MPEX: NCAR WRF-DART, realtime forecasts, retrospective case studies

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Real-time WRF-DART exercise - Spring 2012

Continuously cycled wrf-dart ensemble from 28 Apr – 26 June 2012

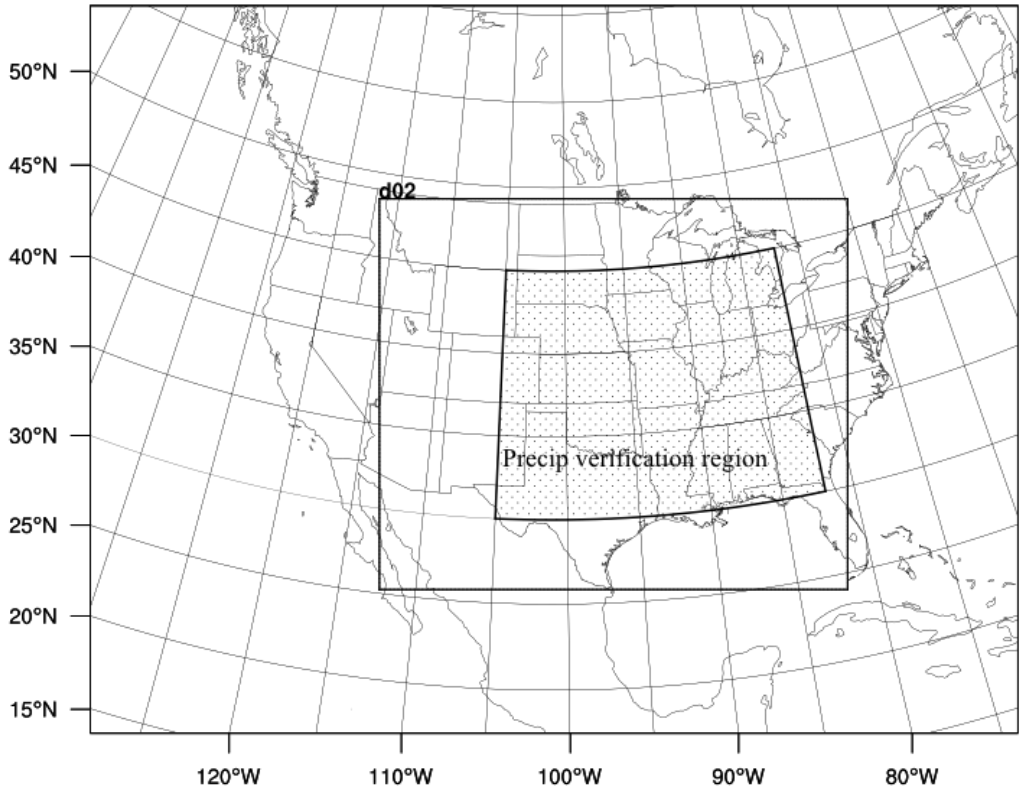
Daily hi-res forecasts from single member analysis @ 00 & 12 UTC

WRF 3.3.1, CONUS 15 km dx, 40 levels
- Tiedtke, RRTMG+AO climatology, MYJ, Morrison, Noah

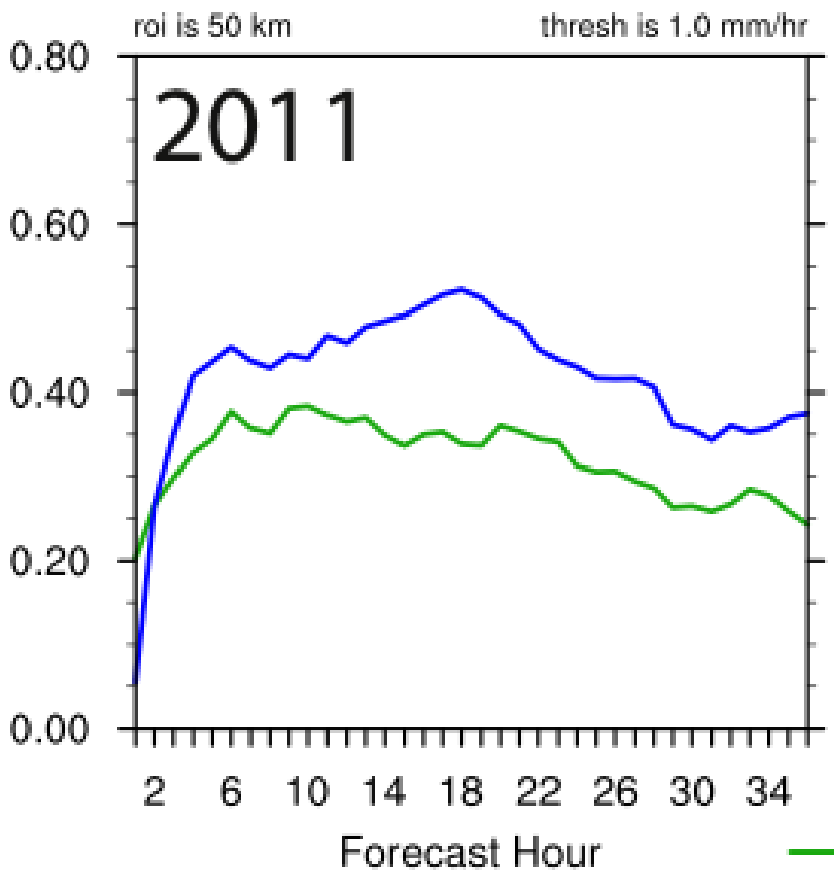
DART – 50 members, 6-hr cycling, adaptive inflation & localization, sampling error correction, ~ 635(8) km half-width H(V) localization

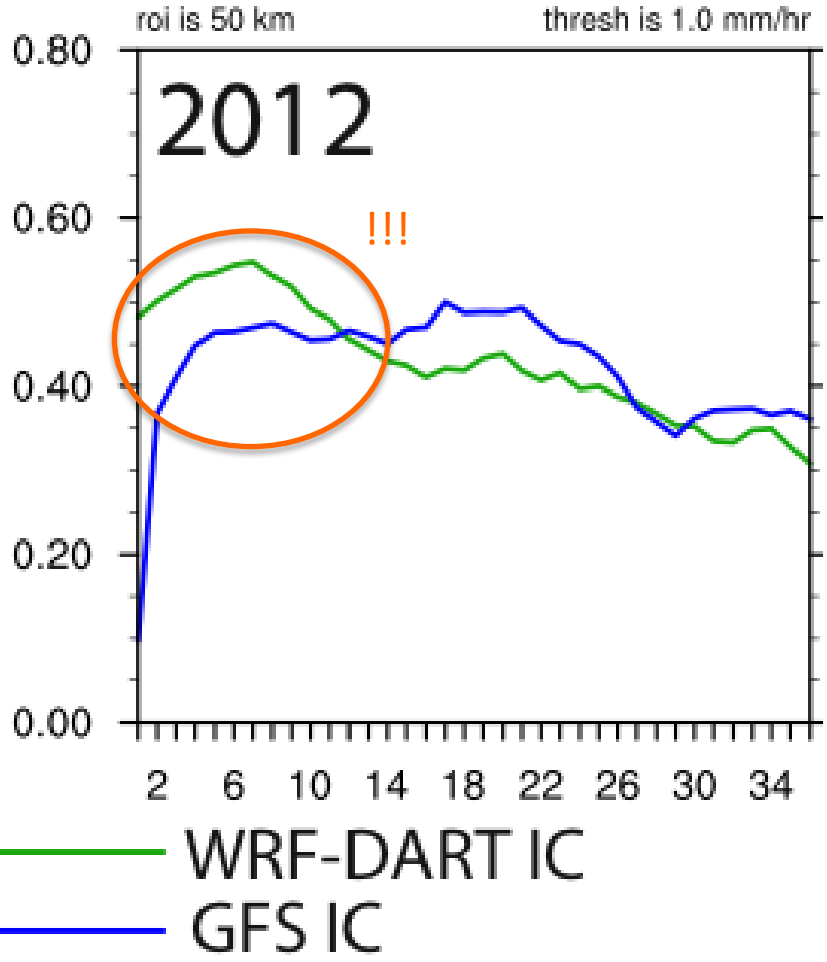
Soil states run free for each member
- TSLB, SMOIS, SH2O, TSK

Analysis downscaled to 3 km on 2/3rds CONUS domain for forecast, verif. limited to hatched region



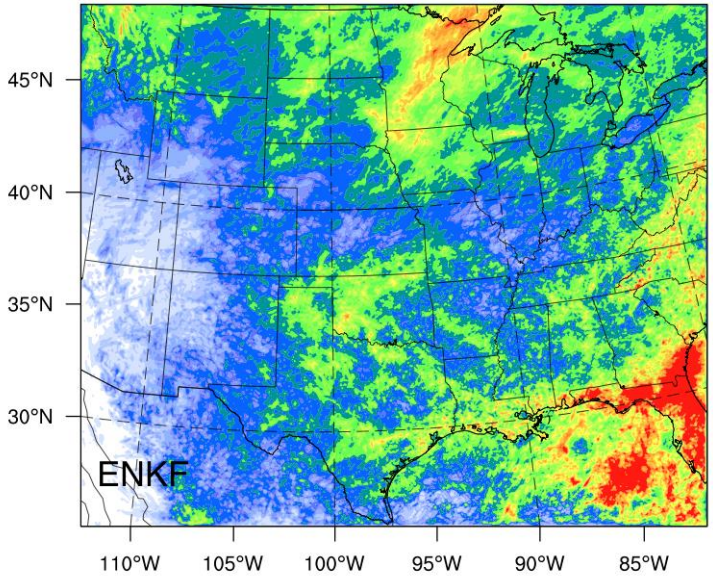
Realtime forecast skill EKF vs. GFS IC from 00 UTC

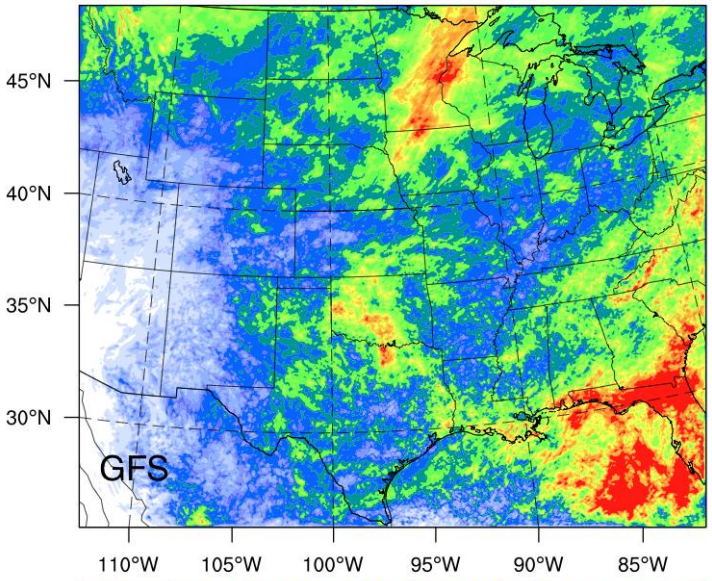




- Clear improvement in real-time forecast skill
- Still weakness at longer range

Mean accum precip EnKF, GFS IC fcst vs. observations

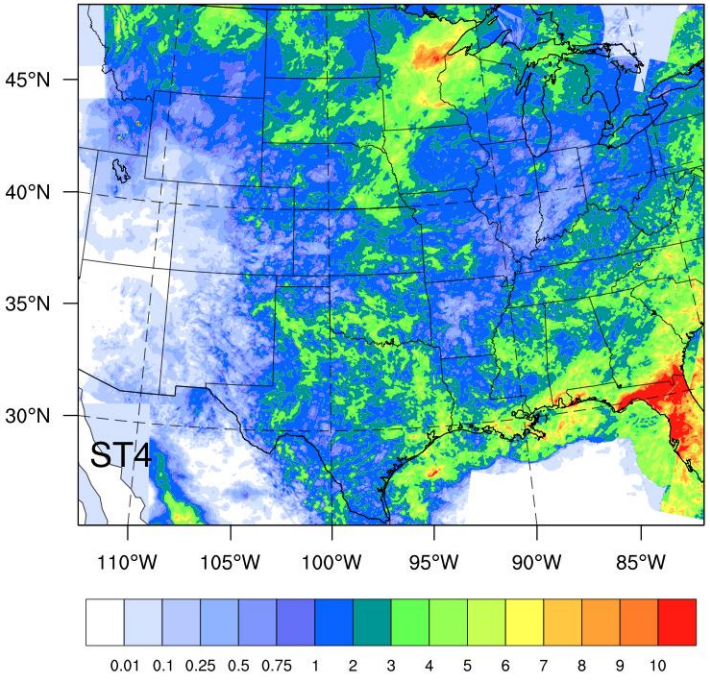




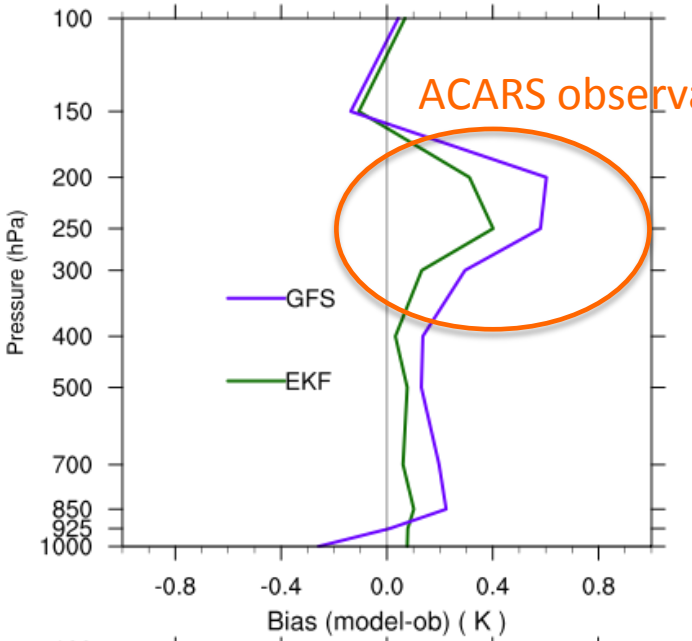
Mean accumulated precip F18-36 h

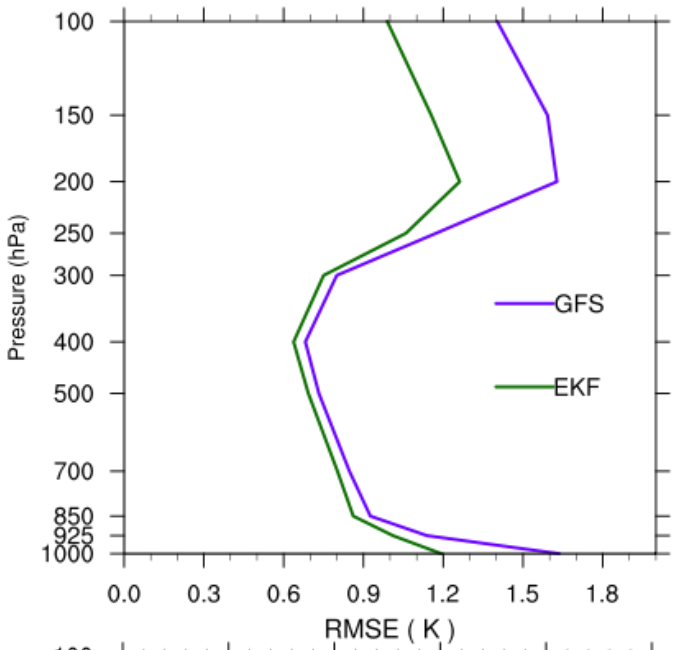
Both GFS and EnKF based ICs generate similar rainfall climatology (identical forecast model) with good agreement to ST4

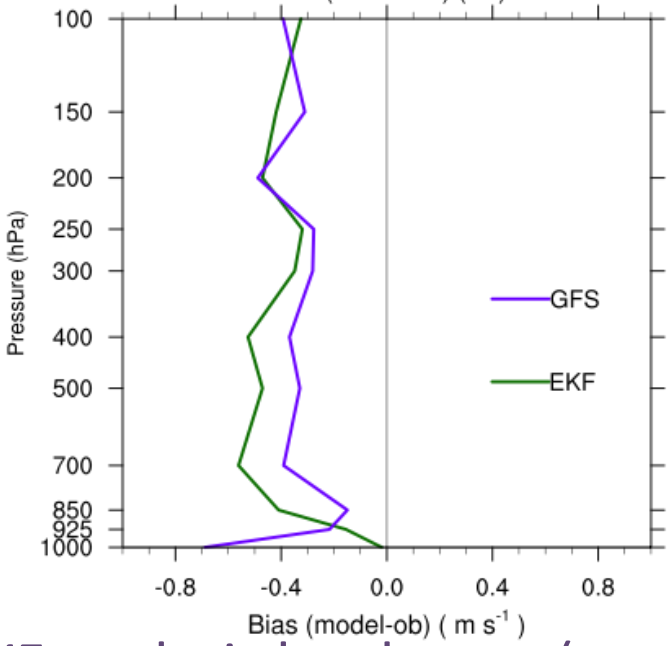
WRF forecasts + precip bias

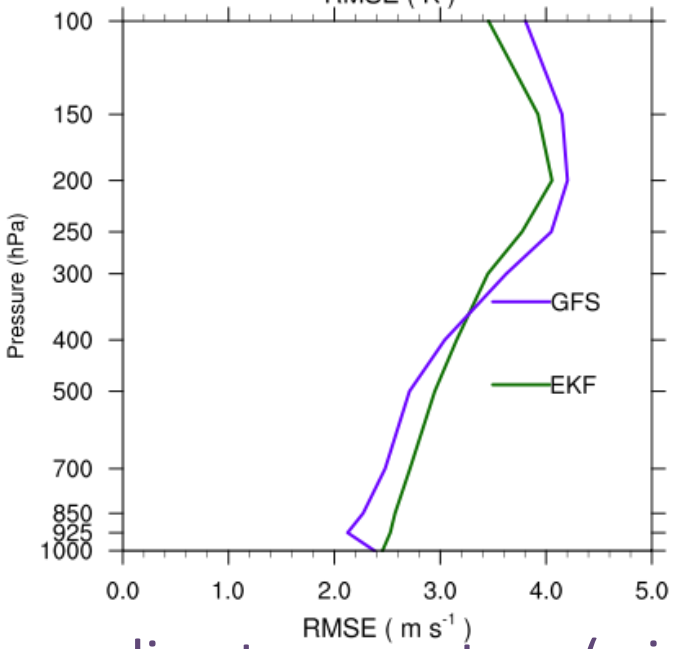


Realtime 60 day avg comparisons against GFS IC







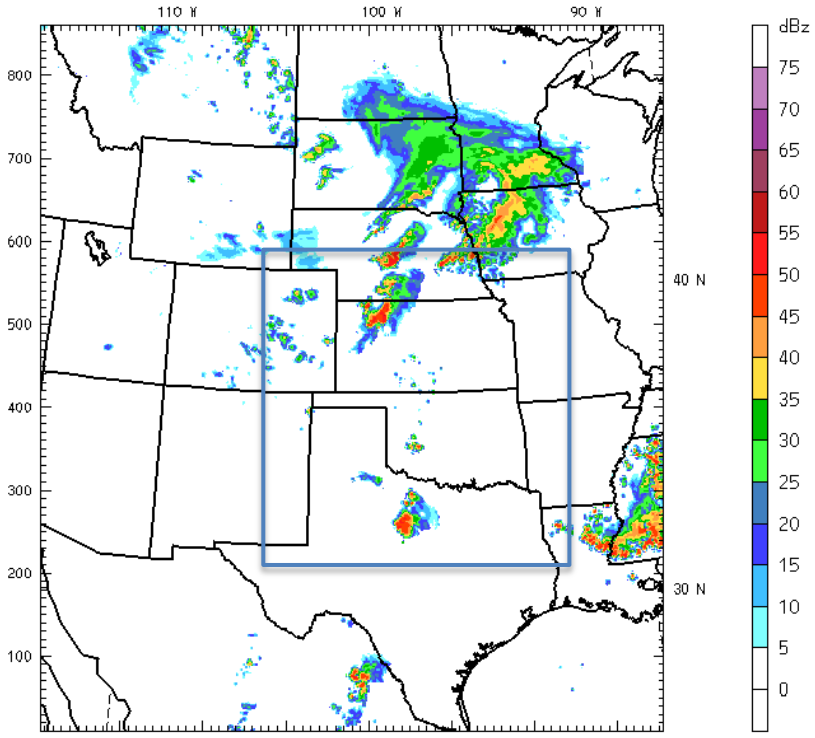


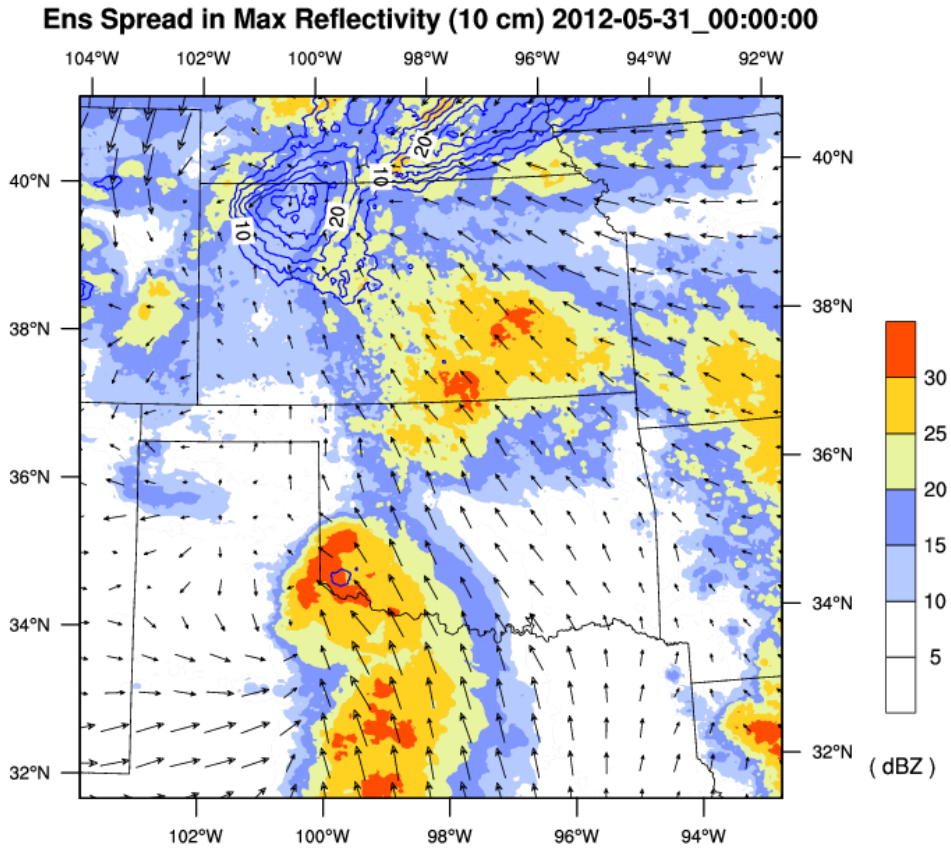
EnKF analysis has better (worse) fit to sounding temperature (winds)

Changes for Spring 2013 realtime

Instead of single member forecast – ensemble forecasts!

Considering 10-30 members (provided CISL support)





Minor tweaks to the model and analysis system

Spring 2013 realtime forecasts -> retrospective

Not currently planning to assimilate dropsondes in real time, although could incorporate limited obs collected near the cycle window (e.g. 11-13 UTC)

Plan retrospective runs (from 00 UTC) with 1 hr cycling to incorporate all available dropsondes on case study events

Upsondes will be used in forecast verification

Focus for forecast verification – probabilistic model skill against Stage IV hourly accumulated rainfall. Other verification will be explored.

Evaluate MTP observations (horizontal gradients in T)

Collaborate on ensemble sensitivity analysis (metrics under consideration)

Spring 2013 realtime forecasts -> retrospective

Realtime targeting:
Ensemble spread/error growth will highlight uncertain features in the ensemble forecast, may provide guidance in targeting (demo later today)

Formal ensemble sensitivity analysis can link IC/forecast uncertainty (e.g. mid-level temperature/moisture) to forecast metrics (e.g. convective development) – Ryan will discuss this in next talk!