Ensembles and post processing

- **What is ensemble modeling?**
  - Run multiple models instead of just one
  - Resource tradeoff
    - We can run 8 models at 4 km resolution or just one at 2 km resolution with the same computer
- **Why do we do this?**
  - Imperfectly observed atmosphere
  - Imperfect models
  - Scientifically appropriate expression of forecast should include *uncertainty* information
    - Event probabilities
    - NRC report: "Completing the Forecast"
  - Historically significant departure from the traditional way of expressing weather forecasts *deterministically* (i.e., as if we really know what's going to happen).
- **Post processing is how we convert ensemble output into forecast probabilities**
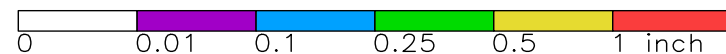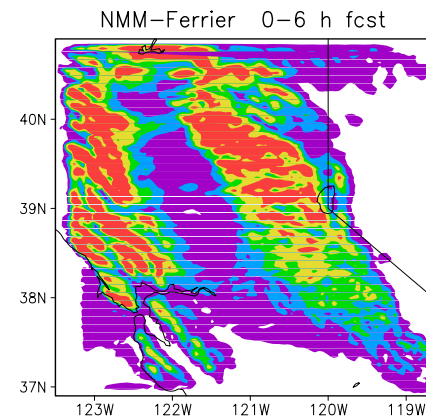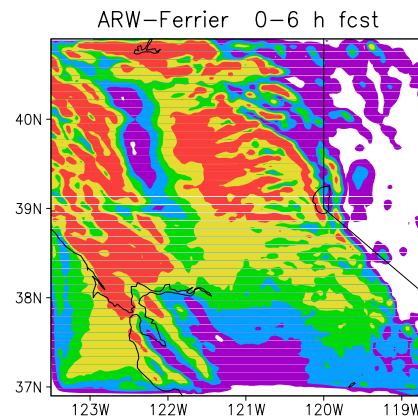
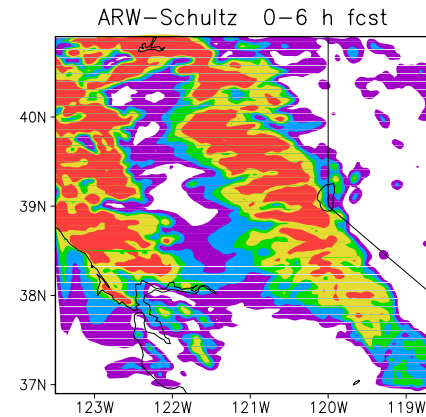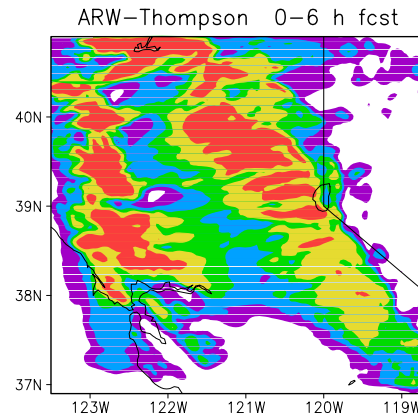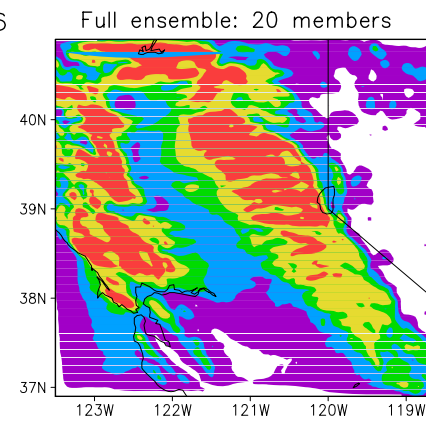# Example: Hydrometeorological Testbed (HMT)

- ESRL participants from PSD, GSD
- Goals:
  - Best-possible QPF for American River Basin
  - Develop PQPF tools and methods
- 4 different WRF models, every 6 hours

Ensemble

- 6-hr forecasts of 6-hr precip

- Time-lagging to enlarge ensemble
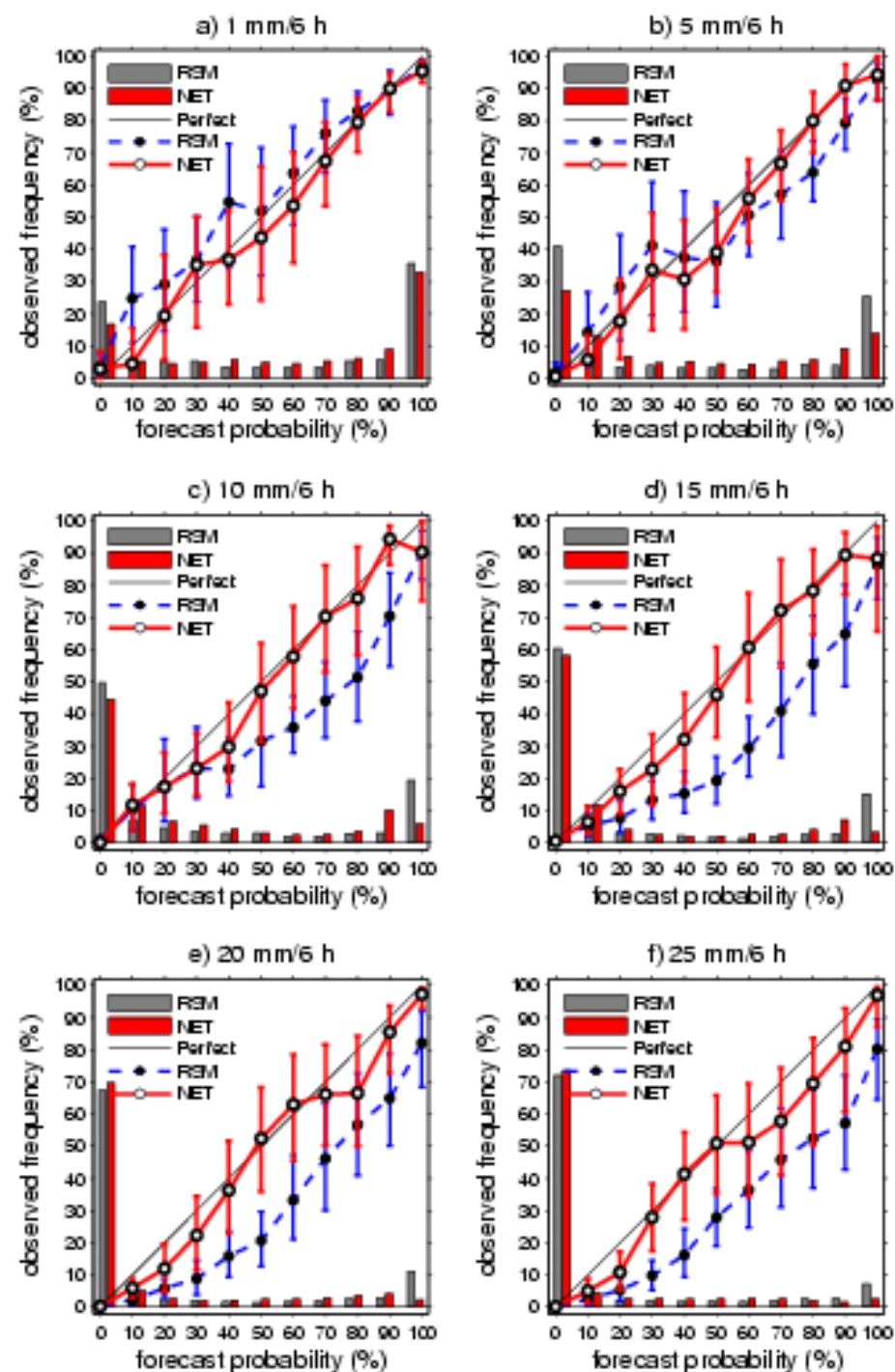
- (Forecasts have more realistic detail than obs!)

Huiling Yuan
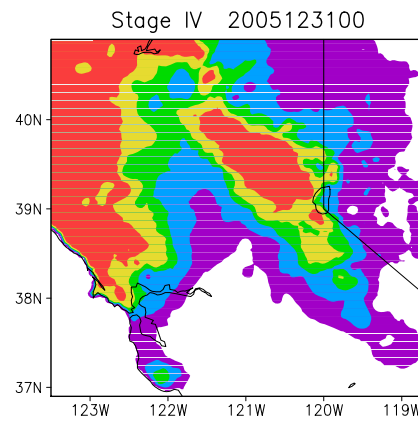
Post processing

- "Raw" probabilities (ensemble relative frequency)
- Post processing is for "calibration"
- Methodology is extensible to other weather variables
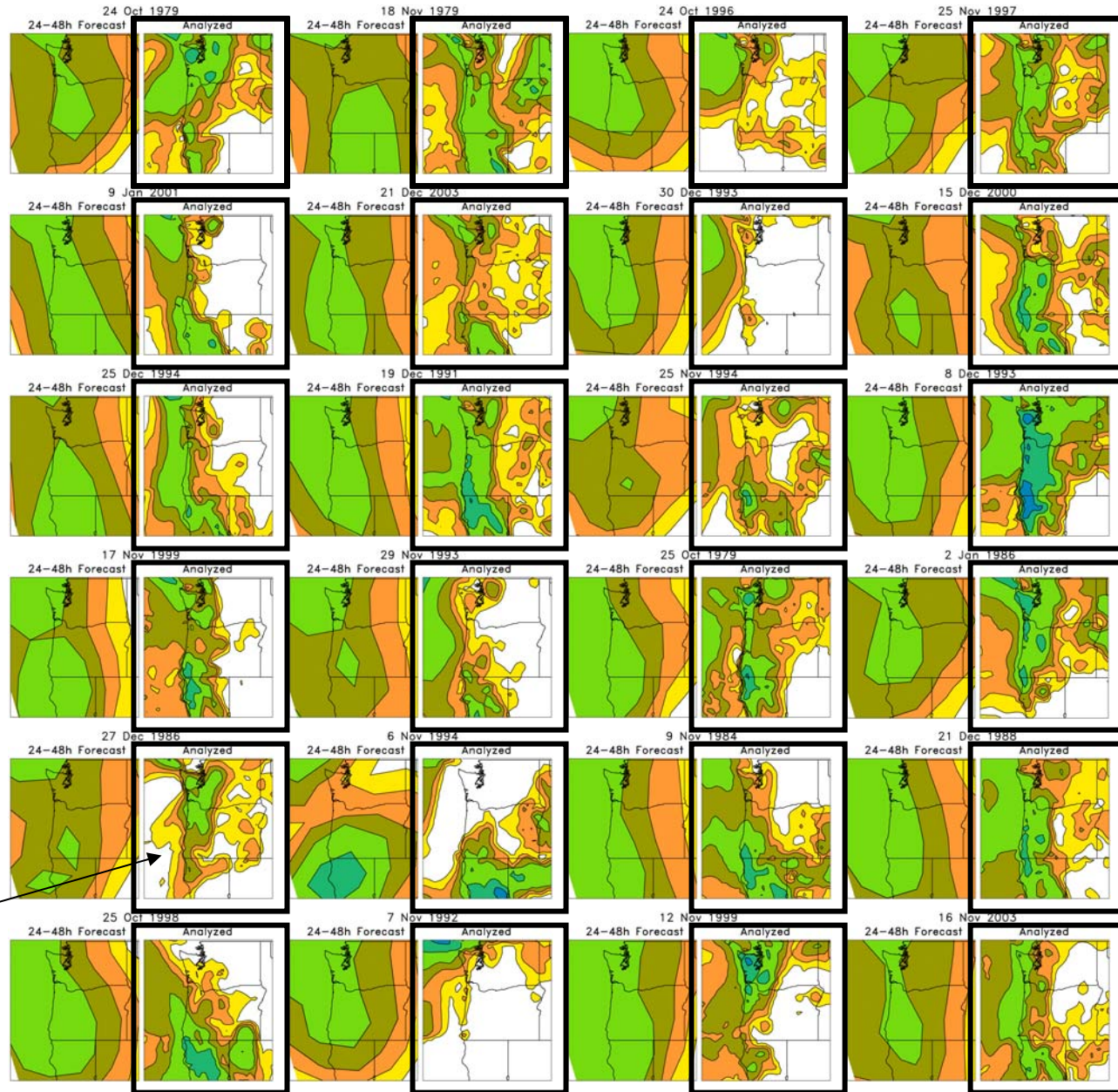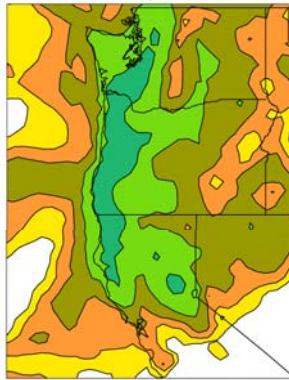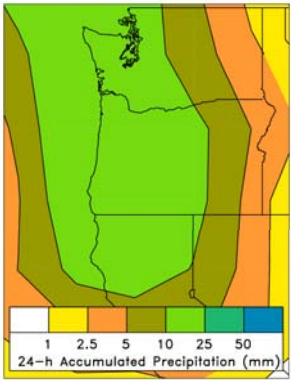- Collaboration with NCEP
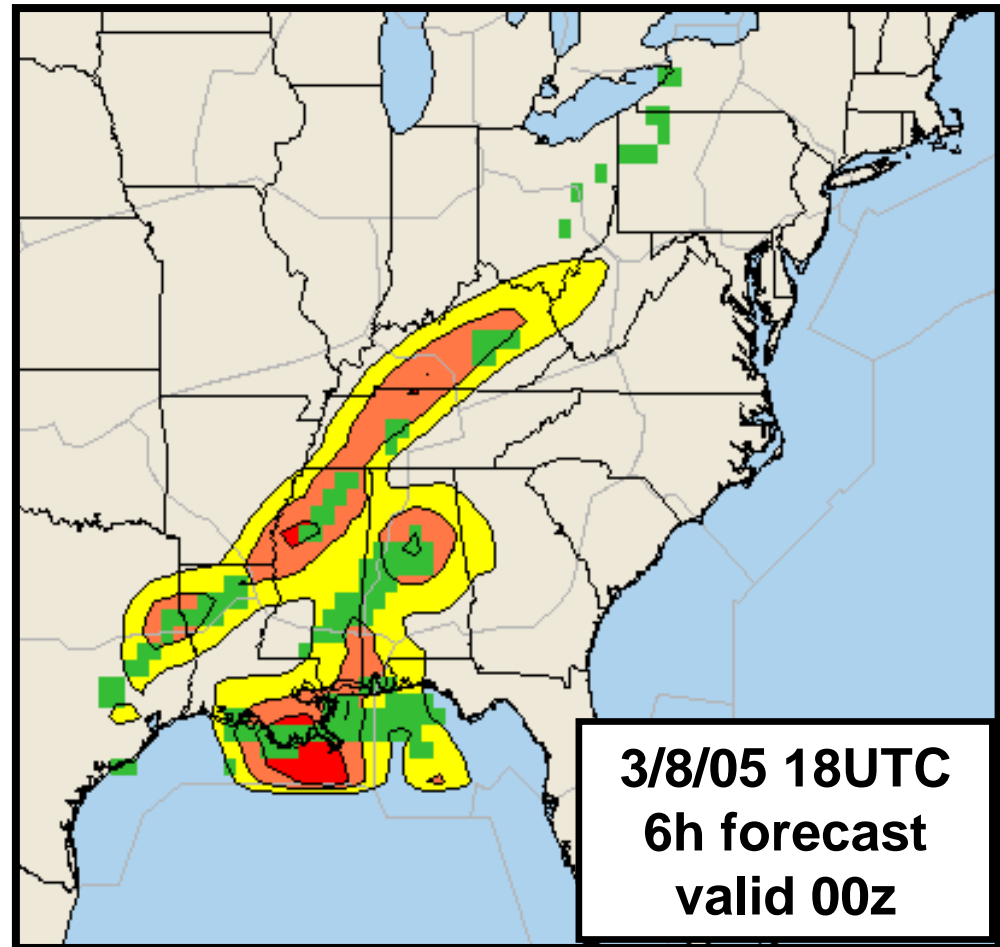
Downscaled probabilistic forecasts using reforecast analogs

On the left are old forecasts similar to today's ensemble-mean forecast. For making probabilistic forecasts, we form an ensemble from the accompanying analyzed weather on the right-hand side.

RUC Convective Probability Forecast

- **Developed for FAA**

- **Hourly 2 → 10 h thunderstorm probability forecast**

- **Made from time-lagged ensemble of hourly RUC model forecasts**

**3/8/05 18UTC
6h forecast
valid 00z**

**NCWD
Verification**

🟩	**NCWD**

25 – 49%
50 – 74%
75 – 100%