Multi-scale radar DA capabilities within GSI and JEDI

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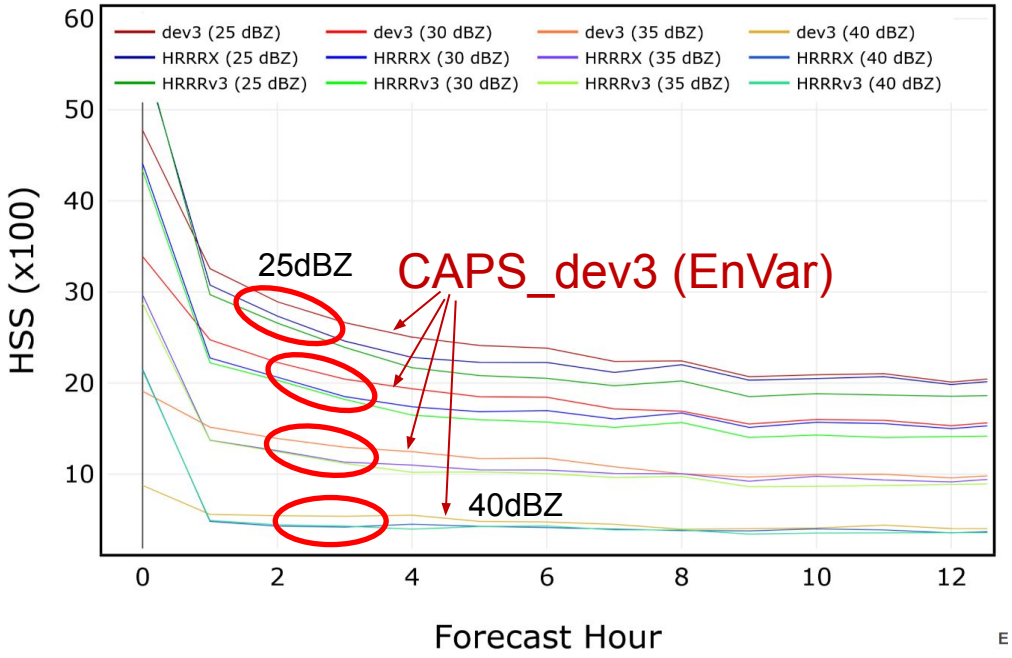
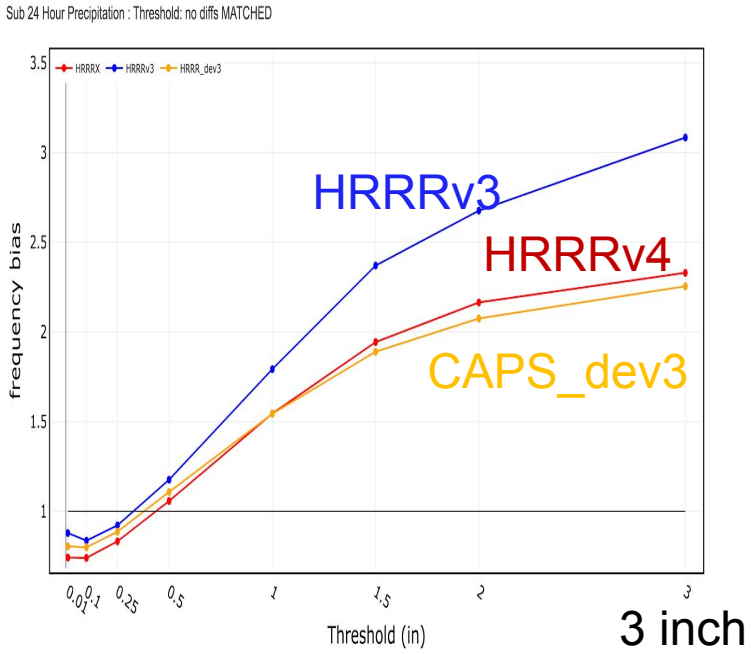
Direct assimilation of radar Z and Vr in GSI EnKF and hybrid EnVar using microphysics-consistent Z operators. Power transform for hydrometeor mixing ratios and number concentrations to overcome nonlinearity problems with EnVar. Some of the capabilities have been implemented in JEDI.

Comparison with HRRRv3 and HRRRv4 for Extended Runs (~70 cases) at GSL
Hourly reflectivity Heidke Skill Scores and 6 h Precip Biases

Dev3 = CAPS, HRRRX=HRRRv4, HRRRv3



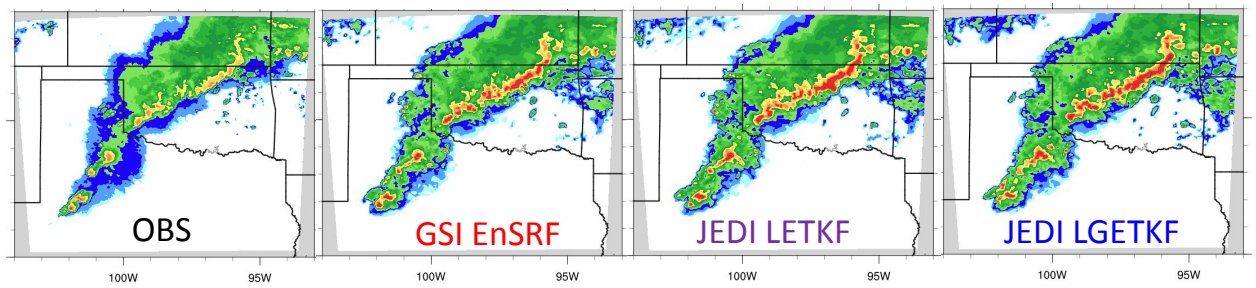


3 inch

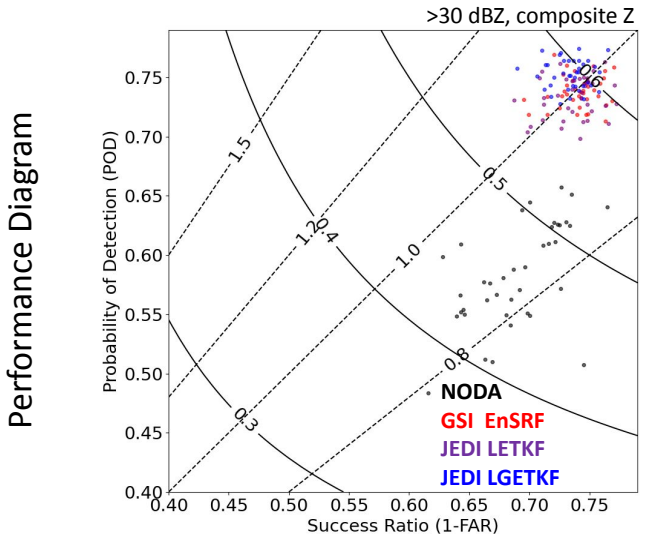
Bias for 6 h precipitation

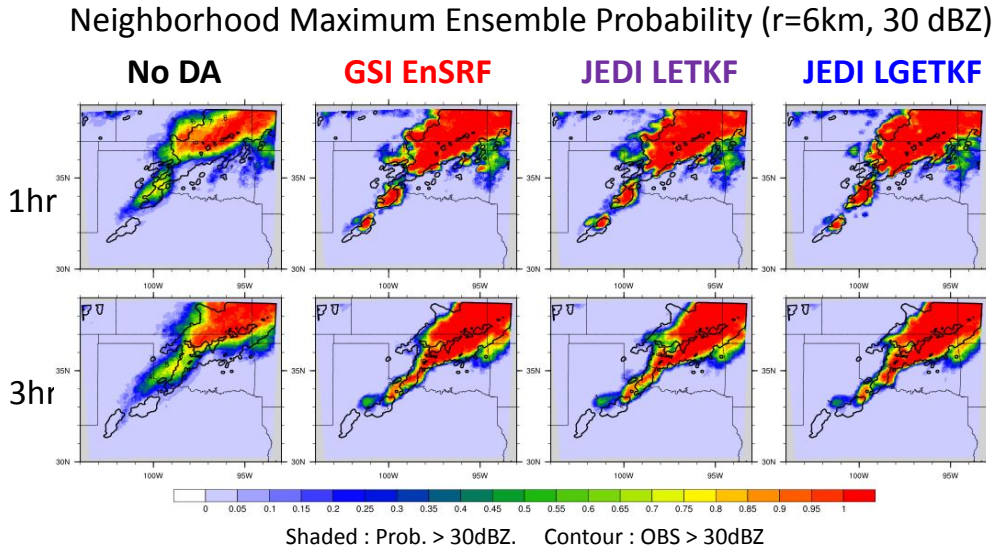
Direct radar DA capabilities in GSI have been preliminarily implemented with JEDI. Initial results coupled with FV3-LAM (1st SRW release) are encouraging.

Composite Z at final analysis time



3-h ensemble forecasts following 1-hour radar DA every 15 min





- Multi-scale formulation within GSI EnKF for enable effective assimilation of multi-scale (soundings through radar) observations by applying successive, observation and height-dependent low-path spatial filters to ensemble perturbations. Extended testing will be done at DTC.
- Radar DA capabilities in GSI are at RL 6 to 7. Radar DA codes are under final review for inclusion in GSI master.