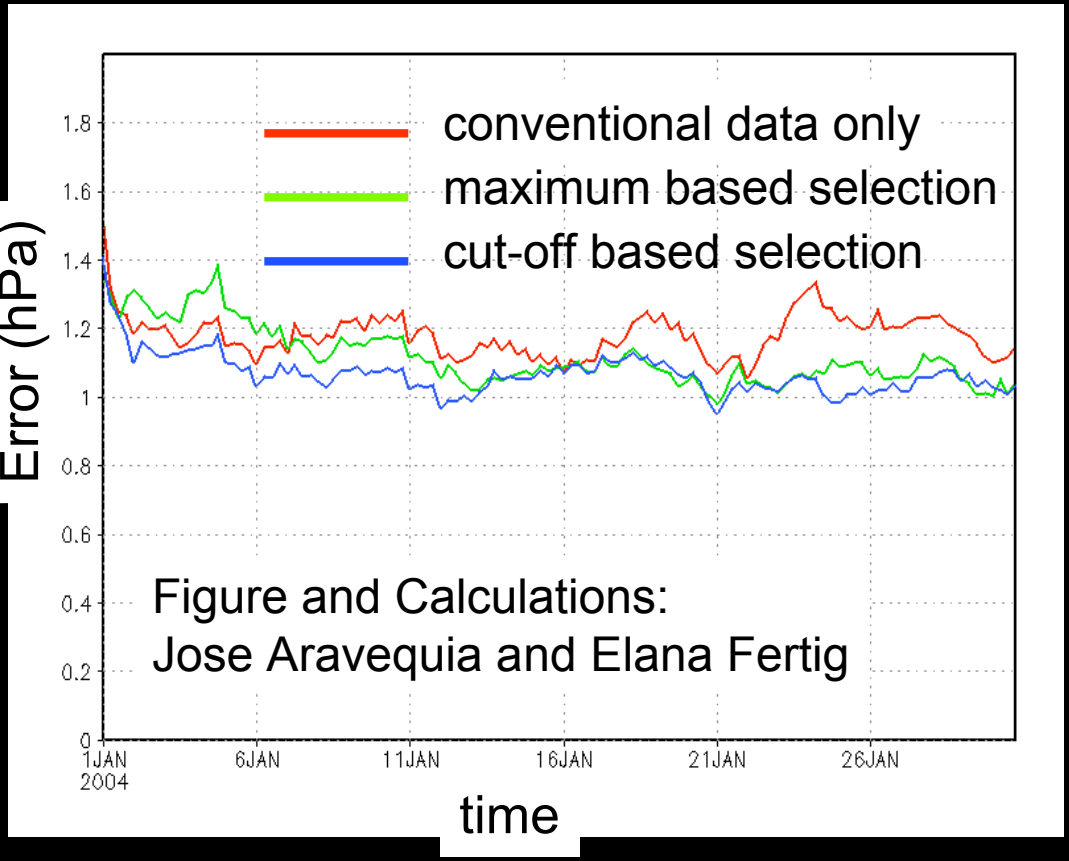
Assimilation of Satellite Radiances

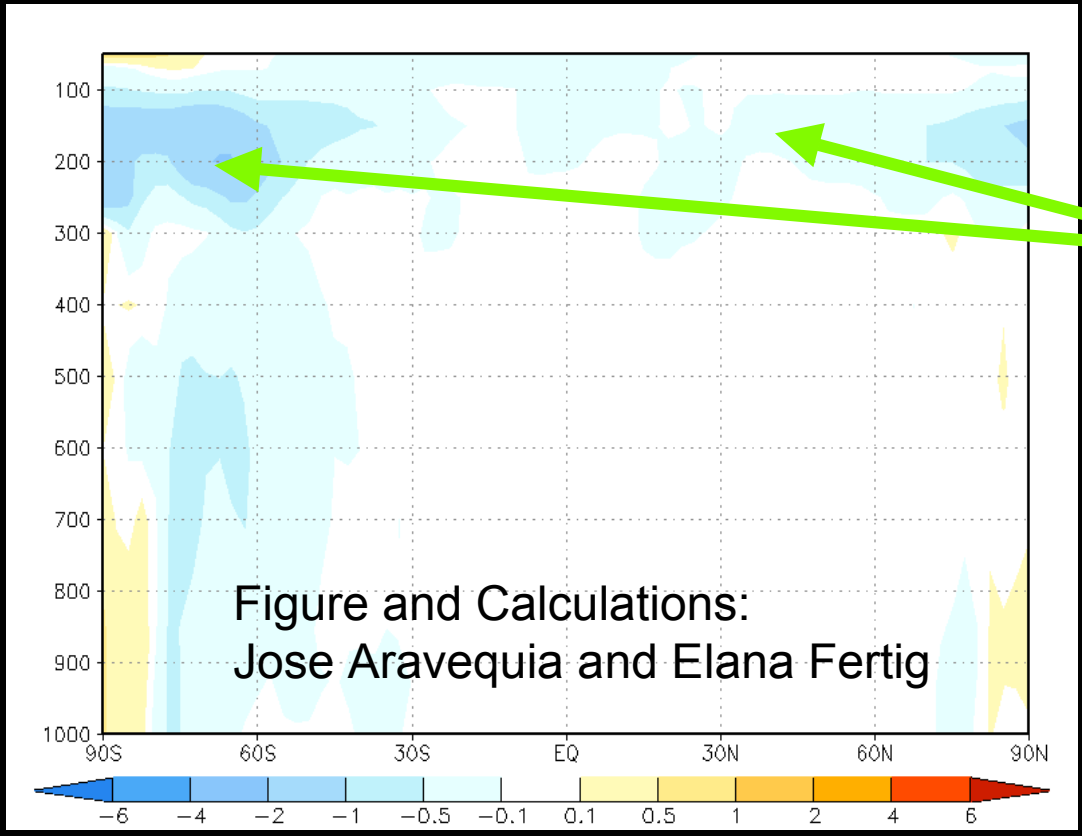
- Cutoff-based data selection strategy a radiance observation is assimilated at a given level, if a significant weight is assigned to any model state vector component within the associated local regions (Fertig et al., 2007, Tellus)
- Bias correction is done by augmenting the state with the bias parameters in the LETKF (Fertig et al., 2007, Tellus, under review?)
- Example:
  - AMSU-A observations from Aqua, radiances are assimilated from 9 channels (channels with peak response near surface are not used)
  - Cutoff is at 60% of the maximum weight
  - Bias correction: $\mathbf{H}(\mathbf{x})$+bias, bias=aT_s+bs+c; T_s: surface temperature, s: scan angle; estimated are a, b, and c, which are then averaged for each latitude circle
  - $\mathbf{H}(\mathbf{x})$ is calculated with the CRTM from JCSDA
  - 40-member ensemble

Time Evolution of the Surface Pressure RMS Error analyses verified against operational NCEP analysis



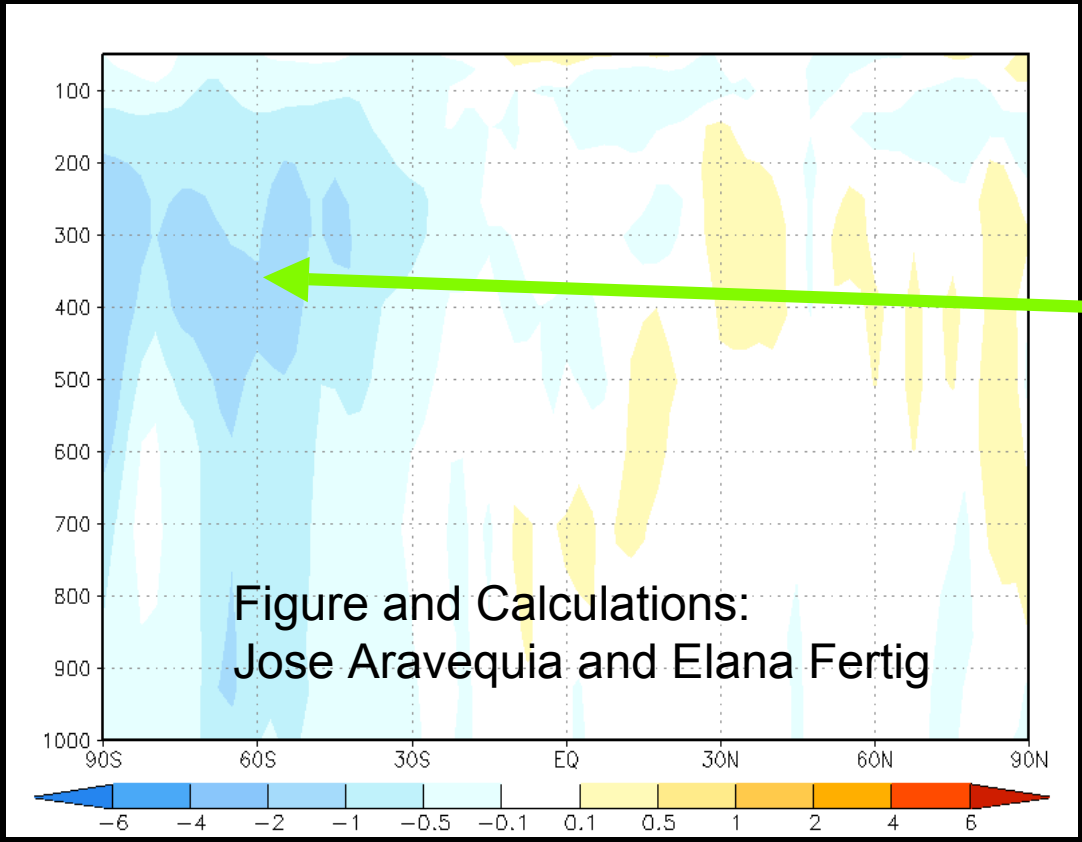
- The error is the largest when only conventional data are assimilated
- The maximum-based data selection leads to a long settling time and occasionally larger errors than those for the cut-off based selection
- The cut-off based selection provides the overall best performance

Effects of the AMSU-A Data on the 48-hour Forecast Errors temperature, 15-day mean



- The AMSU-A data make the most important contribution in the upper troposphere, especially in the SH

Effects of the AMSU-A Data on the 48-hour Forecast Errors meridional wind



- The large improvements in the SH suggests, that there is a lot of useful information in the estimated background error covariance matrix between the temperature (most closely related to the radiances) and the wind