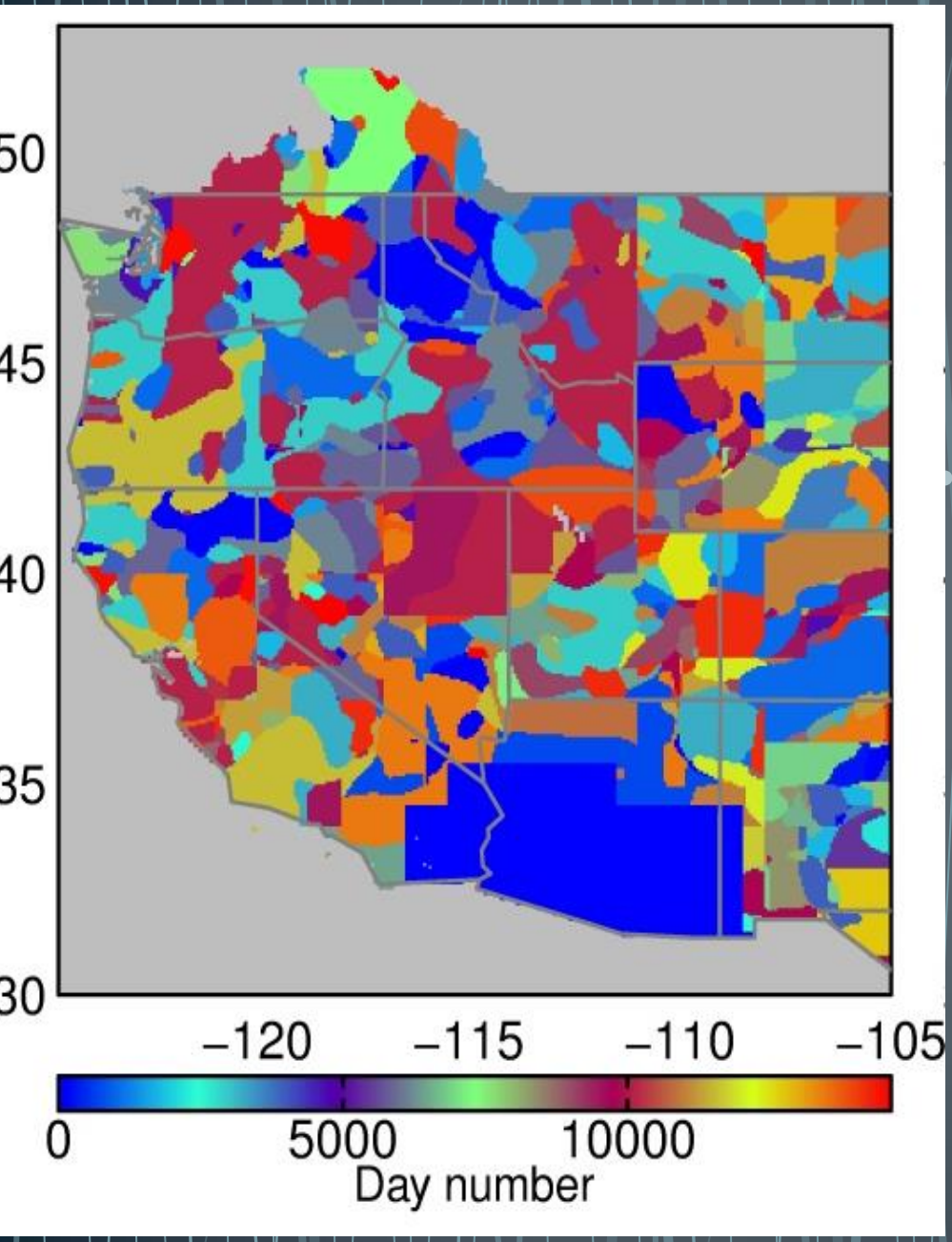


Climate scenarios for California using LOCA (Localized Constructed Analogs)

- **David Pierce and Dan Cayan**
  - Scripps Institution of Oceanography

Development sponsored by

The California Energy Commission

Department of Interior/US Geological Survey via the Southwest Climate Science Center

NOAA RISA Program through the California Nevada Applications Program

Production runs sponsored by

U.S. Army Core of Engineers/USBR

NASA via computing resources

LOCA Overview

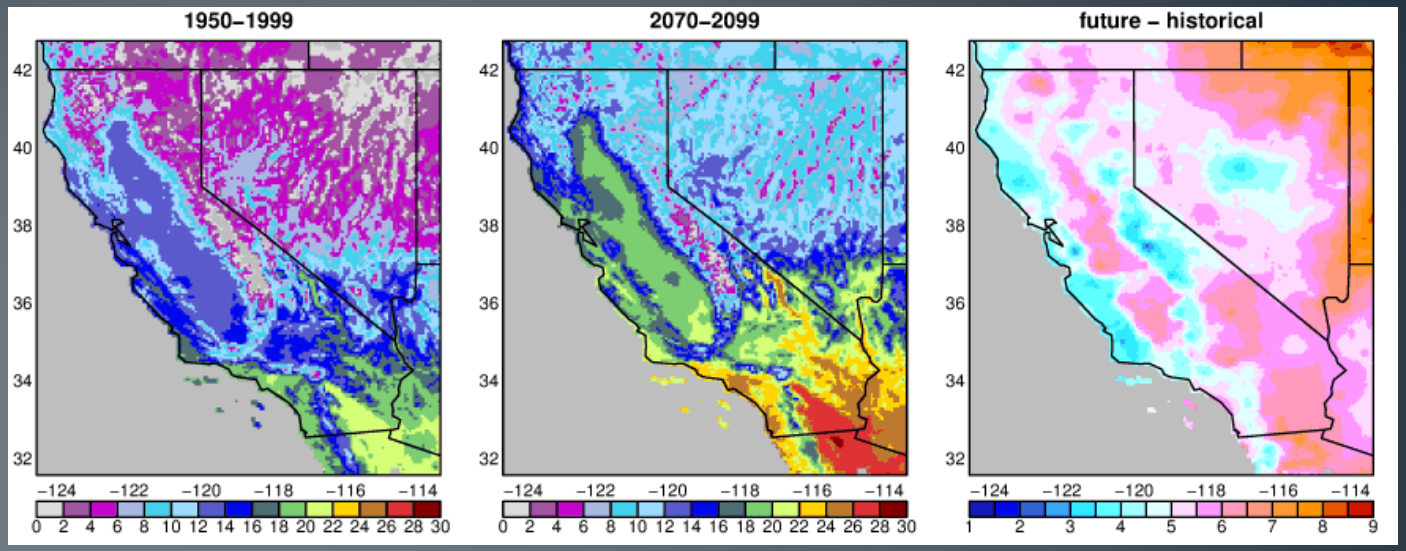
- Statistical downscaling scheme
- 1/16th degree (~6 km, or 3.5 miles) spatial resolution
- Daily data: Precipitation, Tmin, Tmax
- 1950-2005 historical period
- 2006-2100 future period:
  - Rcp 4.5 (medium greenhouse gas emissions)
  - Rcp 8.5 (high greenhouse gas emissions)
- 32 Global Climate Models
- Central Mexico through Southern Canada

LOCA Goals

- Realistic seasonal mean values
- Realistic extreme values
- Preserve model-predicted future changes
- Preserve model-predicted spatial coherence
- Fix the model calendars
- Improve simulated spectrum (i.e., daily, monthly, seasonal, and annual variability)

Example change: Tmax (C) by 2070-2100

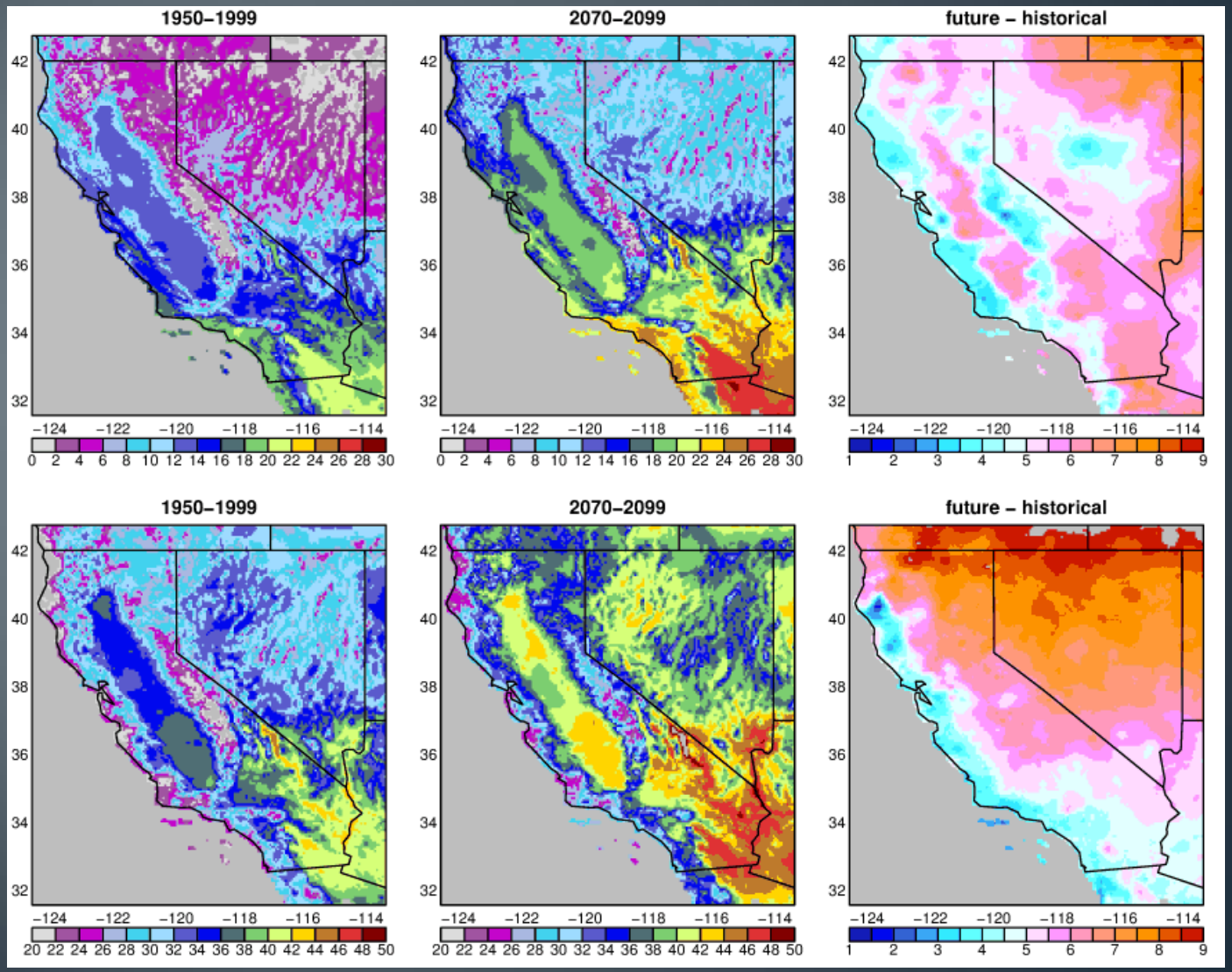
January



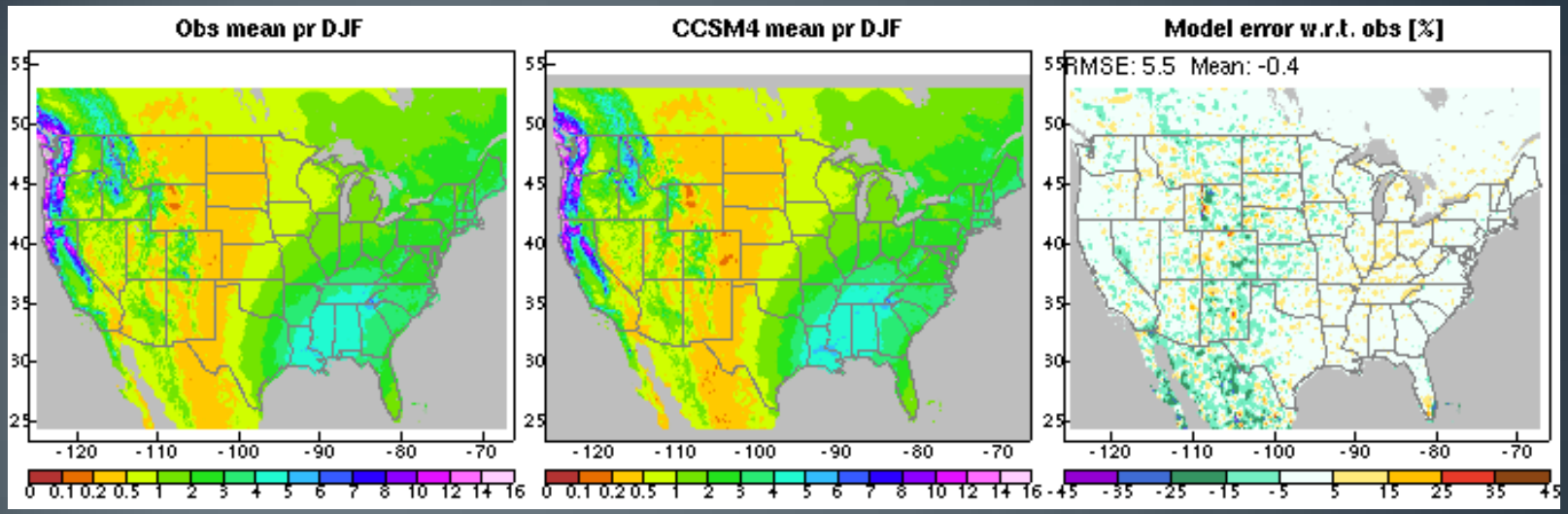
Example change: Tmax (C) by 2070-2100

January

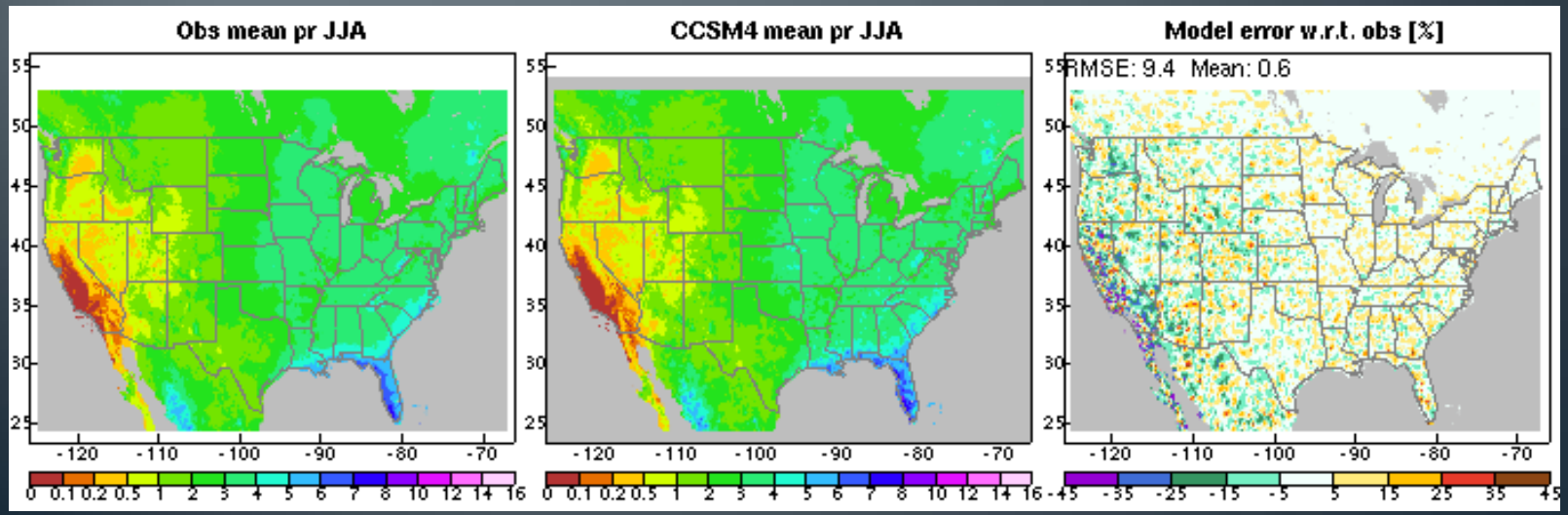
July



Goal: Realistic seasonal means (Precip)

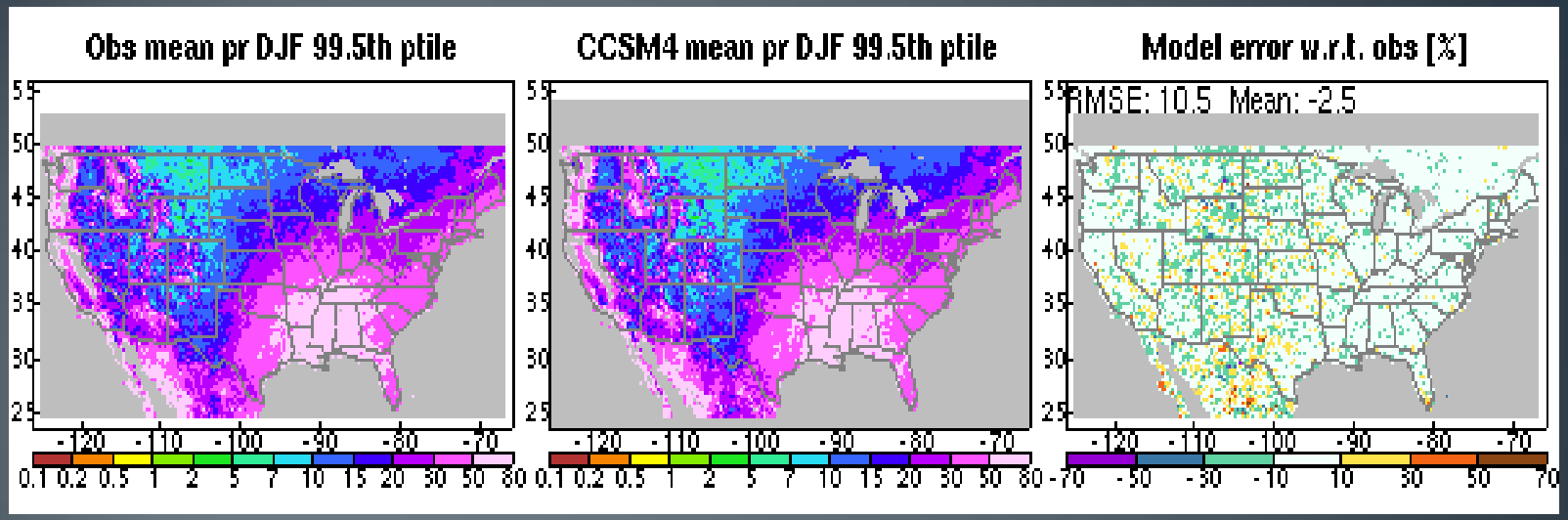


Winter, mm/day

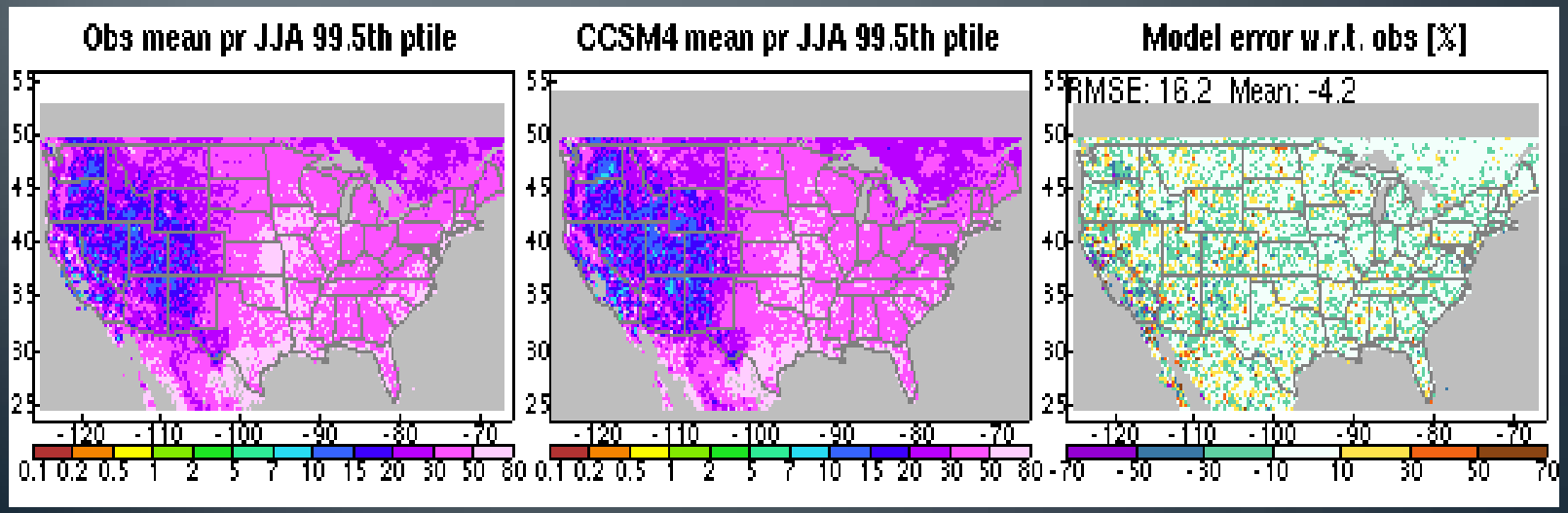


Summer, mm/day

Goal: Realistic daily extremes (Precip)

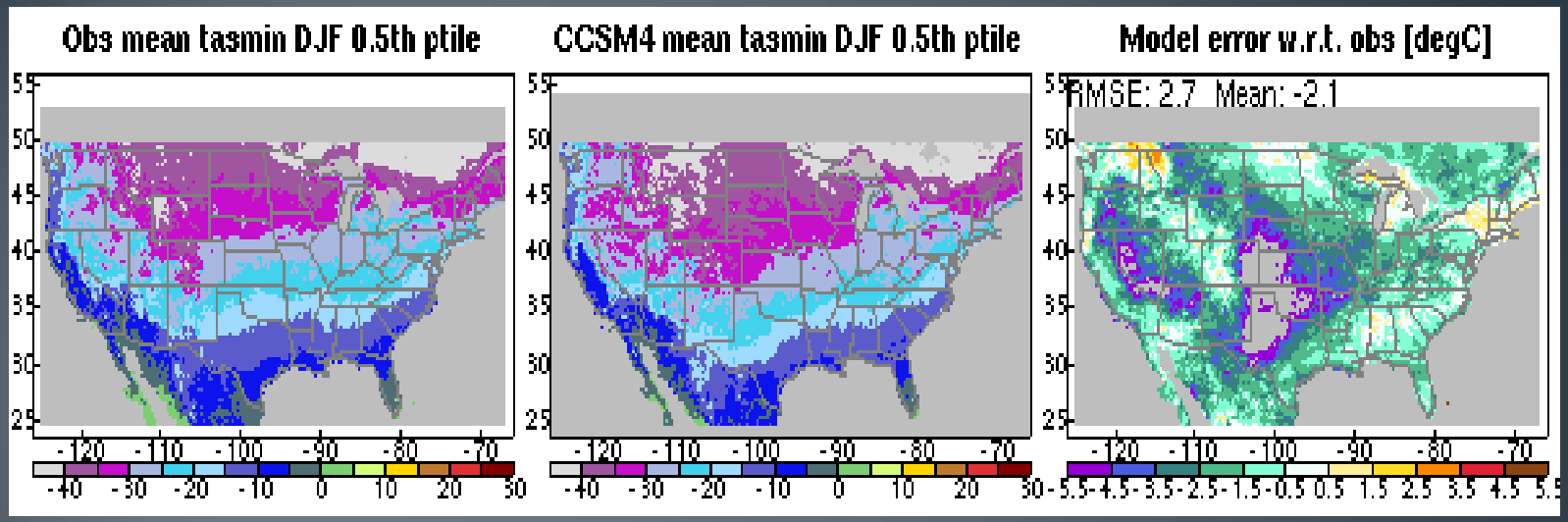


Winter, mm/day

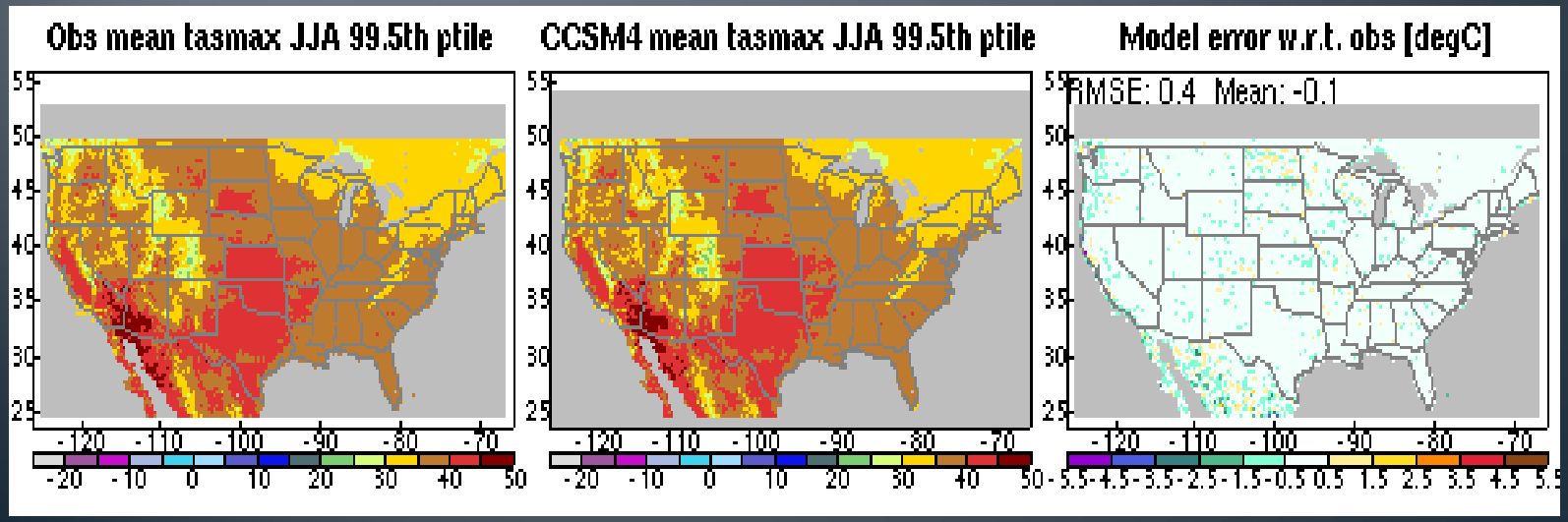


Summer, mm/day

Goal: Realistic daily extremes (Temp)



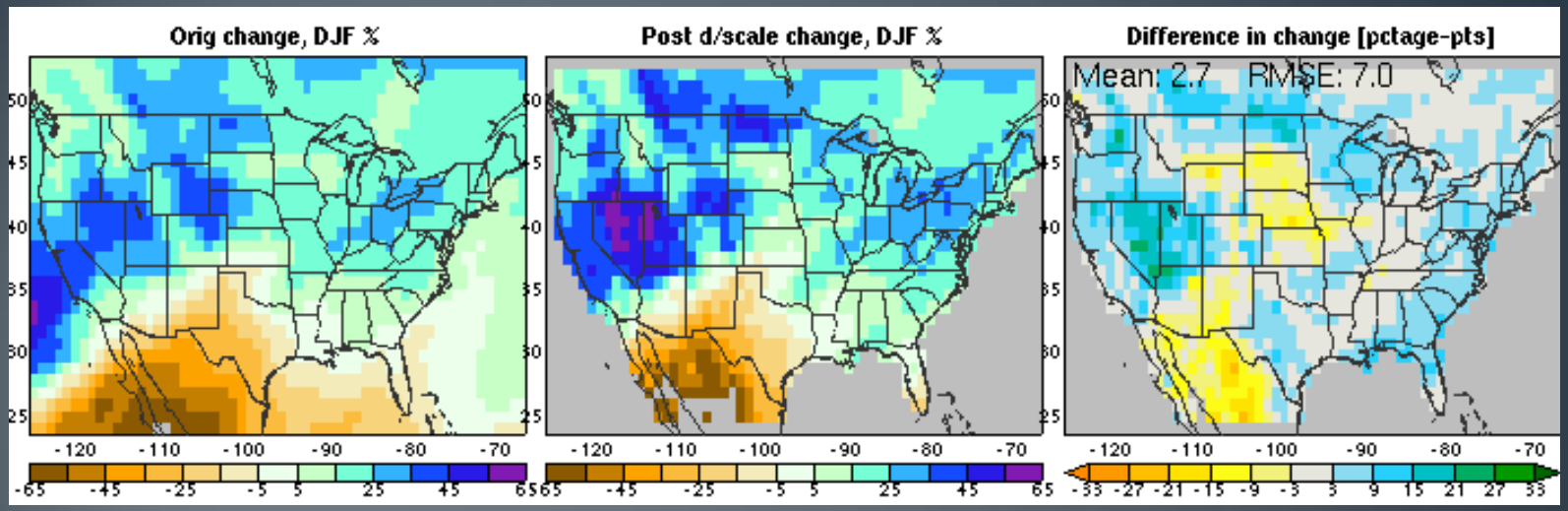
Winter, C



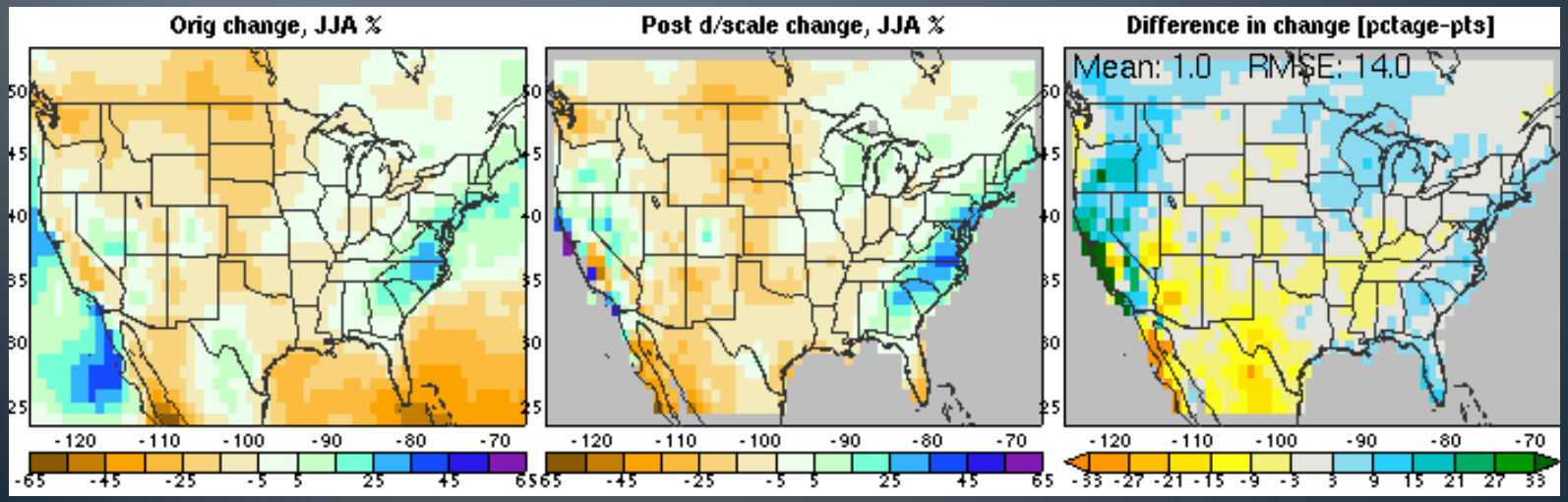
Summer, C

Goal: Preserve model-predicted changes

(Precipitation, CCSM4, rcp 8.5, 2070-2100 minus 1950-1999)



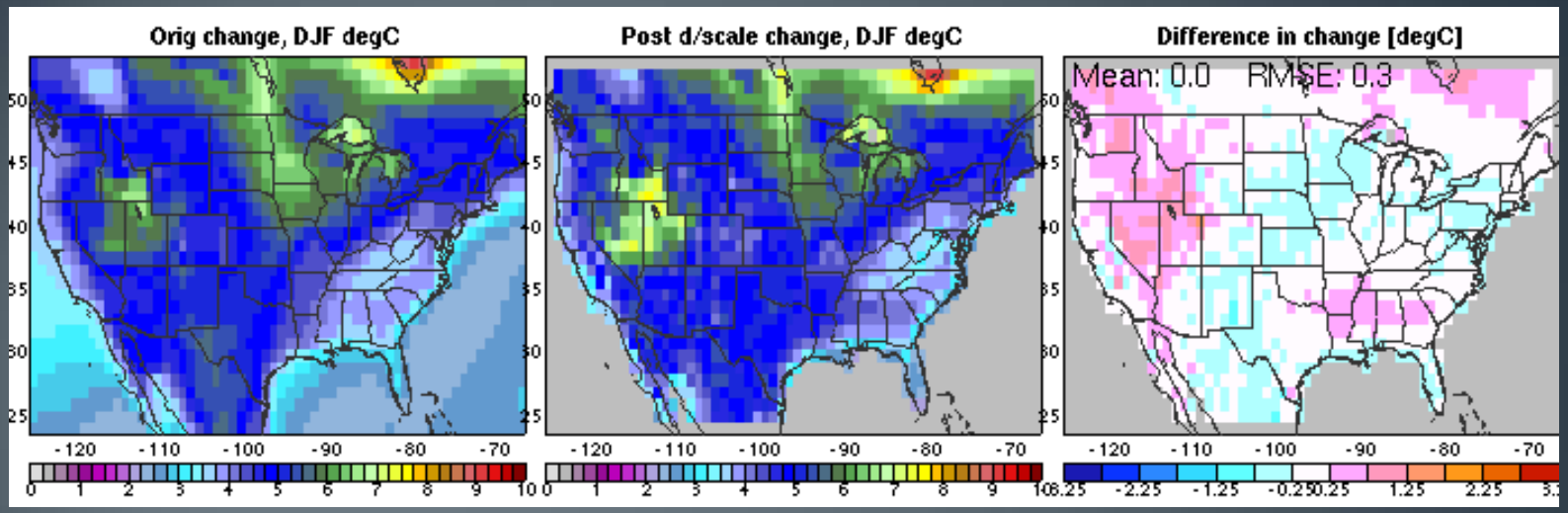
Winter, %



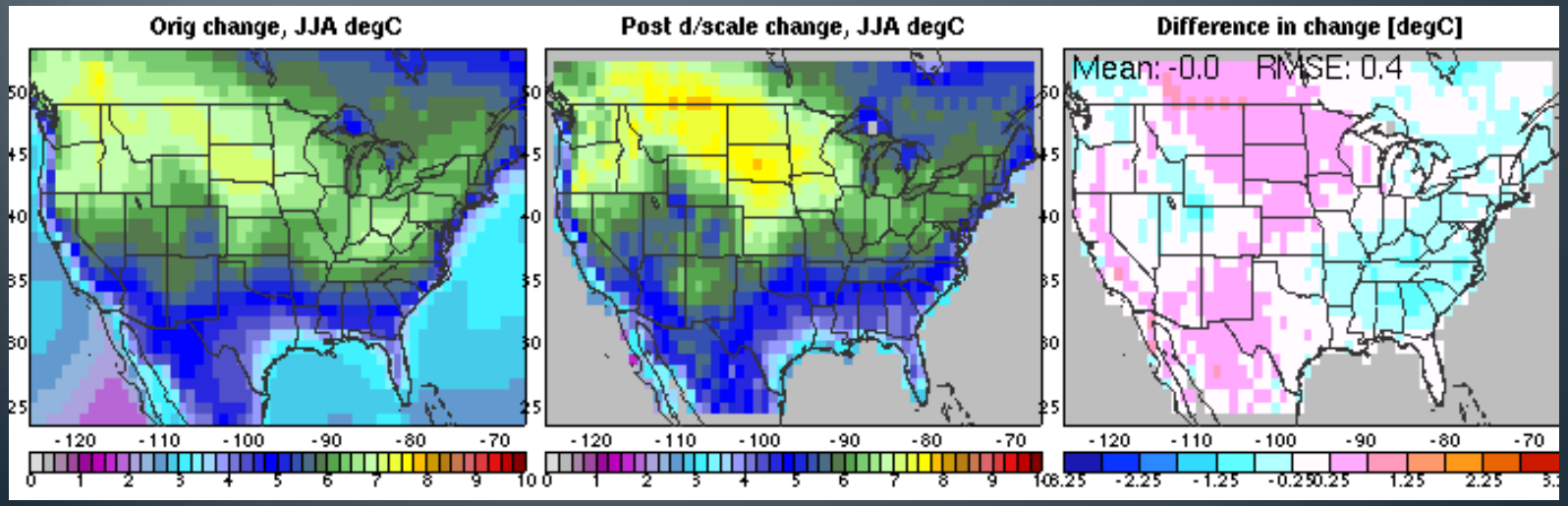
Summer, %

Goal: Preserve model-predicted changes

(Tmax, CCSM4, rcp 8.5, 2070-2100 minus 1950-1999)



Winter, C



Summer, C

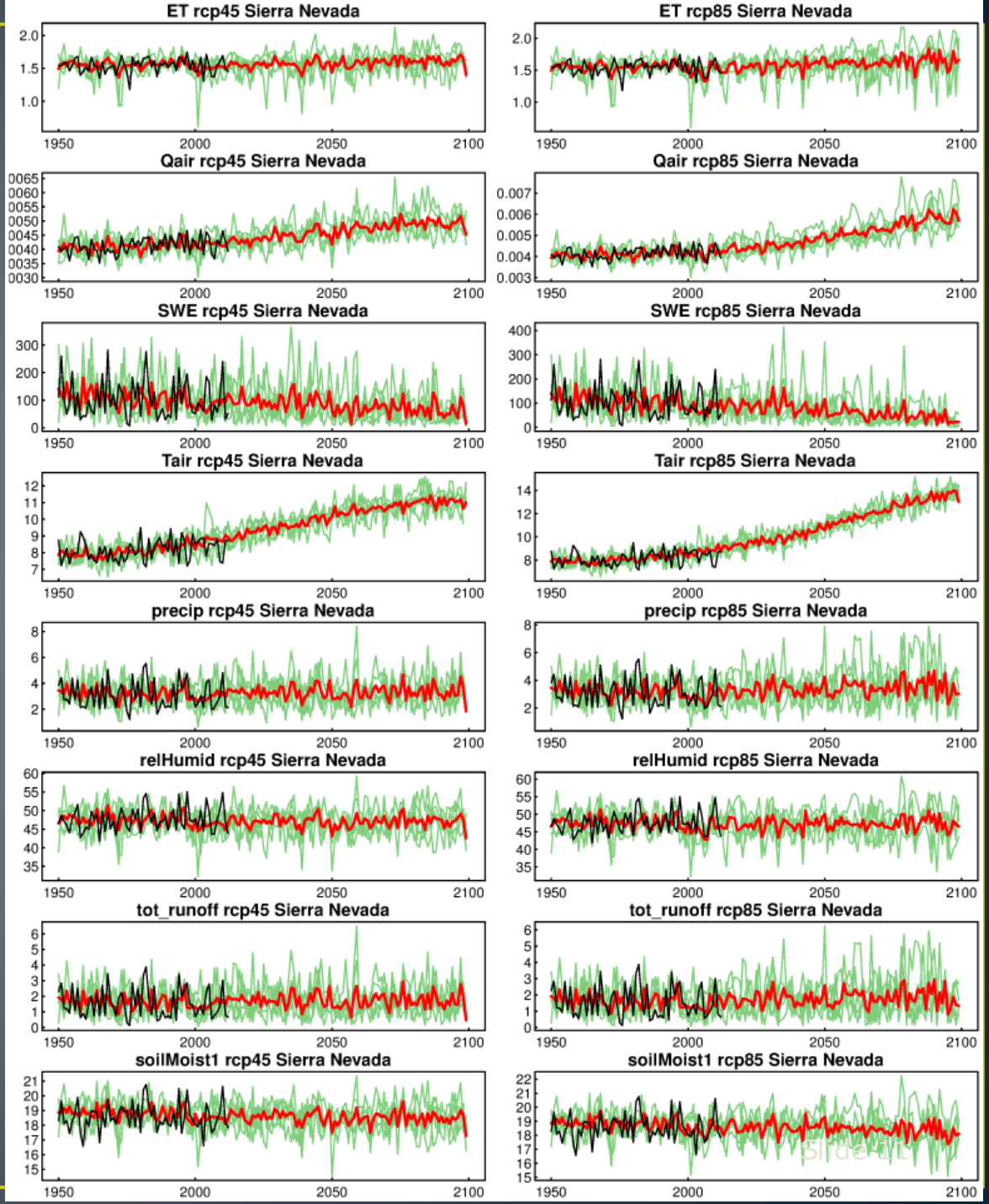
Example VIC output

(water yr avgs)

Available variables:

Evapotranspiration
Snowpack
Humidity
Total runoff
Soil moisture

Black = with obs forcing
Green = 10 models
Red = model average



Status

- First round of downscaling done, evaluating
- Running a subset of 10 global models through VIC hydrological model in California-Nevada region
- Online evaluation plots are available

- Distribution:
  - California domain and value added products: Cal Adapt
  - Entire domain raw data: LLNL's Green Data Oasis