

MRED: Seasonal forecasting for climate applications

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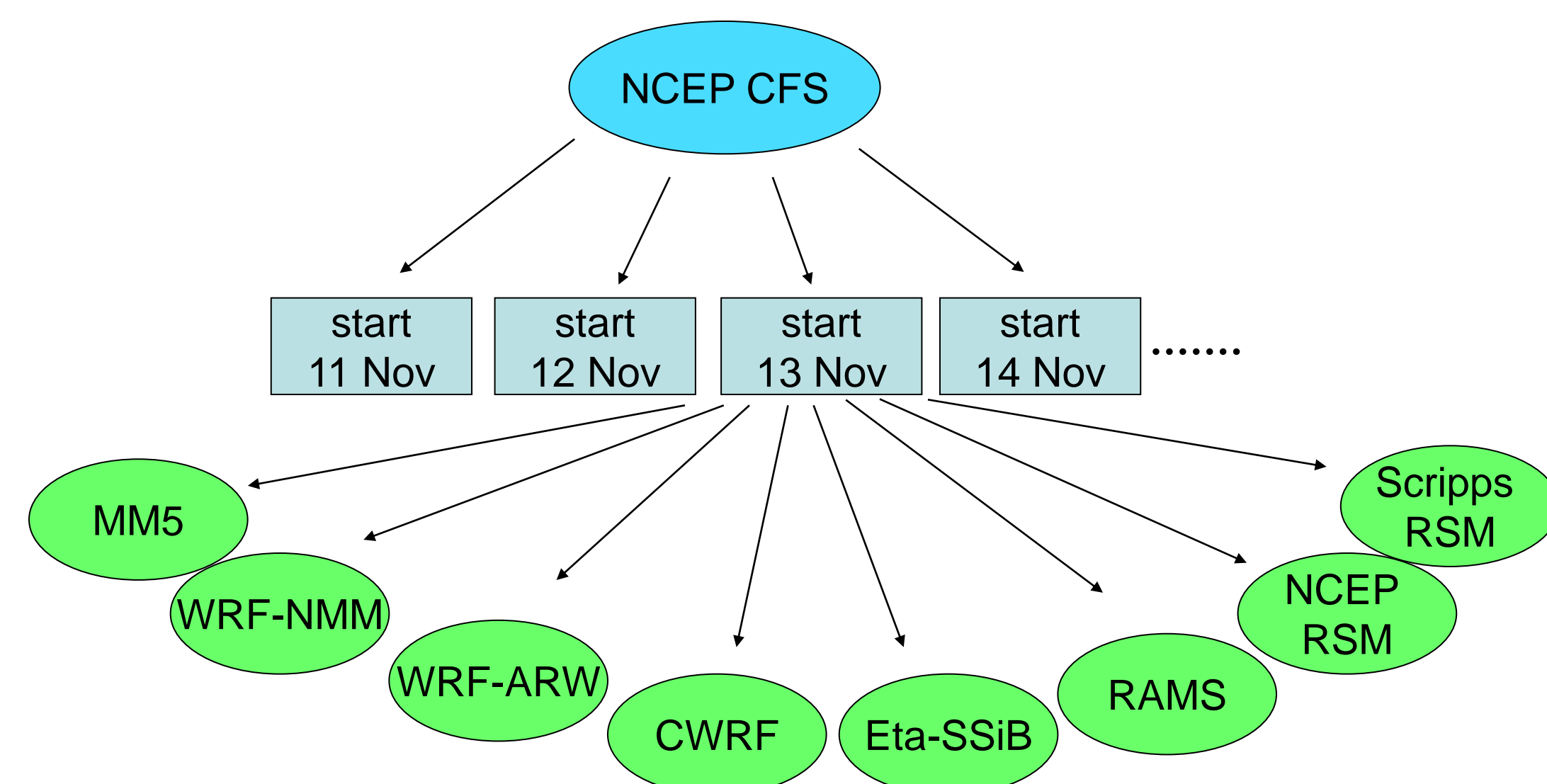
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Overview

Seasonal forecasts are potentially valuable for water resources, agriculture, and other applications, but global forecast models produce seasonal forecasts at rather coarse scales. The Multi-Regional climate model Ensemble Downscaling experiment (MRED) aims to provide improved spatial detail from global seasonal forecasts.

- Downscale **23 years** of winter (December-April) reforecasts from the NOAA Climate Forecast System (CFS) global seasonal forecast model: T62L64 (~1.9° latitude / longitude, 210 km).
- **Initial focus is on winter** (1 December – 30 April): ENSO signal is stronger in winter, providing improved prospects for seasonal prediction. Winter focus provides linkage to applications such as the cold season hydrometeorological research of the Climate Prediction Program for the Americas (CPPA).
- The regional models cover the coterminous U.S. with grid spacing **32 km**.
- The ensemble for each winter contains (15 start dates) x (8 regional models) = 120 members



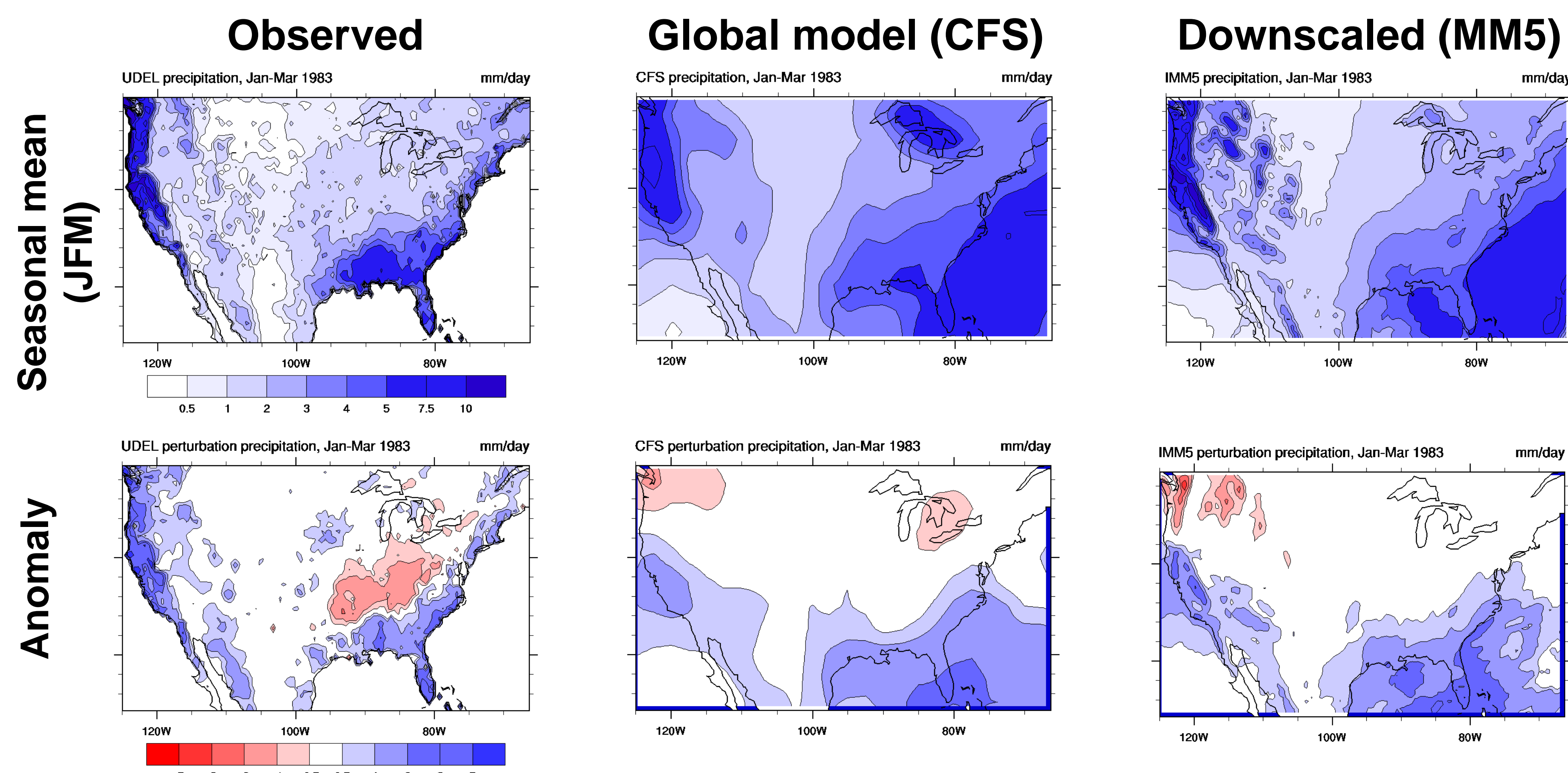
Global forecast model

The global model runs 15 ensemble members for each winter by starting from different dates

Each global model ensemble member is downscaled by 8 regional models

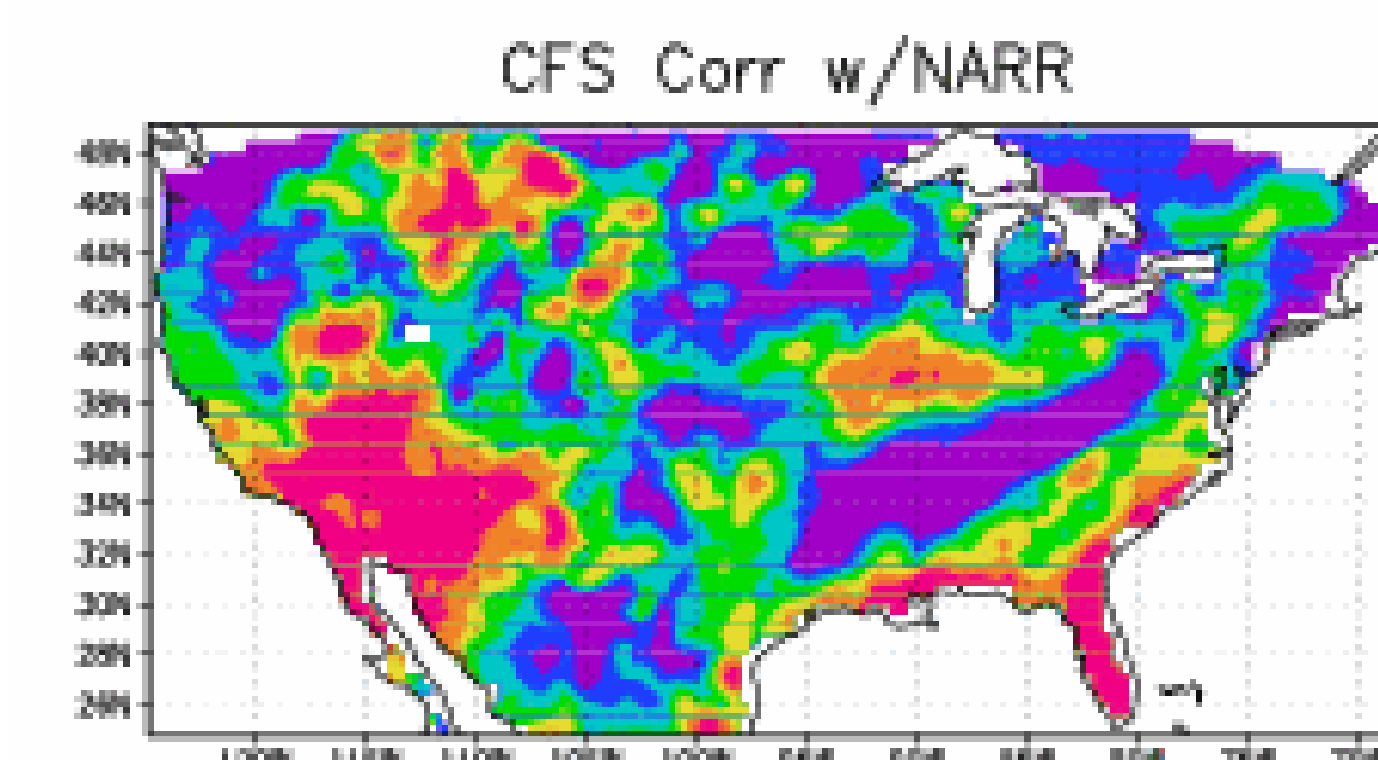
Downscaled precipitation

- The regional model does not usually compensate for errors in the global model. Instead it provides more spatial detail, whether the global model is skillful or not (see e.g., the extreme northwest part of the domain). This example shows predicted precipitation for January-February-March during the strong El Niño event of 1982-83.

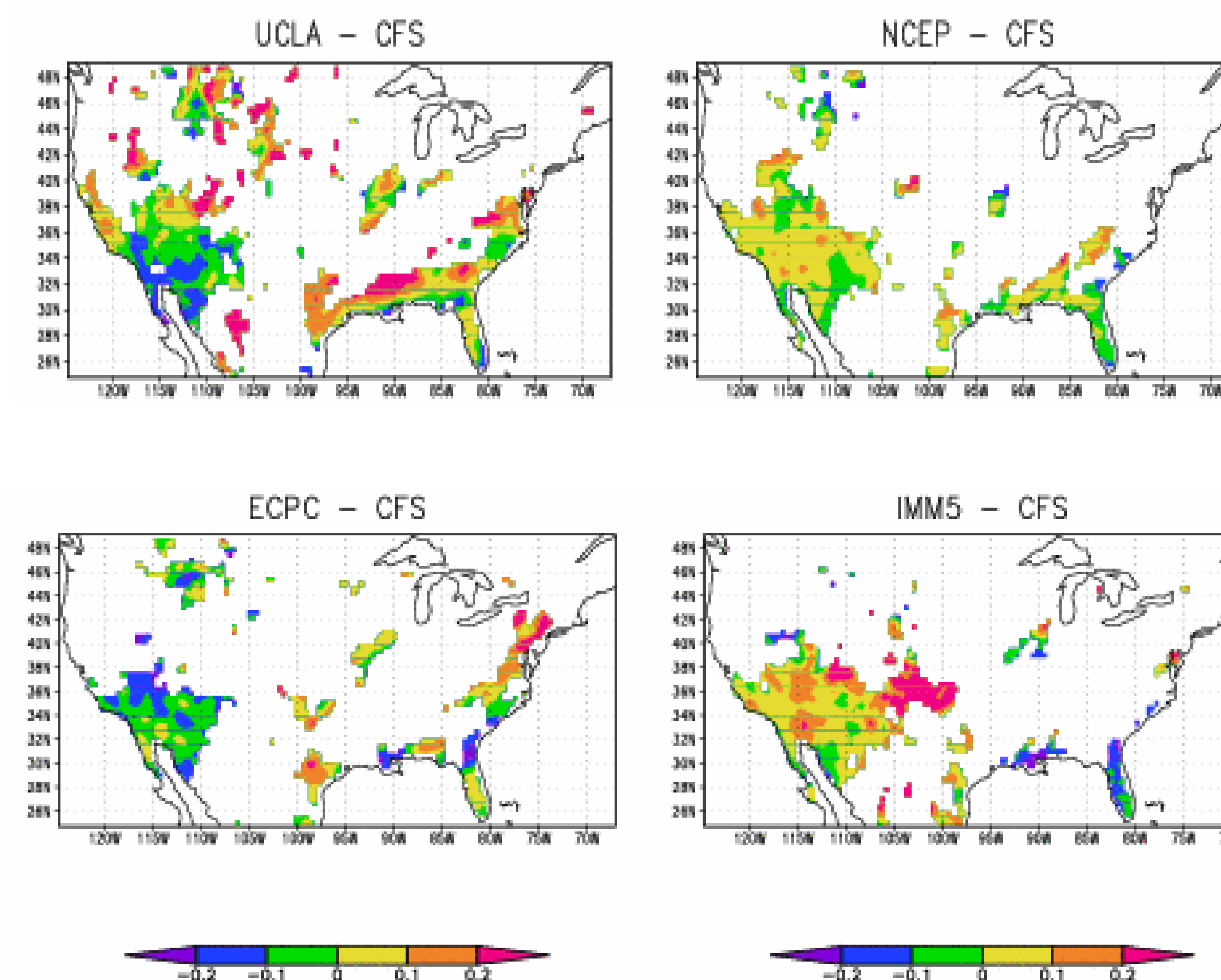


Correlation of downscaled and analyzed precipitation

- Temporal correlations are shown for monthly predicted precipitation from four of the regional models with precipitation in the North American Regional Reanalysis (NARR).
- Correlations also are shown for predicted precipitation from the global driving model compared with NARR.
- Correlations are computed separately for each point in the analysis domain.



- The CFS global model has greatest correlations with NARR in the southwestern and southeastern U.S.
- This may be because these regions have a strong signal of ENSO in climatological precipitation.



- Results are shown for regional models as differences from the CFS global model.
- The regional models have correlations mostly similar to CFS.
- Two of the regional models (MM5 and the NCEP version of RSM) have consistently higher correlations than CFS in the southwestern U.S.

Summary

- Results from MM5 are true **downscaling**: they follow the large-scale features of the global model, whether the global model is skillful or not.
- Area mean results are similar to the global model but there is **more spatial detail**.
- As with the global model, the best skill in the regional model is for **strong El Niño** events.
- **Downscaling skill ultimately is tied to the ability of the global model to reproduce the large-scale flow.**
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