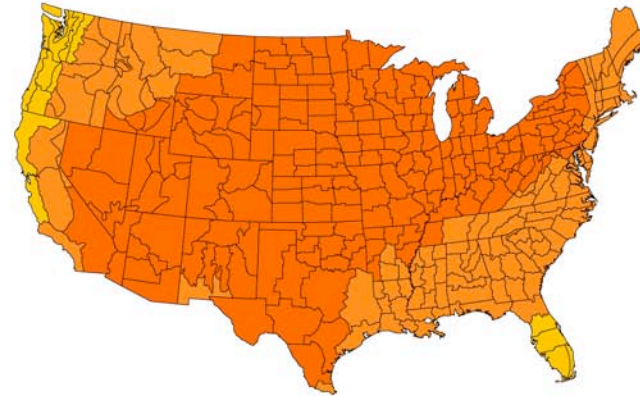


U.S. Annual Temperature Departure (2000–04) minus (1961–90)

Observed



GHG Signal



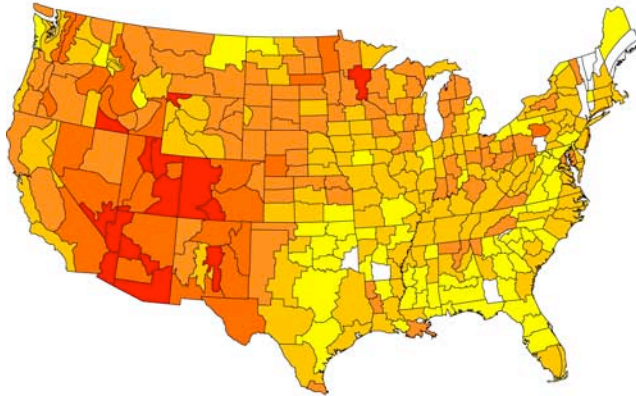
Degrees Celsius



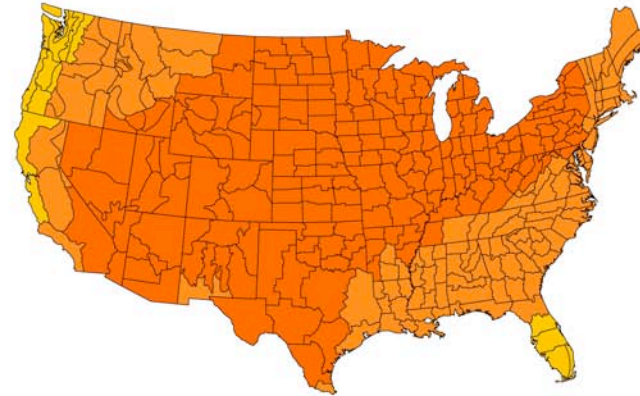


U.S. Annual Temperature Departure (2000–04) minus (1961–90)

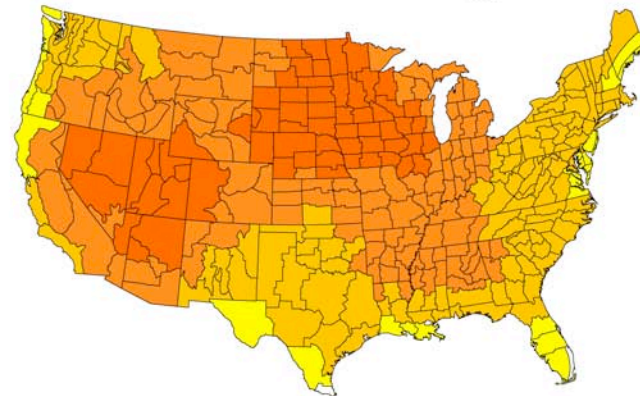
Observed



GHG Signal



Indian Ocean Signal



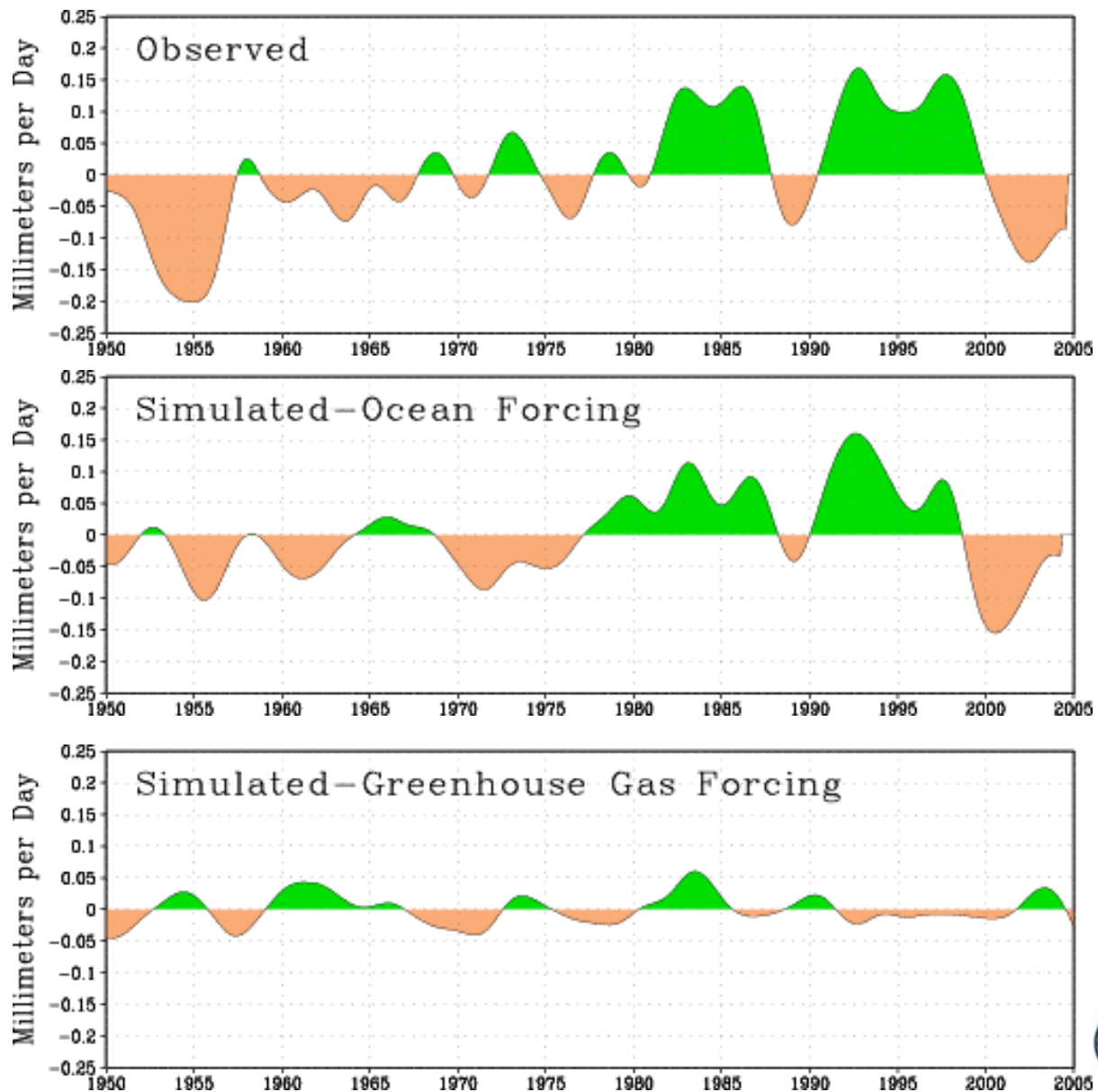
Degrees Celsius





Western U.S. Precipitation

1950 to 2004

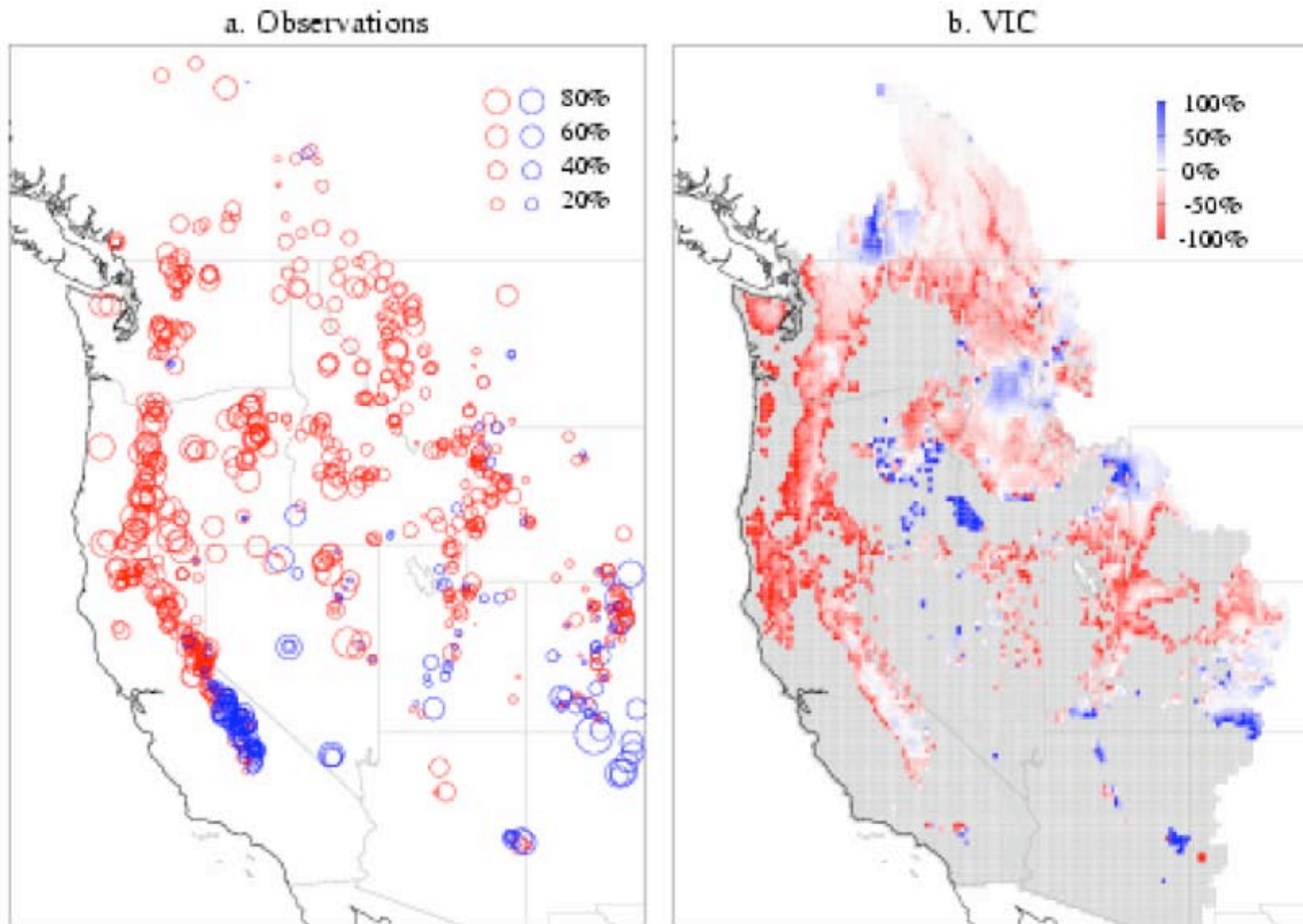




Current status on projections of climate change

- *Fourth Assessment of the IPCC, report in 2007*
- *Increased focus to be on regional change.*
- *Increased credibility of projections being built upon success at explaining known, observed regional changes.*

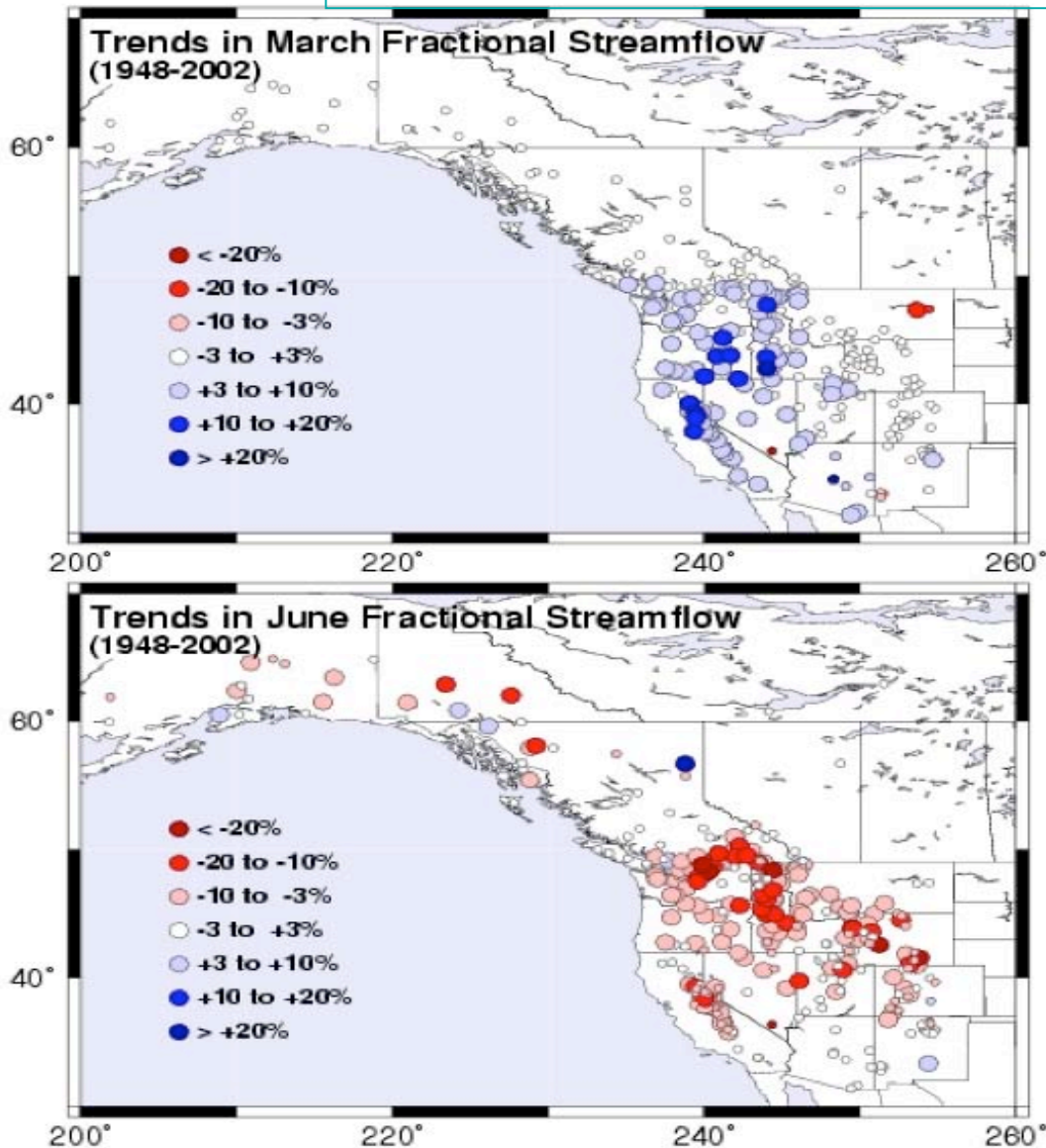
Trends in April 1 SWE 1950-1997



Mote P.W., Hamlet A.F., Clark M.P., Lettenmaier D.P., 2005, Declining mountain snowpack in western North America

BAMS 86, pp 39-49

Advancing Western Hydrographs



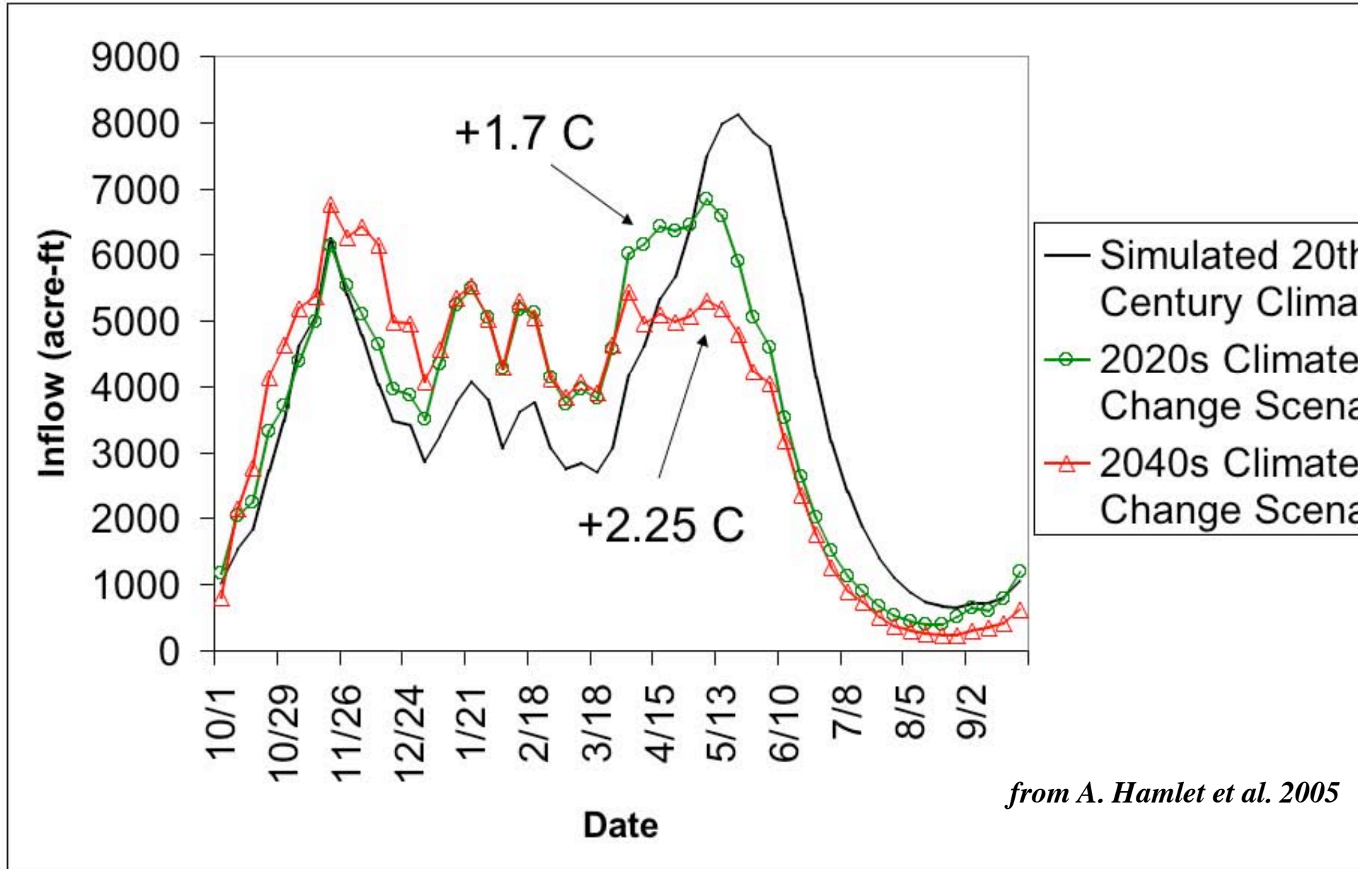
As the West warms, winter flows rise and summer flows drop

Stewart IT, Cayan DR, Dettinger MD, et al., Changes toward earlier streamflow timing across western North America, J.

Journal of Climate: 2005
Vol. 18, No. 8, pp. 1136–1155.

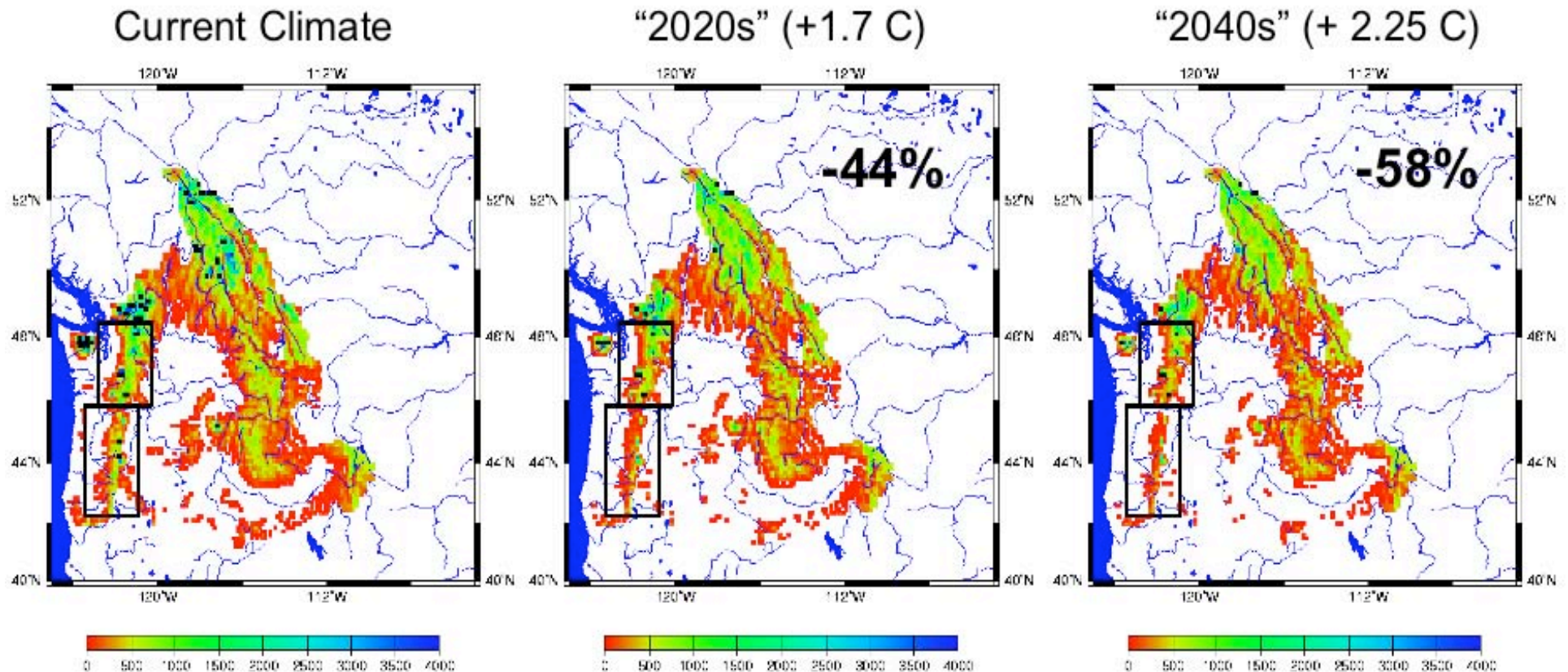
from:
Stewart, I.T., D.R. Cayan, and M.D. Dettinger (2004)
Changes toward earlier streamflow timing across western North America

Effects to the Cedar River (Seattle Water Supply) for “Middle-of-the-Road” Scenarios



from A. Hamlet et al. 2005

Changes in Simulated April 1 Snowpack for the Cascade Range in Washington and Oregon for Middle-of-the-Road Climate Change Scenarios



April 1 SWE (mm)

from A Hamlet et al 2005



Key Points and New Opportunities

- *Both variability and change are present, are important, and are relevant to water management.*
- *Need to address how watersheds and ecosystems respond to temperature & precipitation variations & extremes.*
- *More focused attention on extreme events is required, both for seasonal climate predictions and climate change.*
- *Improved mechanisms needed to ensure that scientific information more directly addresses user needs.*