EnKF testing at NCEP

preliminary results

Thorpex Ens DA conf call: 10/04/2007
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Experimental Design

- **test period**: May and June 2007 (only May 8-May 23 done so far).

- **observations used**: all prepbufr, GPS ,AMSU radiances (exclude AIRS, HIRS etc. for now).

- **resolution**: T126L64 (256x128x64 analysis grid)

- **ensemble size**: 64

- **benchmark**: GSI, same resolution and observation set.

EnKF implementation

- both serial EnSRF ('Potter' update) and LETKF.

- radiance bias correction a la GSI.

- Radius of influence for obs: 1400 km, 1 scale height (log(pressure)). Linear tapering.

- covariance inflation (20%), plus 0.3 x random sample of reanlysis tendencies.

Computation Cost: Serial EnSRF vs LETKF

- parallelization:

    - scales nearly linearly for both, EnSRF has more communications overhead.

- cost as a function of ensemble size (K) and observation count (L).

    - $O(K^2L)$ for LETKF

    - $O(L^2K)$ for EnSRF

    - K=64, L=700K, 32 processors: EnSRF takes ~7000 seconds, LETKF ~ 3000 seconds. Strong function of observation influence radius.
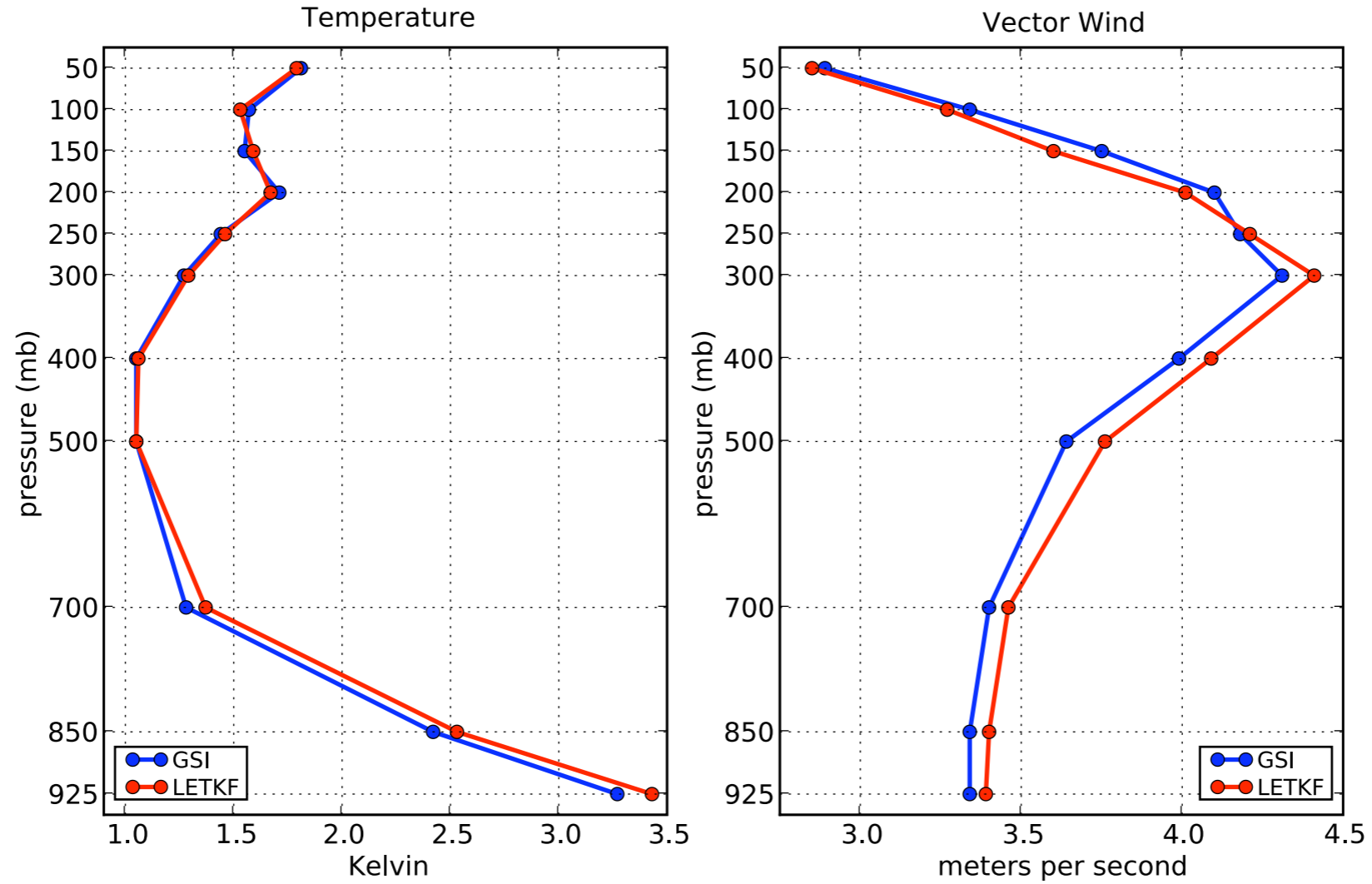
O-F statistics (AMSUA)
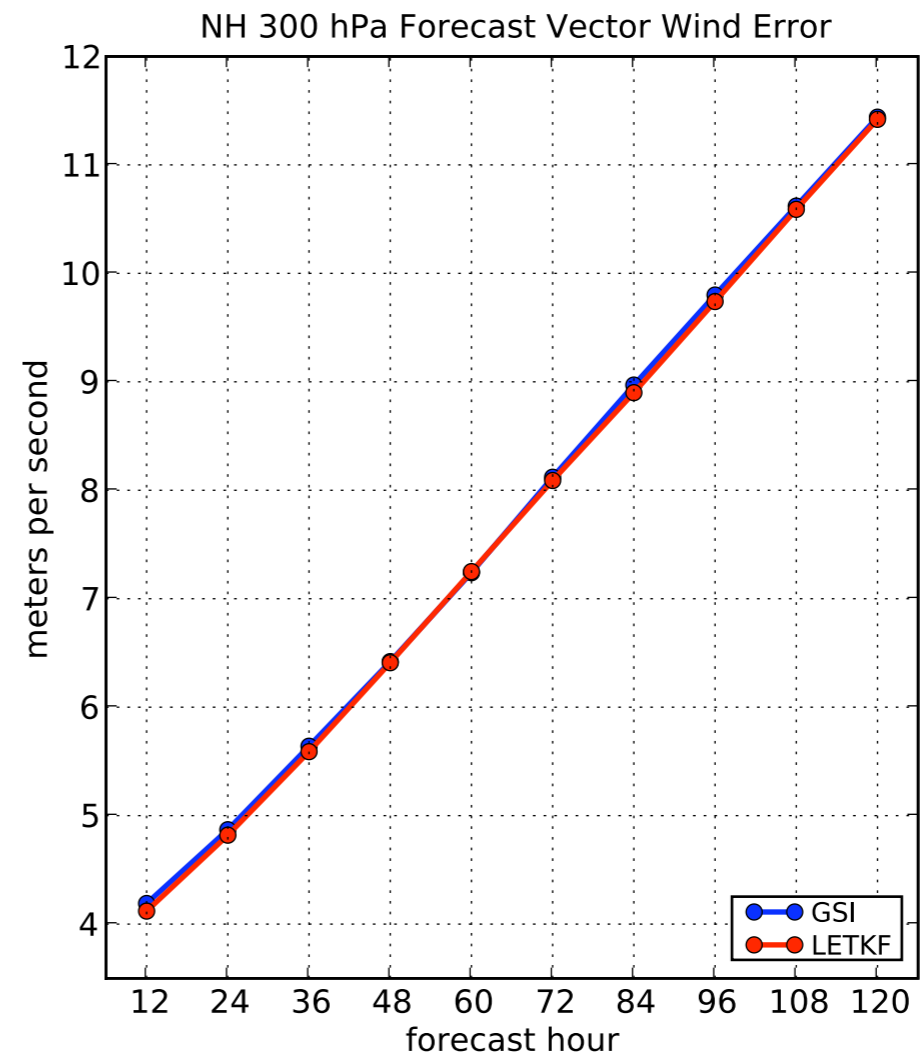
O-F AMSUA Brightness Temperatures 2007051400-2007052212
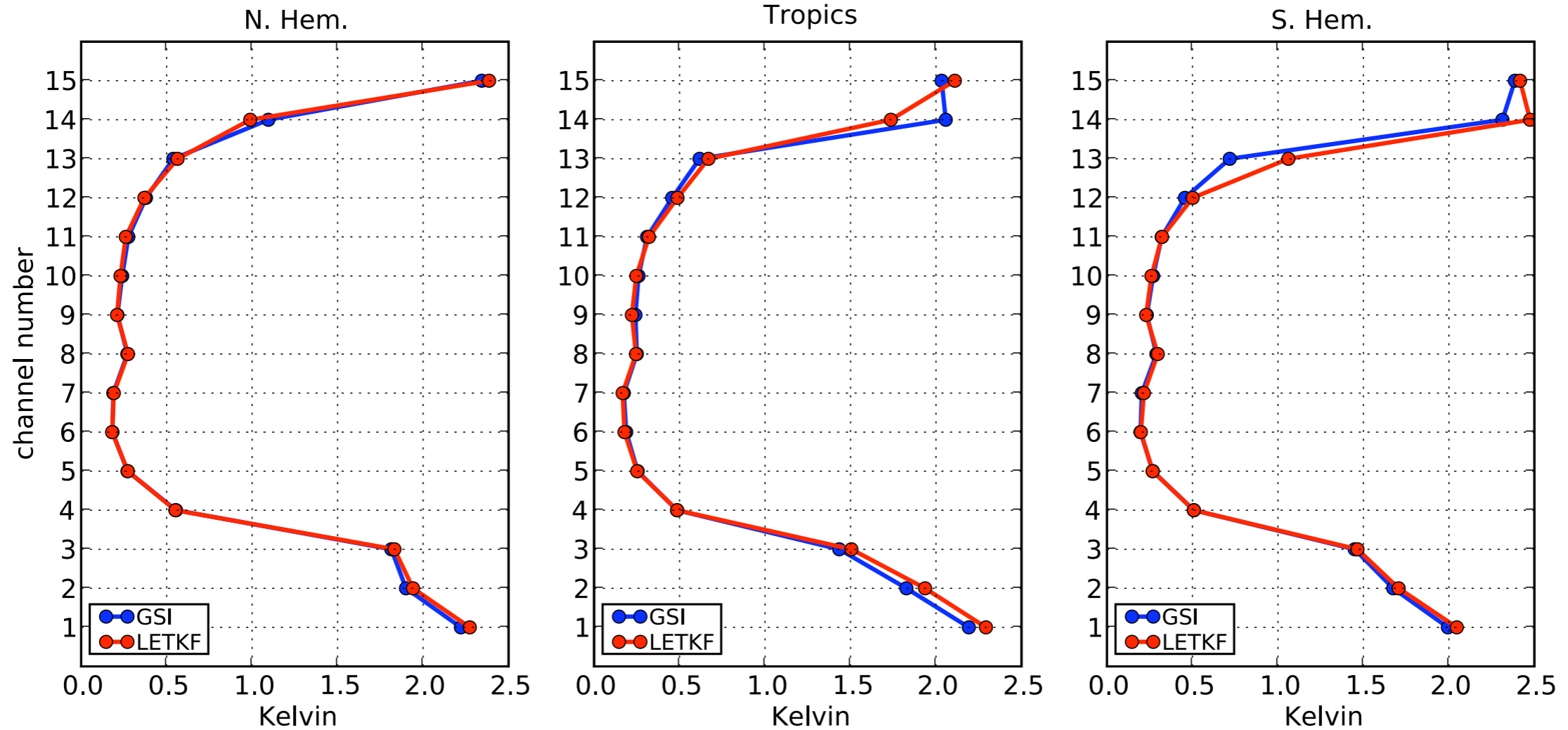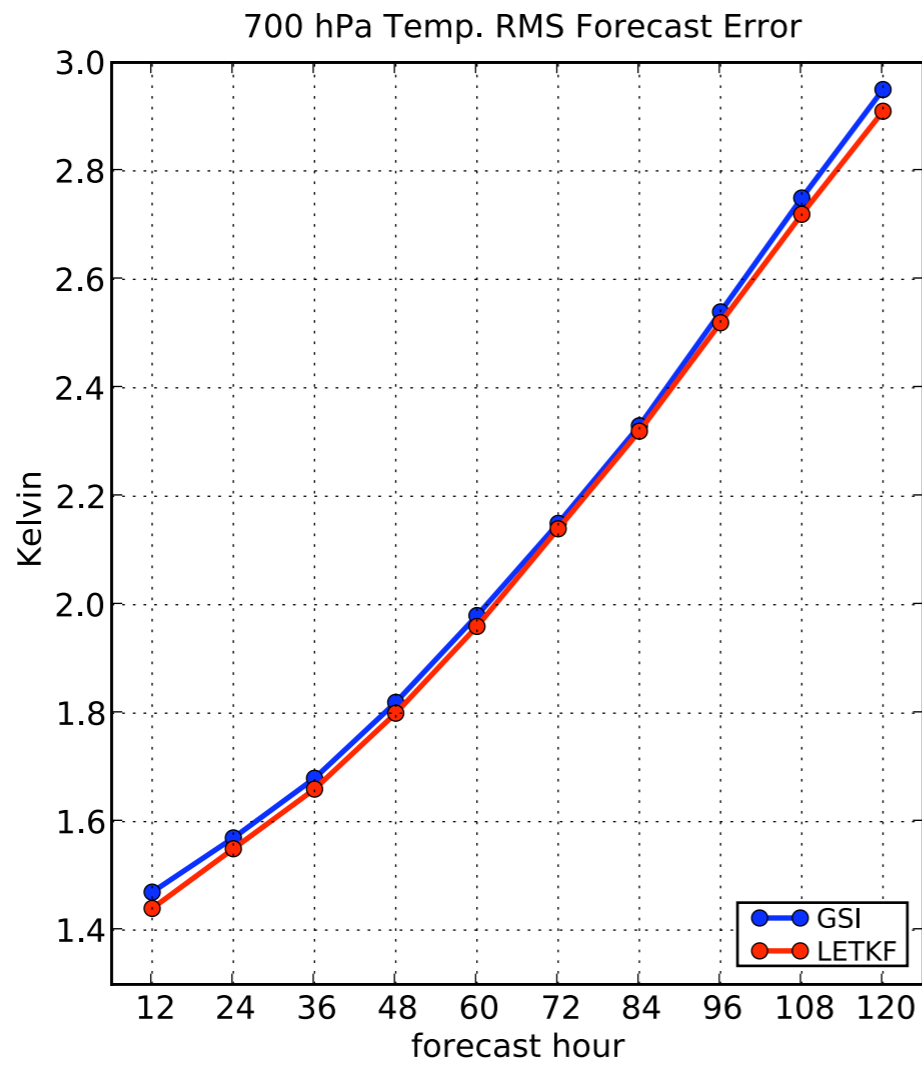
O-F statistics (Sondes, Ps)

O-F Radiosondes 2007051400-2007052212

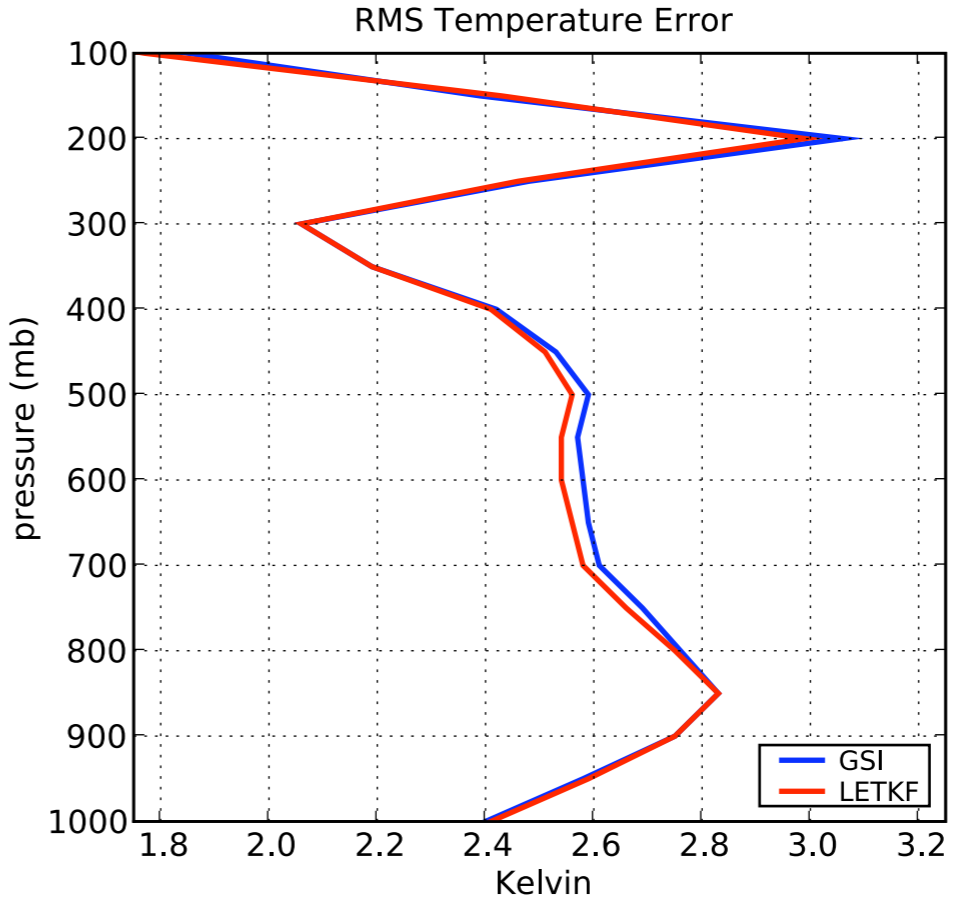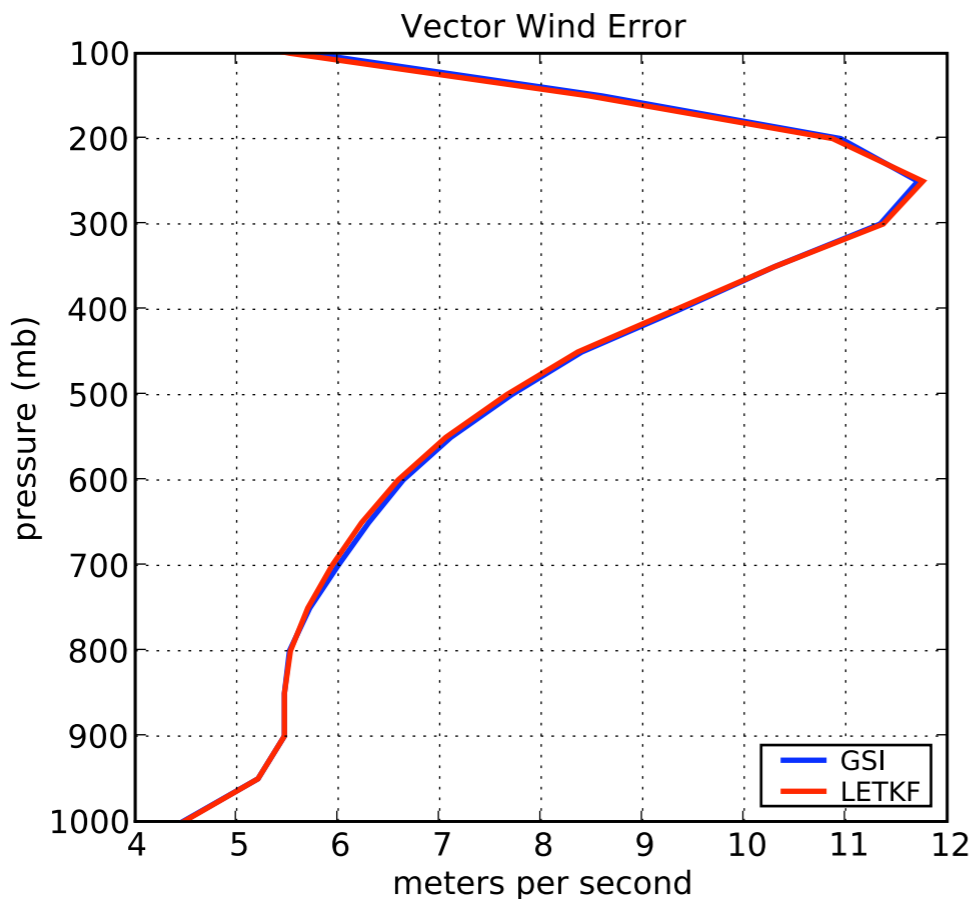| Ps O-F	NH	TR	SH	Global
LETKF	1.14	1.26	1.28	1.17
GSI	1.14	1.34	1.28	1.18

Forecast Skill
relative to UKMET analyses

Forecasts initialized 2007051400-2007052212, verifed against UKMET analyses

5-day Forecast Skill
relative to operational GDAS analysis

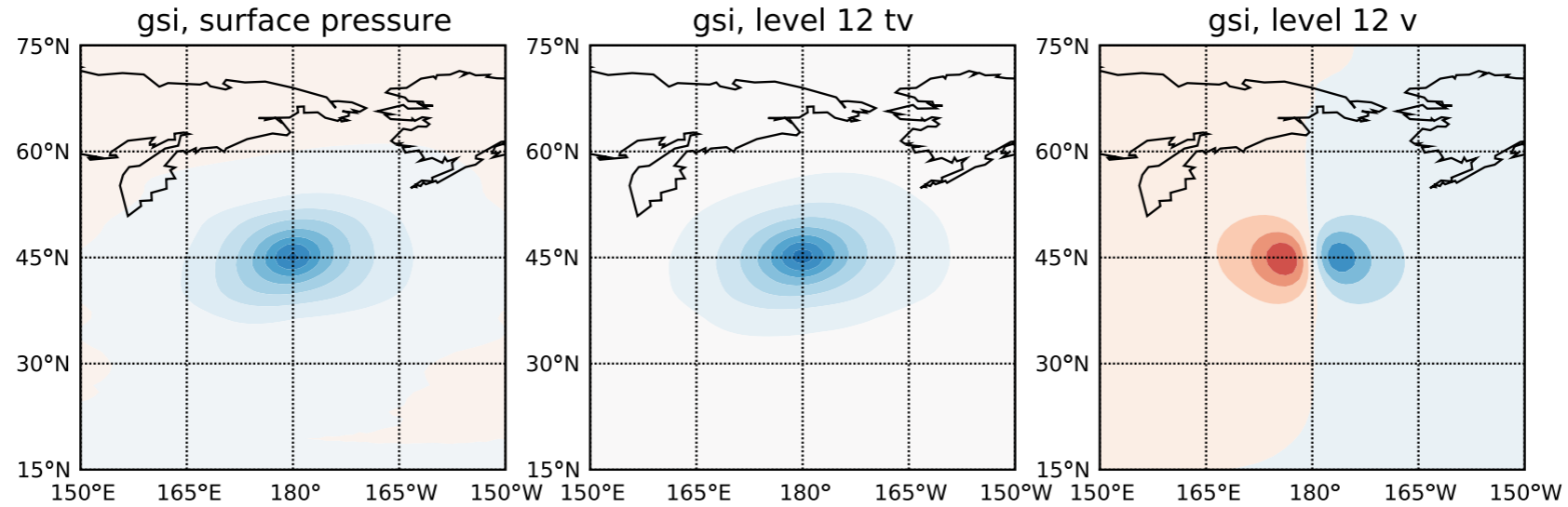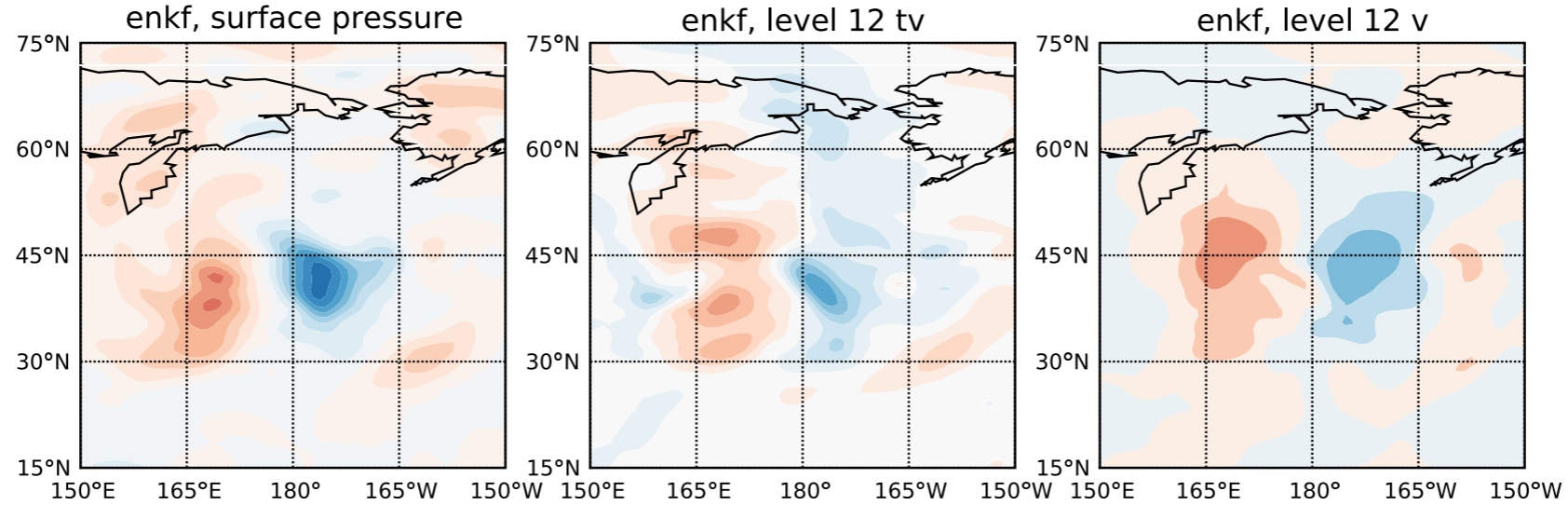120-h Forecasts initialized 2007051400-2007052212, verifed against operational GDAS1 analysis

Single Ob Increments

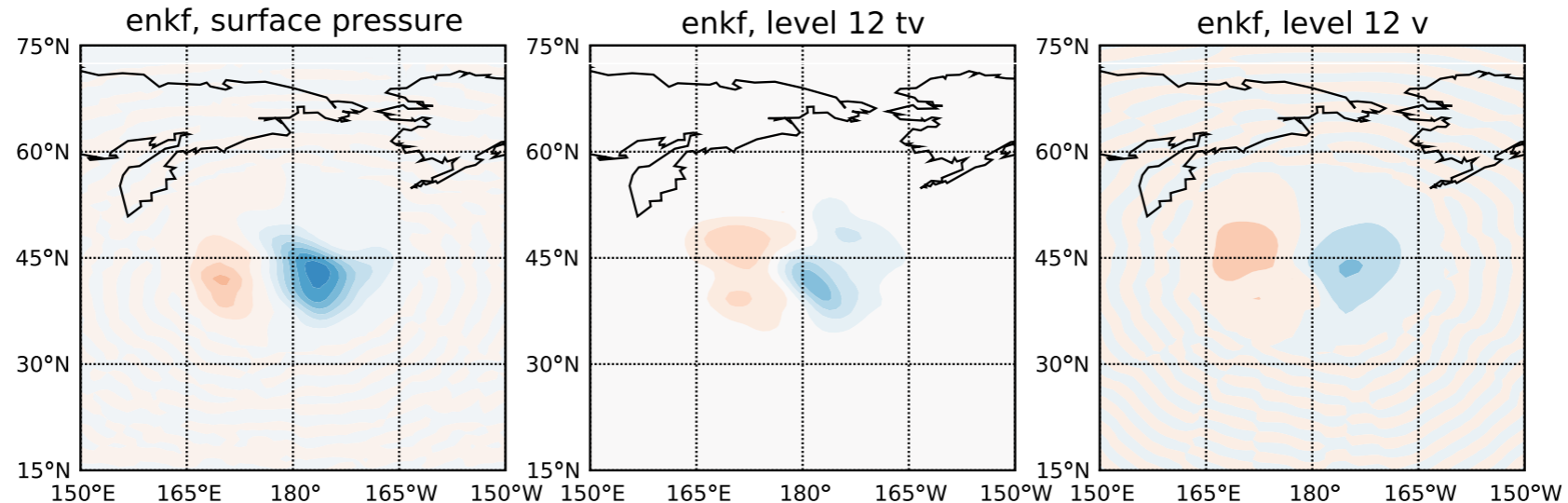*single ps ob at 45N,180W, 1mb lower than background, 1mb error*

Single Ob Increments (cont.)
single ps ob at 45N,180W, 1mb lower than background, 1mb error
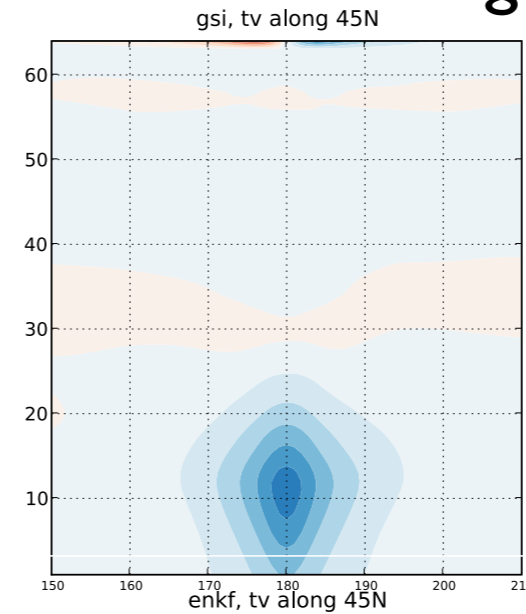
GSI

LETKF
no localization

LETKF
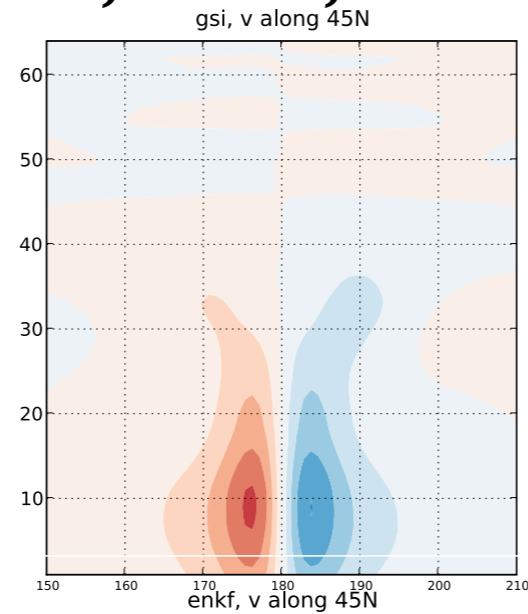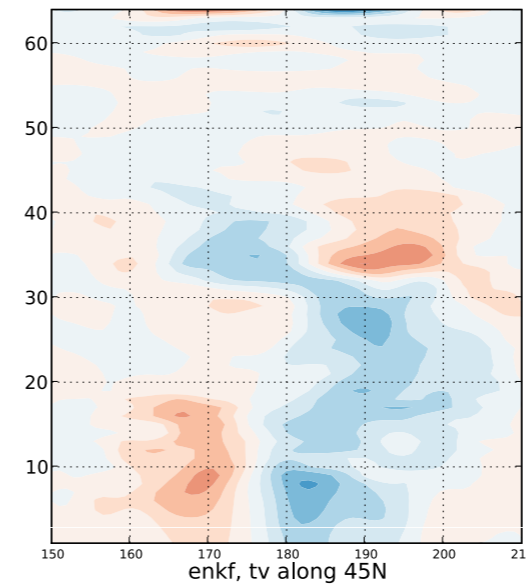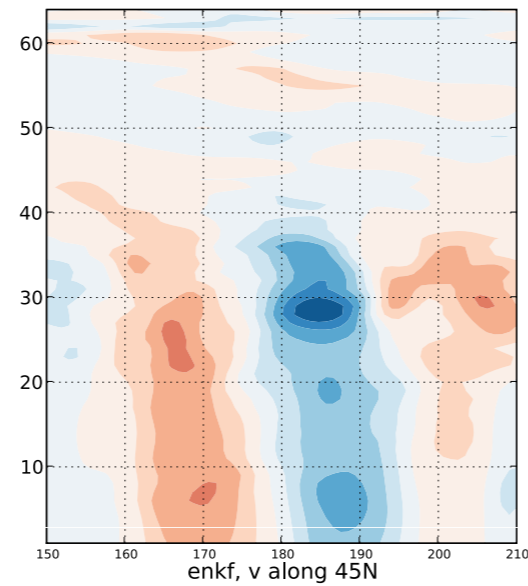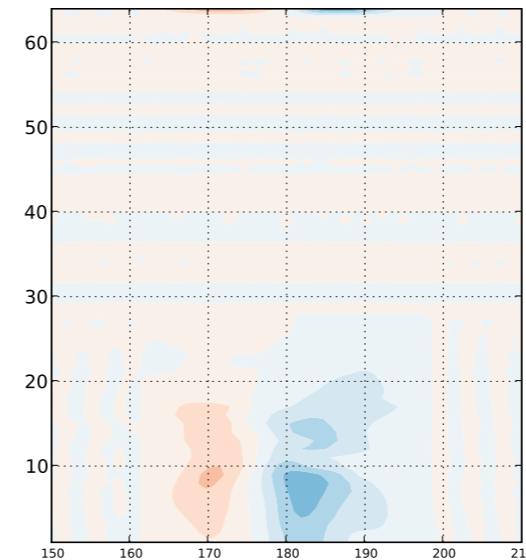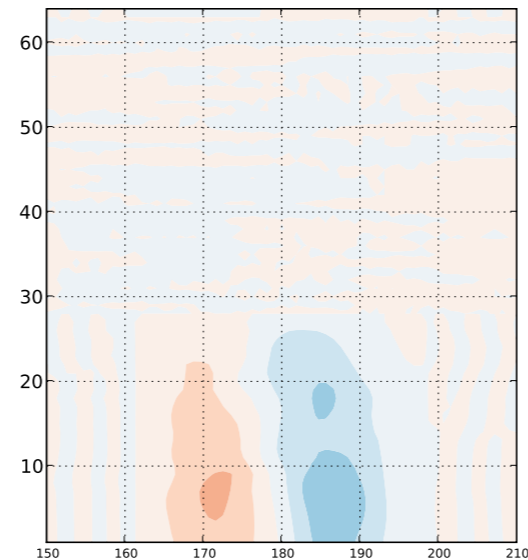*1 scale height localization*

TODO List

- More tuning.

- Better (more refined) localization scheme?

- Better 'system error' parameterization, bias correction?

- Higher resolution? Larger ensemble?

- ????