The Depiction of Atmospheric Rivers in Downscaled Data

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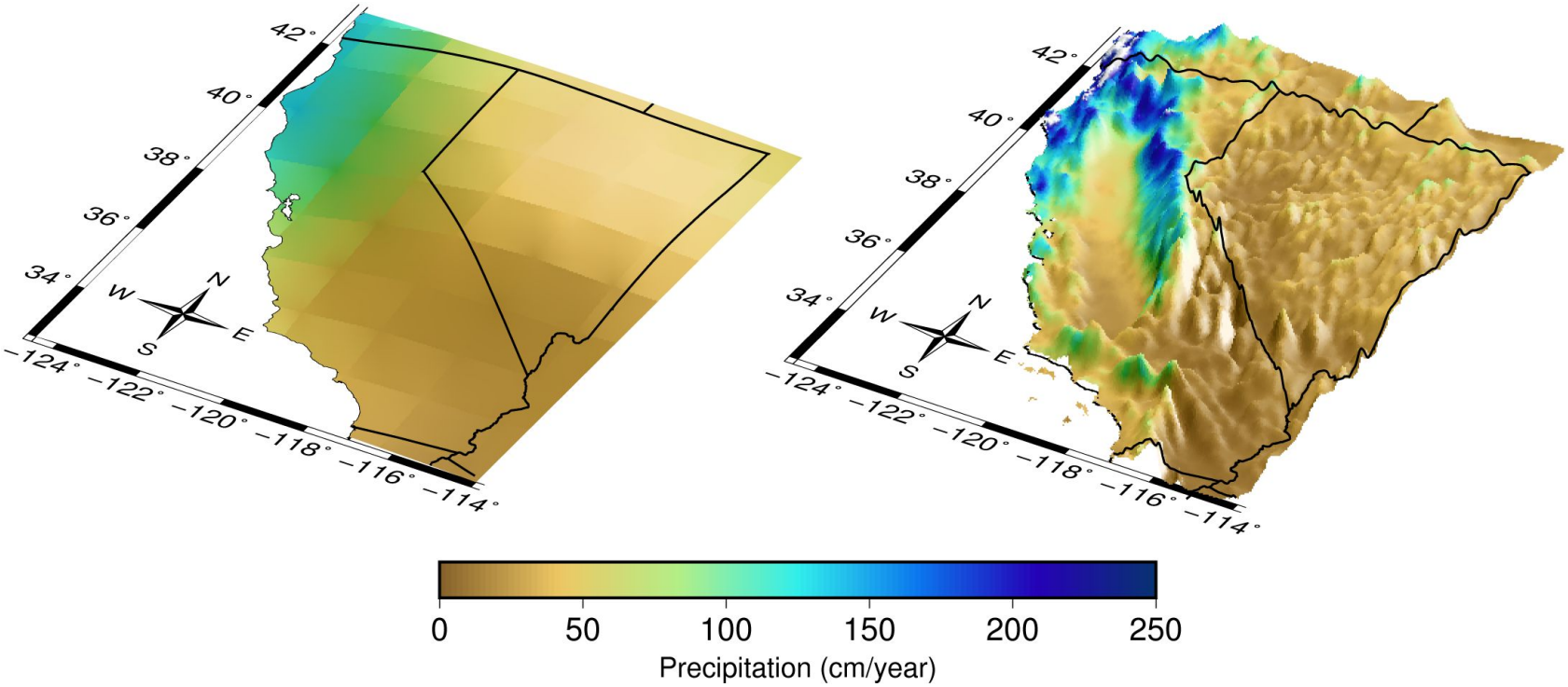

Approach

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Dynamical:

WRF

CanRCM4 (0.22 deg)

RegCM4 (0.22 deg)

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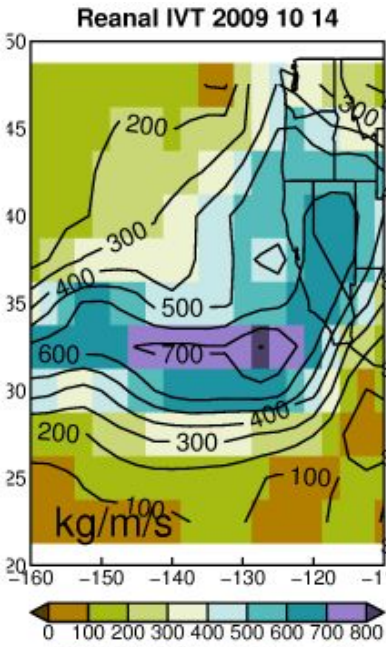
U.S. Bureau of Reclamation “Green Data Oasis”

NA-CORDEX

One example: Oct 14, 2009



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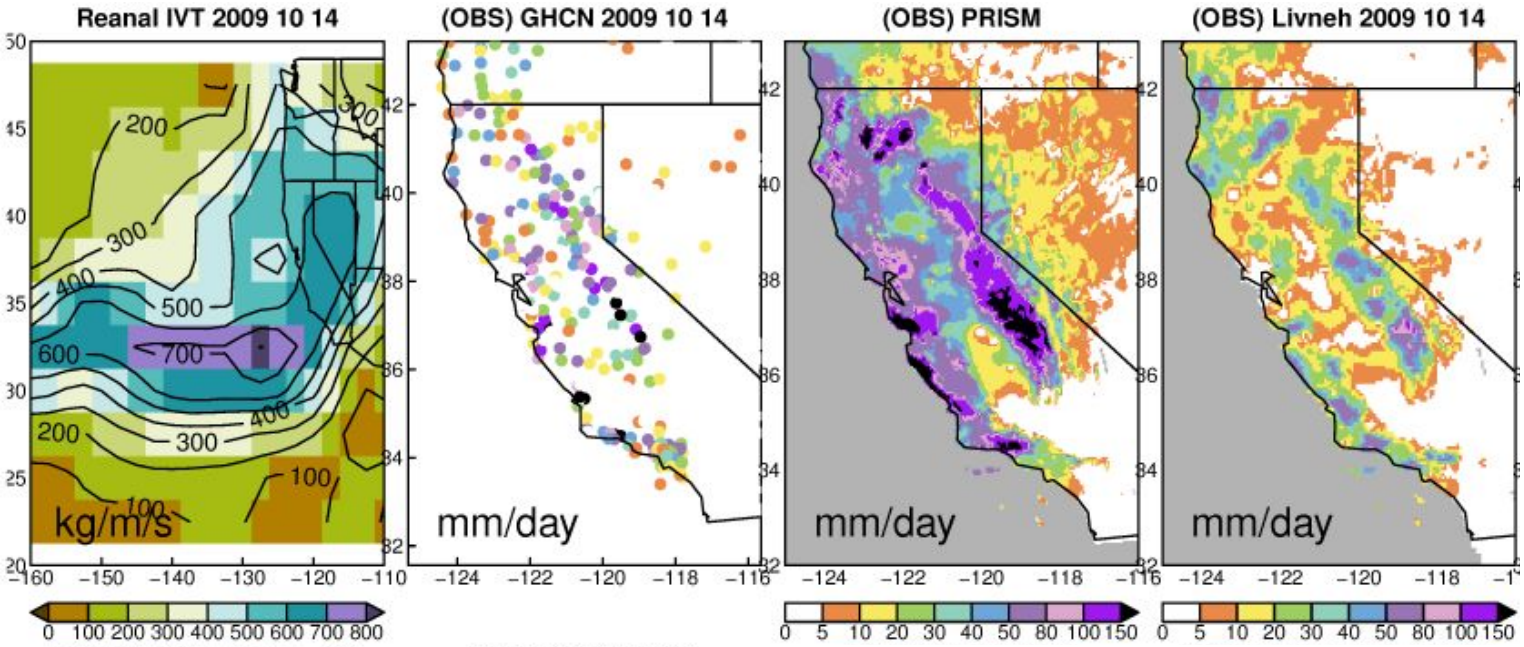

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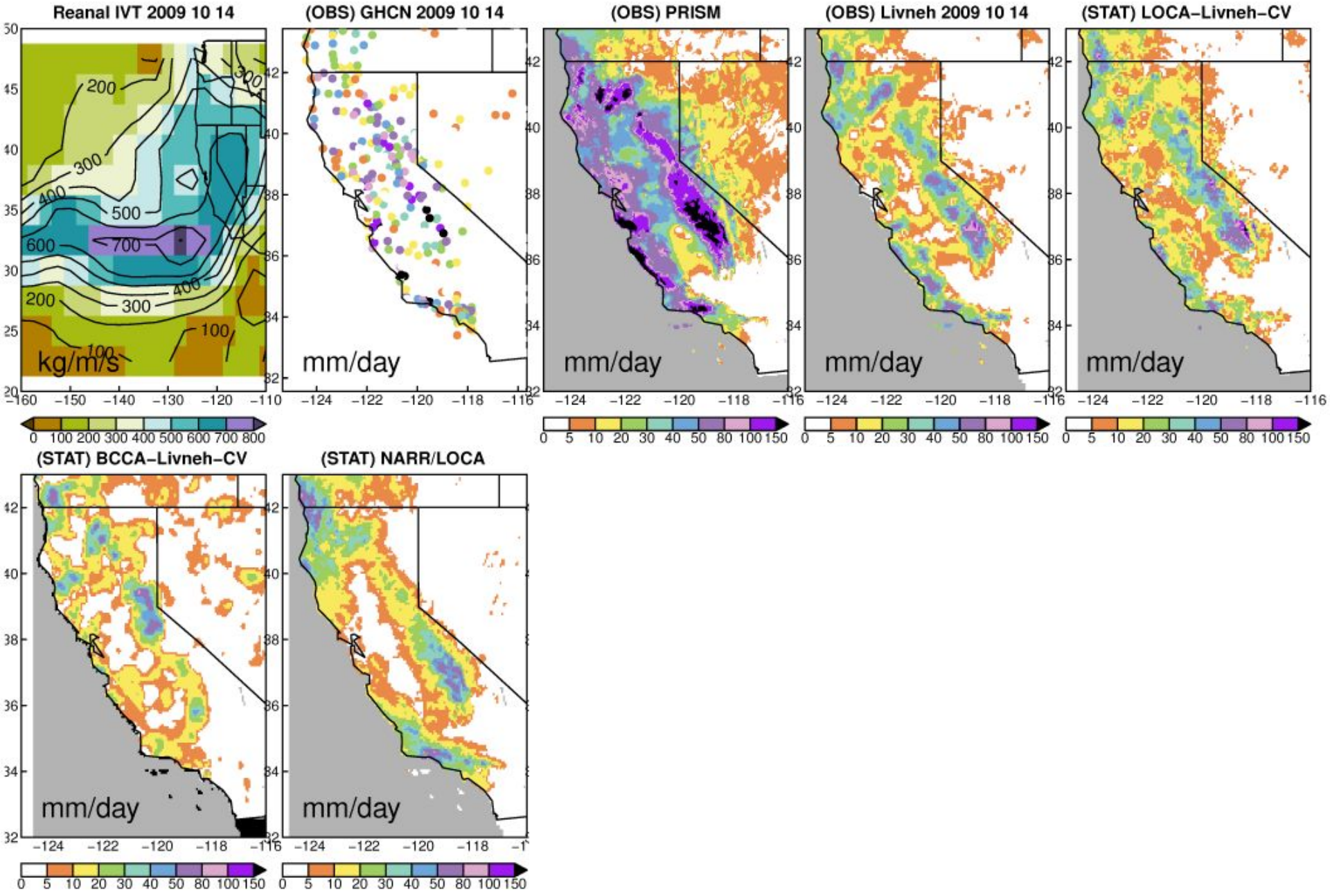

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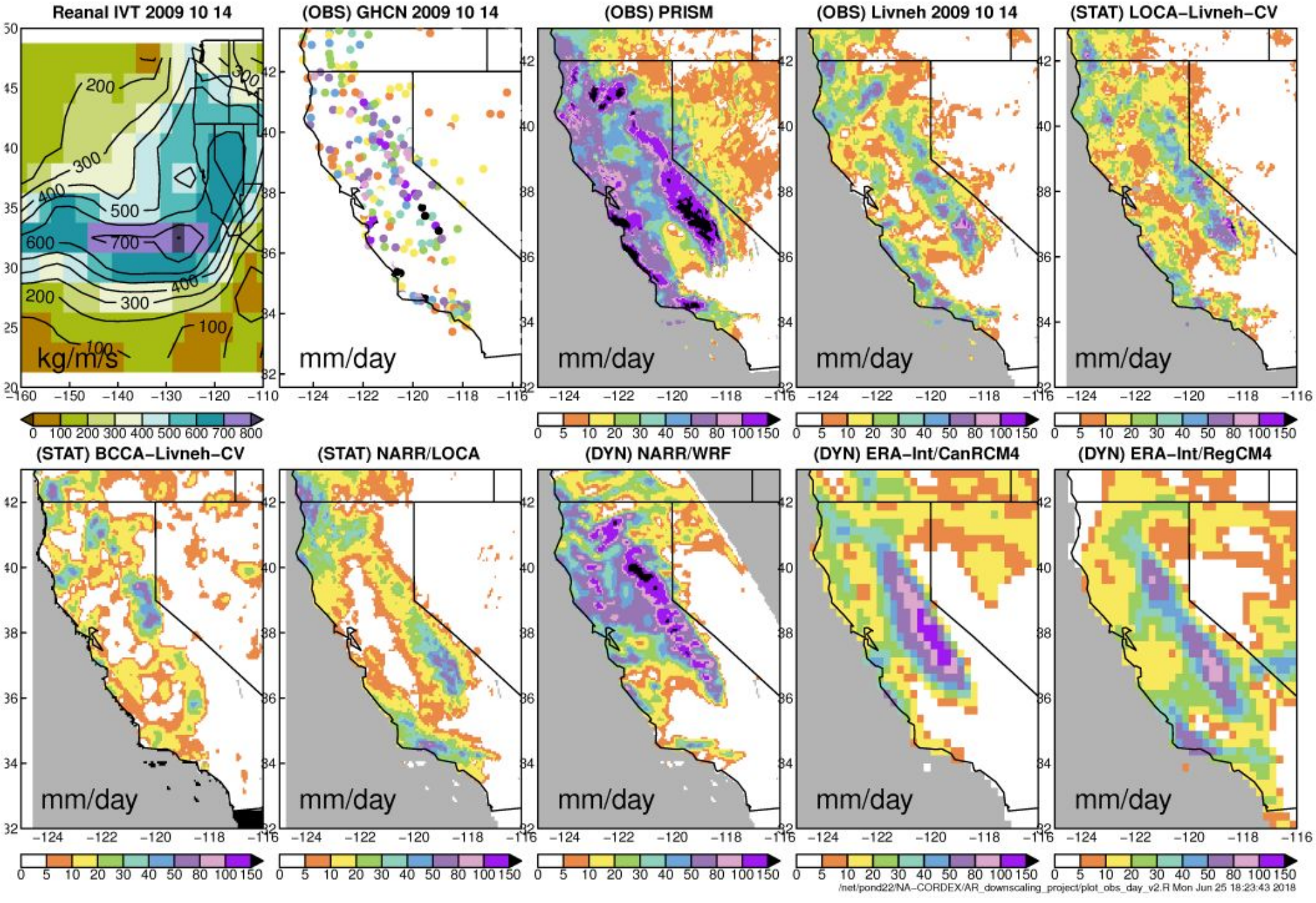
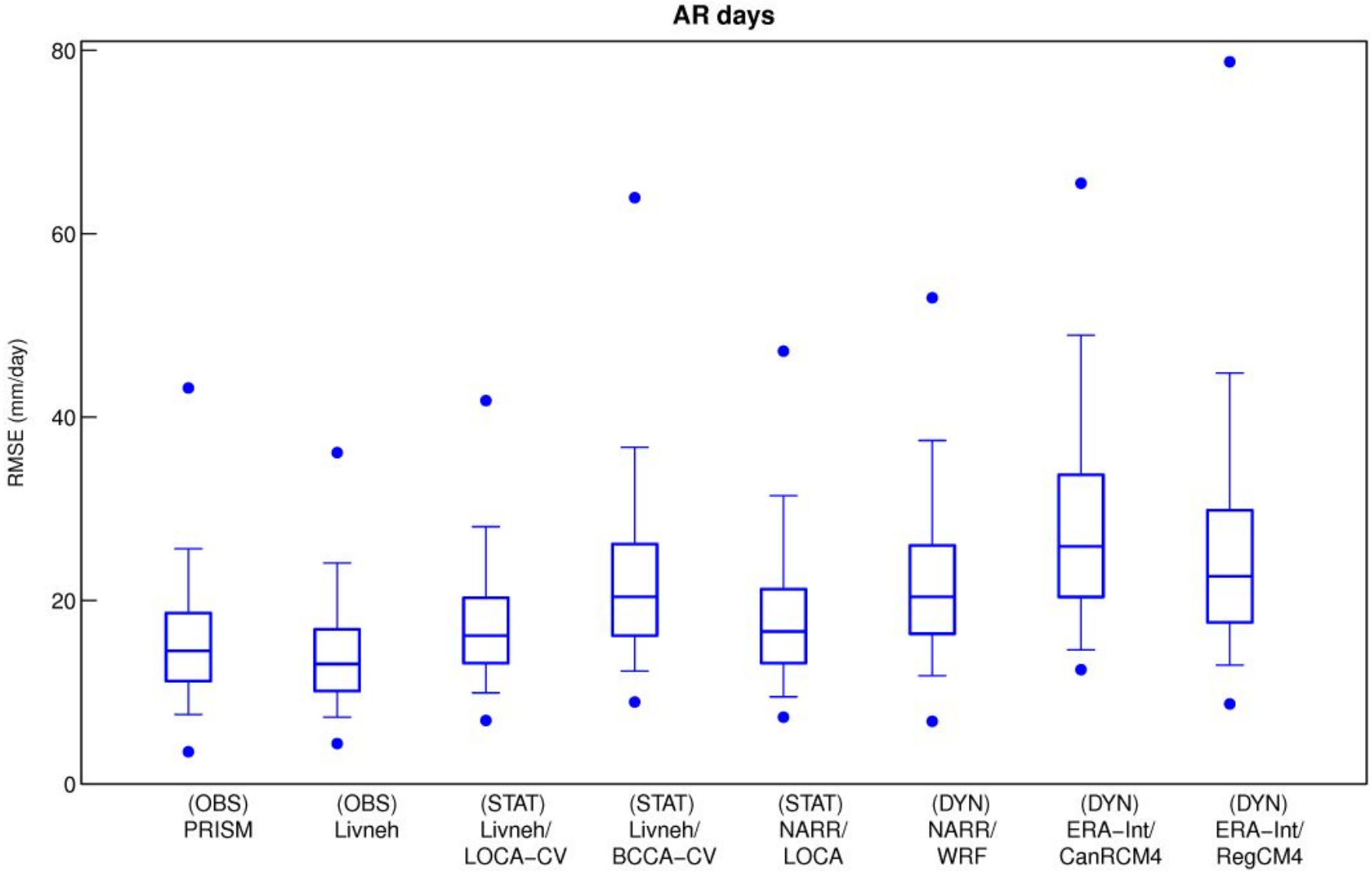


First way to look at it:

At each *day*, form RMSE across all stations (at matching grid cells)
Look at distribution of RMSE across all days

Dist across all days of spatial RMSE (mm/day) w.r.t GHCN stations



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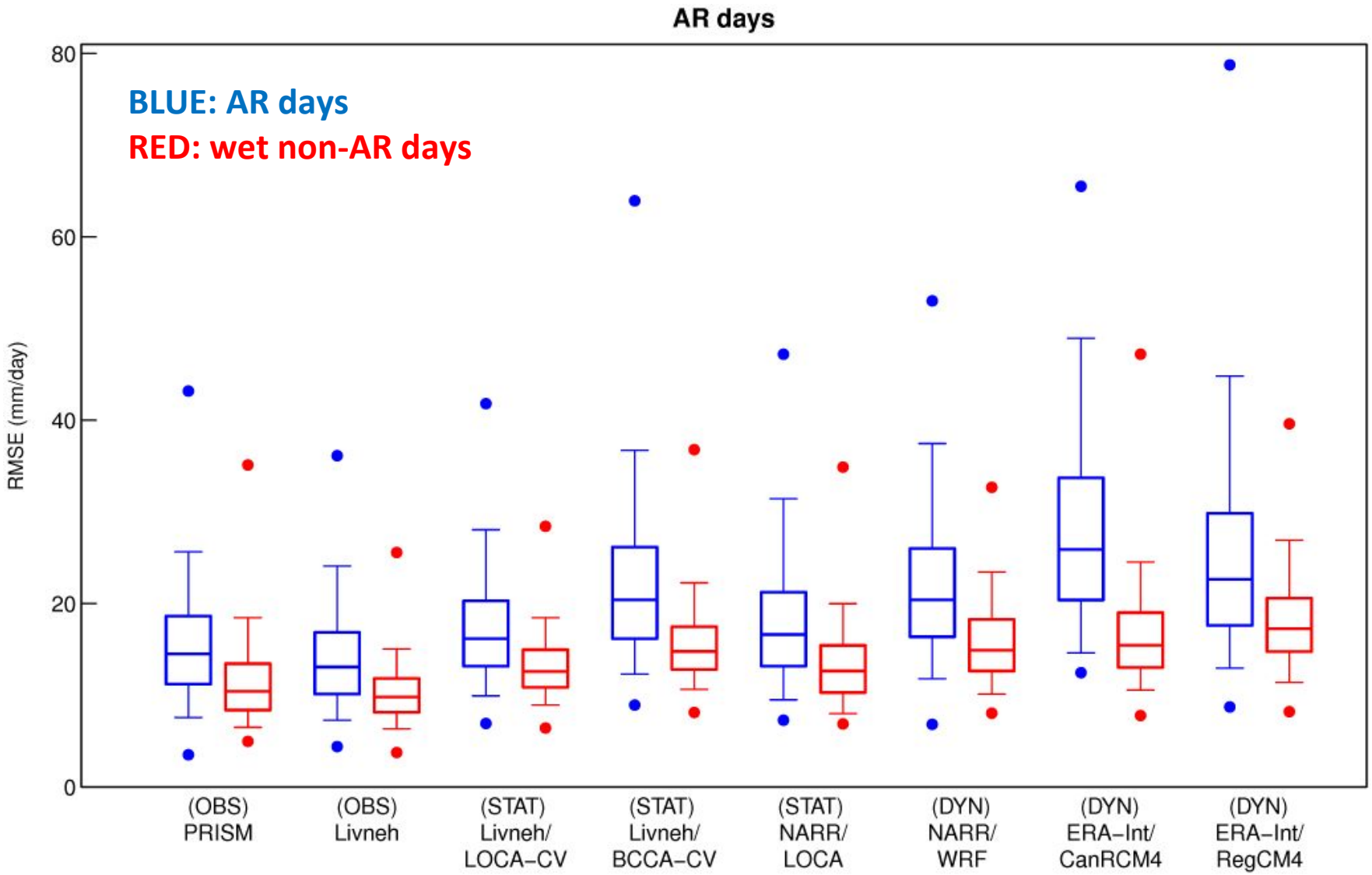

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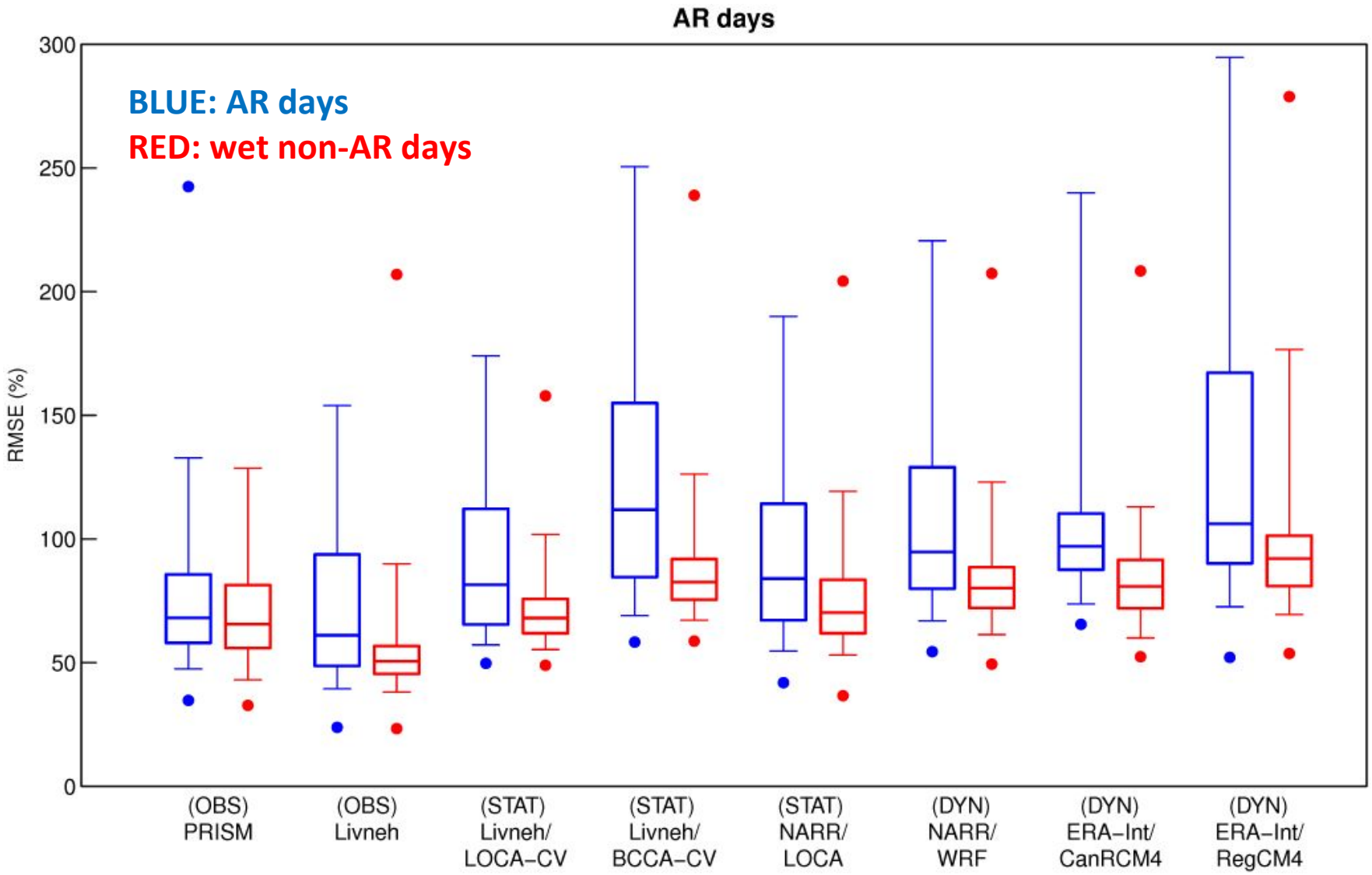

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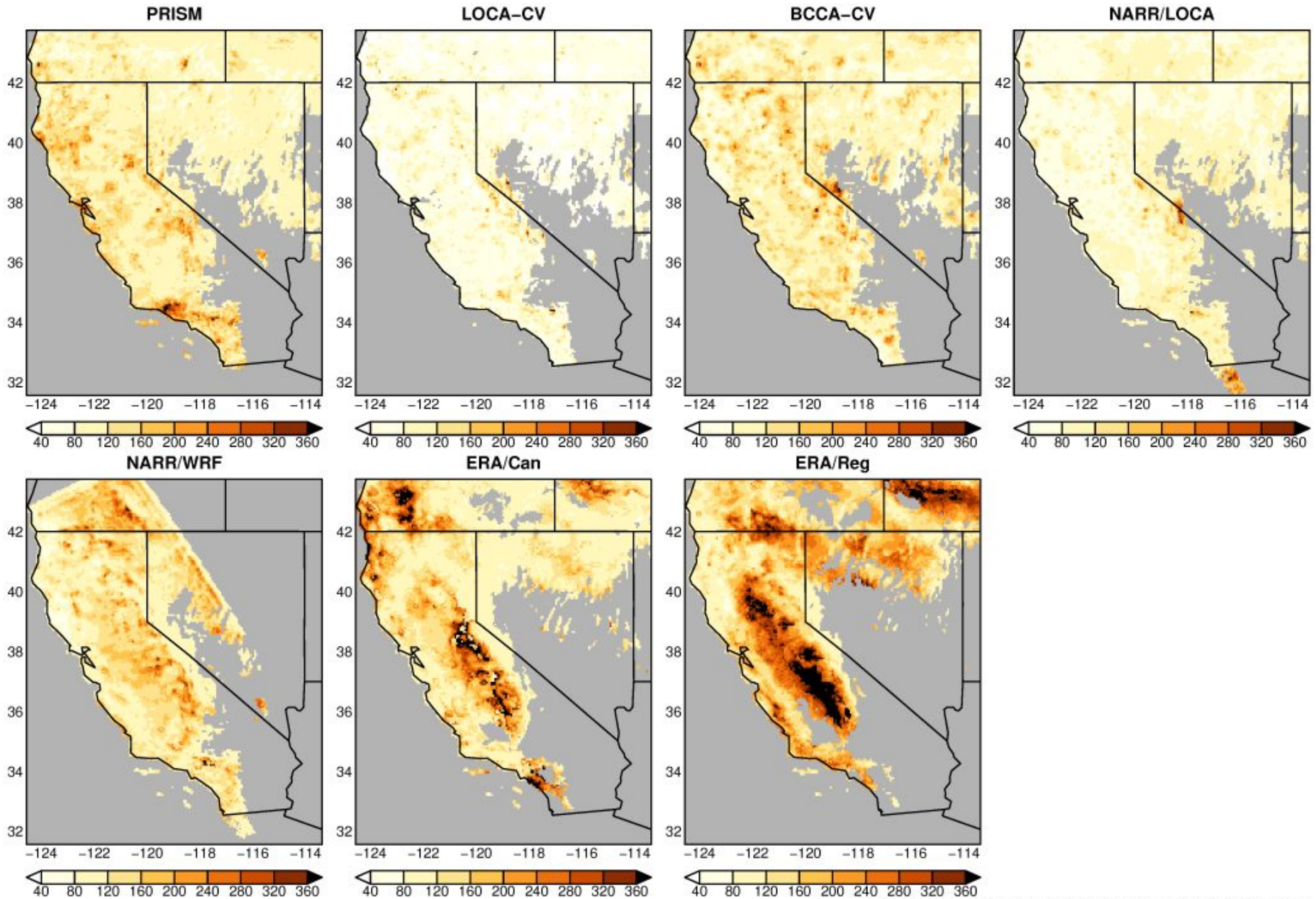
Second way to look at it:

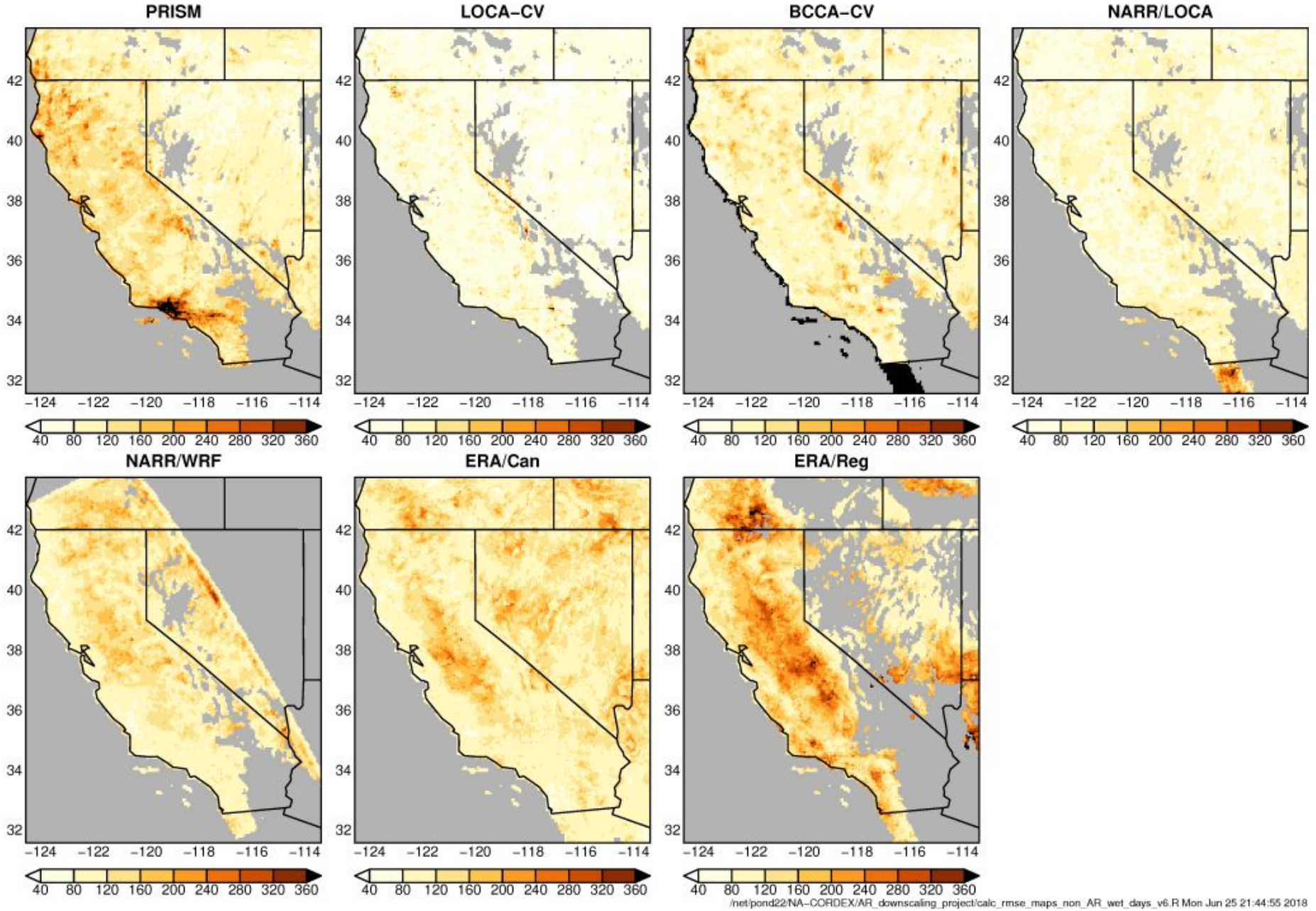
At each *gridcell*, form RMSE using time series of all AR (or non-AR) days
Look at maps of RMSE across domain

RMSE w.r.t. Livneh

RMSE (%) at each location: AR days



RMSE (%) at each location: NON-AR days



What about future changes?

- Not to see what future change is, per se
- Not to see if different downscaling methods give different future change
- Rather: Do different downscaling methods *treat AR changes differently?*
- Only one model had multiple NA-CORDEX downscaling results AND an AR catalog available: GFDL-ESM2M

Precip change (%), RCP 8.5 2070-2099 w.r.t. 1950-2005

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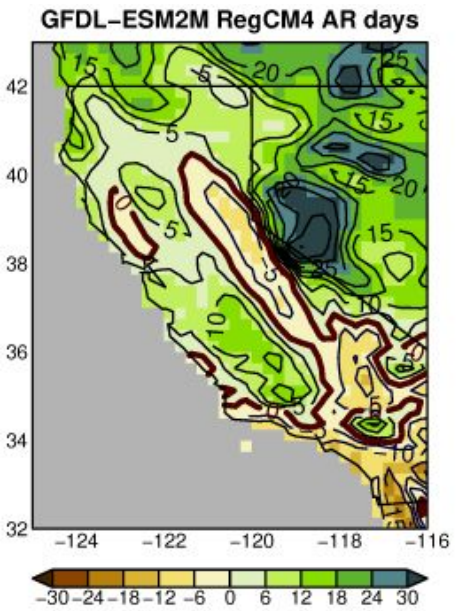
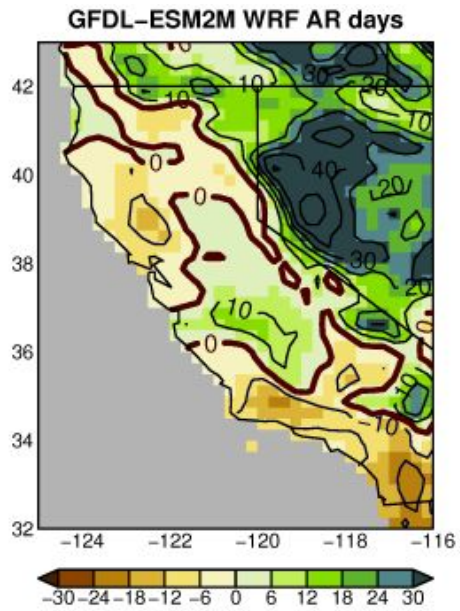
AR days

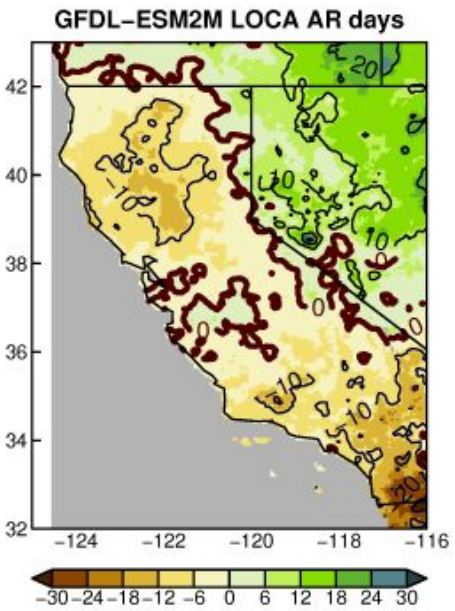
RegCM4



WRF



LOCA



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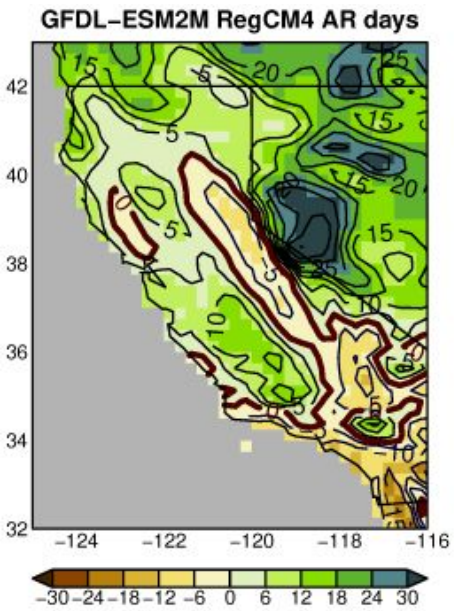
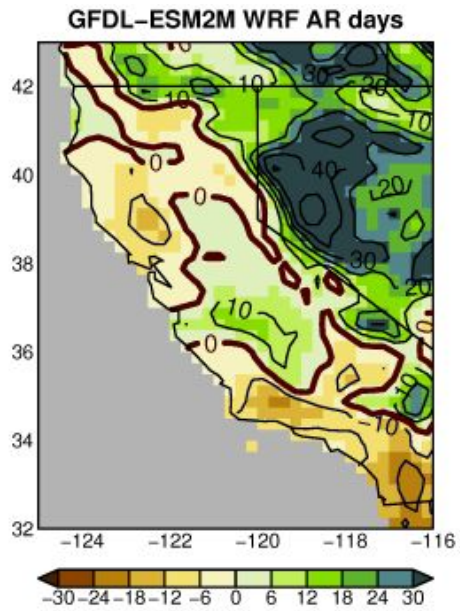
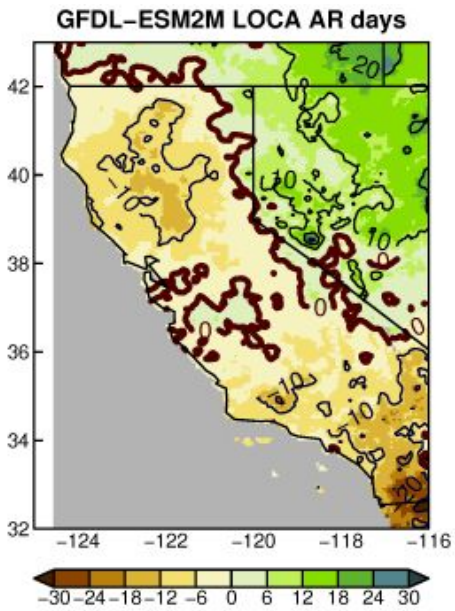
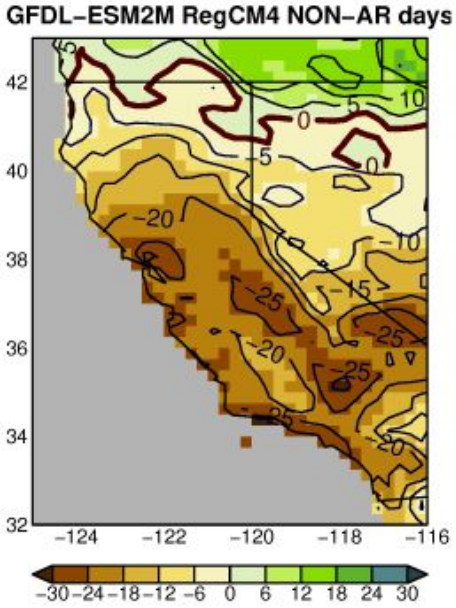
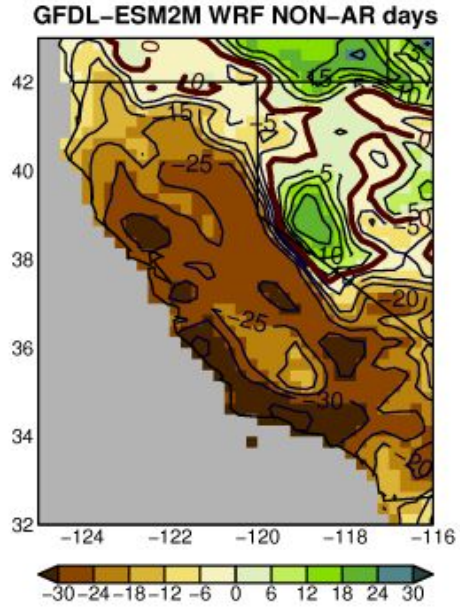
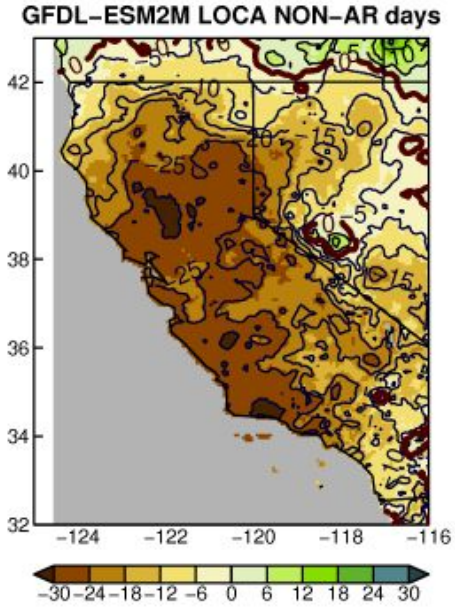
AR days			
Wet non-AR days			

Conclusions

- The obs (GHCN stations, Livneh, PRISM) don't agree that well (RMSE ~50%)
  - Livneh agrees with the stations better than PRISM
- AR days had larger RMS errors w.r.t. stations than (wet) non-AR days, even when evaluated as a percentage
- LOCA (cross-validated) does better than BCCA (cross-validated)
- The statistical methods do slightly better than the dynamical, but difference is modest
  - ERA-Int/RegCM4 does seem to be an outlier
- ERA-Int seems to have problems with ARs & the Sierra Nevada
- Only *one* example for future conditions (so far), but it shows:
  - d/s methods *disagree* on future changes for AR days
  - d/s methods *agree* on future changes for (wet) non-AR days