



EMC: FV3-CAM DA Update

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Thanks to EMC colleagues including Wanshu Wu, Tom Black, Jim Abeles, Dusan Jovic,
and George Gayno
Thanks to GFDL's Lucas Harris



Intro & Outline

- Initial work done by Wan-shu to perform GSI on single FV3-tile
- FV3-SAR Ensemble DA
- FV3-SAR DA Imbalance

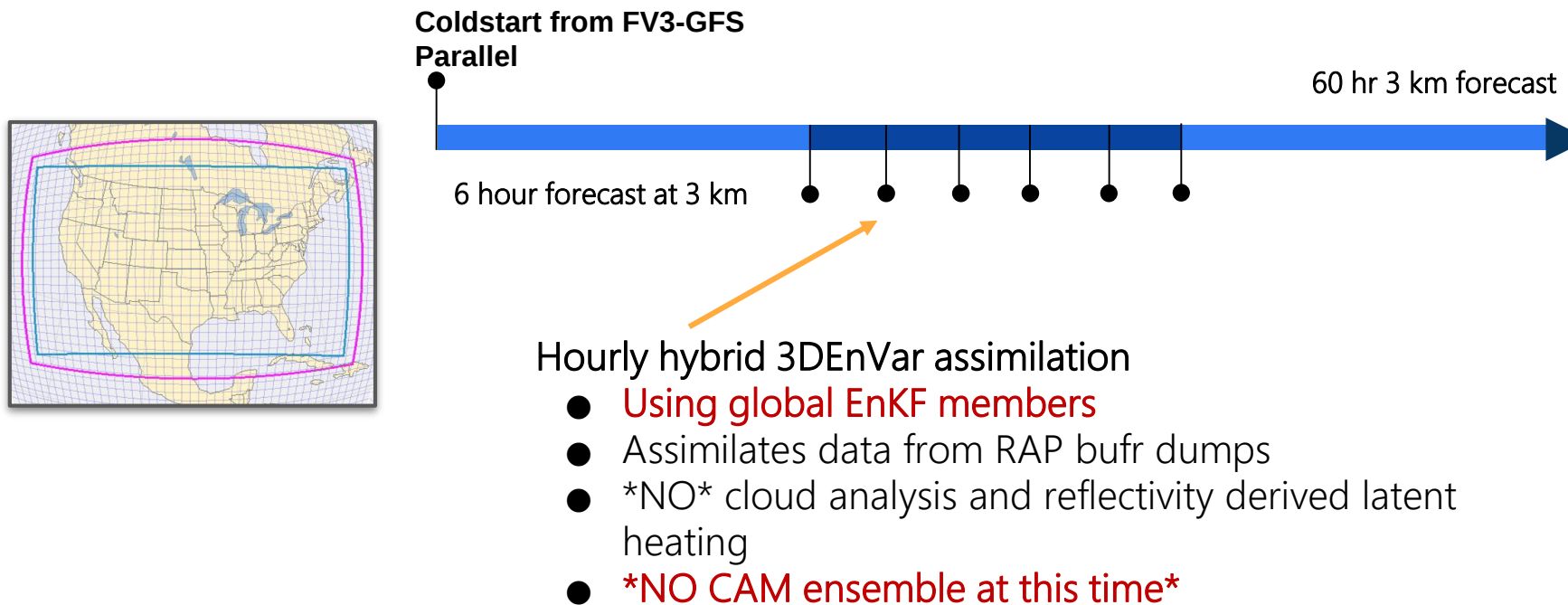


FV3-SAR Ensemble DA Update

[Material from Ting Lei]

Background

Current SAR-DA Parallel



Under development: Cycled FV3SAR ensemble based GSI hybrid GSI DA



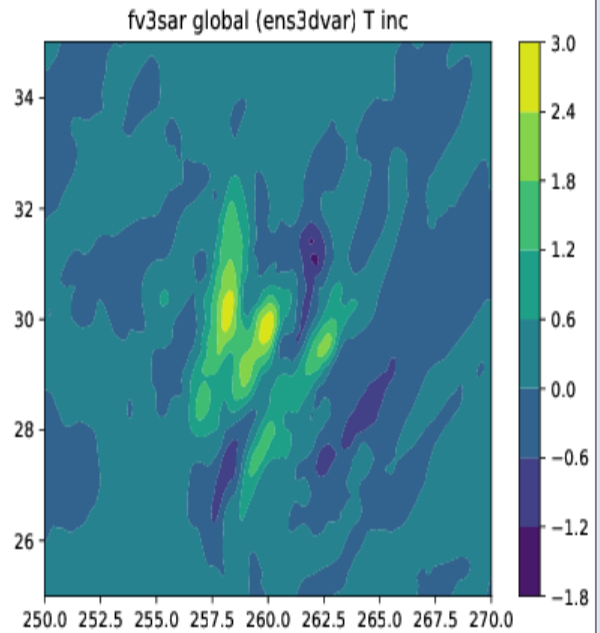
Ensemble DA Updates

- Enhancements are needed to GSI EnVar code and EnKF code to handle FV3-SAR
 - GSI capabilities to read in FV3SAR ensembles
 - Restart files
 - “cold start” files generated by CHGRES
 - EnKF to use the FV3SAR ensembles in the form of the restart files
- Capabilities have been *preliminarily* validated
 - Broader application, testing, and feedback is welcome
 - Can provide the branch info for anyone

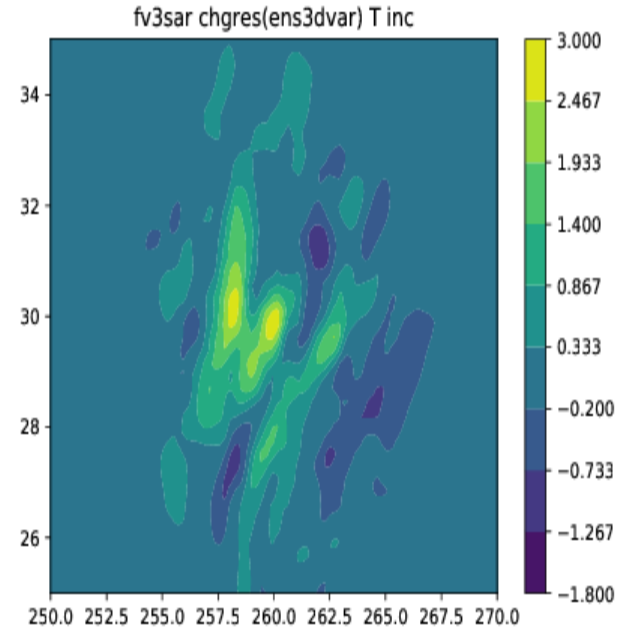


Single Observation Test

T increment shown on model level 29 on native grid (*pure Ens3Dvar*)
10 members



global ensembles



FV3SAR-CHGRES ensemble

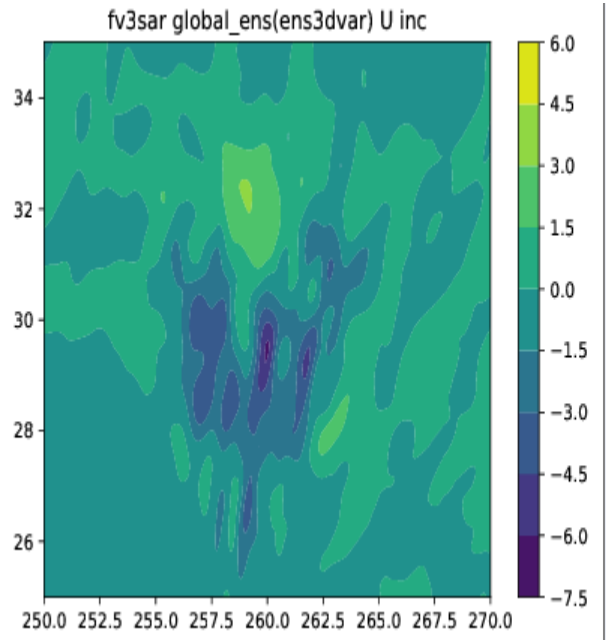
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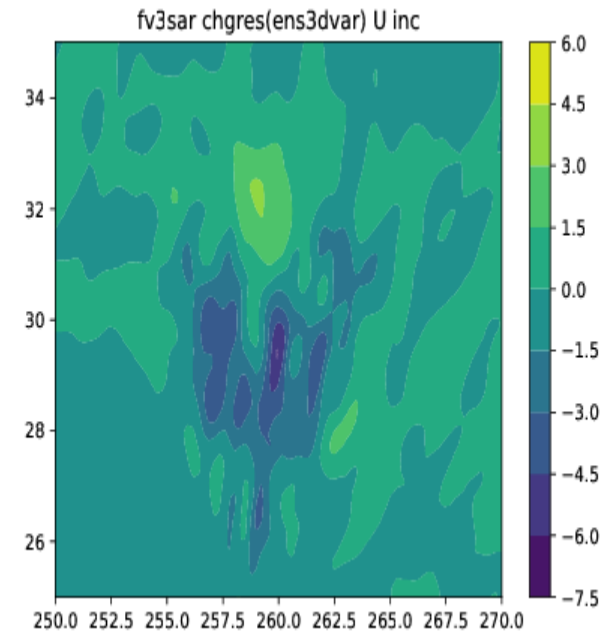
Single Observation Test

U increment shown on model level 29 on native grid (*pure Ens3Dvar*)
10 members

From a pseudo
T observation –
exercising cross
covariances



global ensembles



FV3SAR-CHGRES ensemble

maginnov=2.0,magoberr=0.01,oneob_type='t',
oblat=30.,oblon=260.,obpres=200.



Ongoing and planned developments

- Use of FV3SAR cold start files as the background files for GSI
- Complete the workflow for a cycled FV3SAR ensemble based hybrid GSI DA system
 - Includes adding interface for tools (e.g. re-centering, etc.)
 - Coordinate/collaborate
- Dual resolution capability

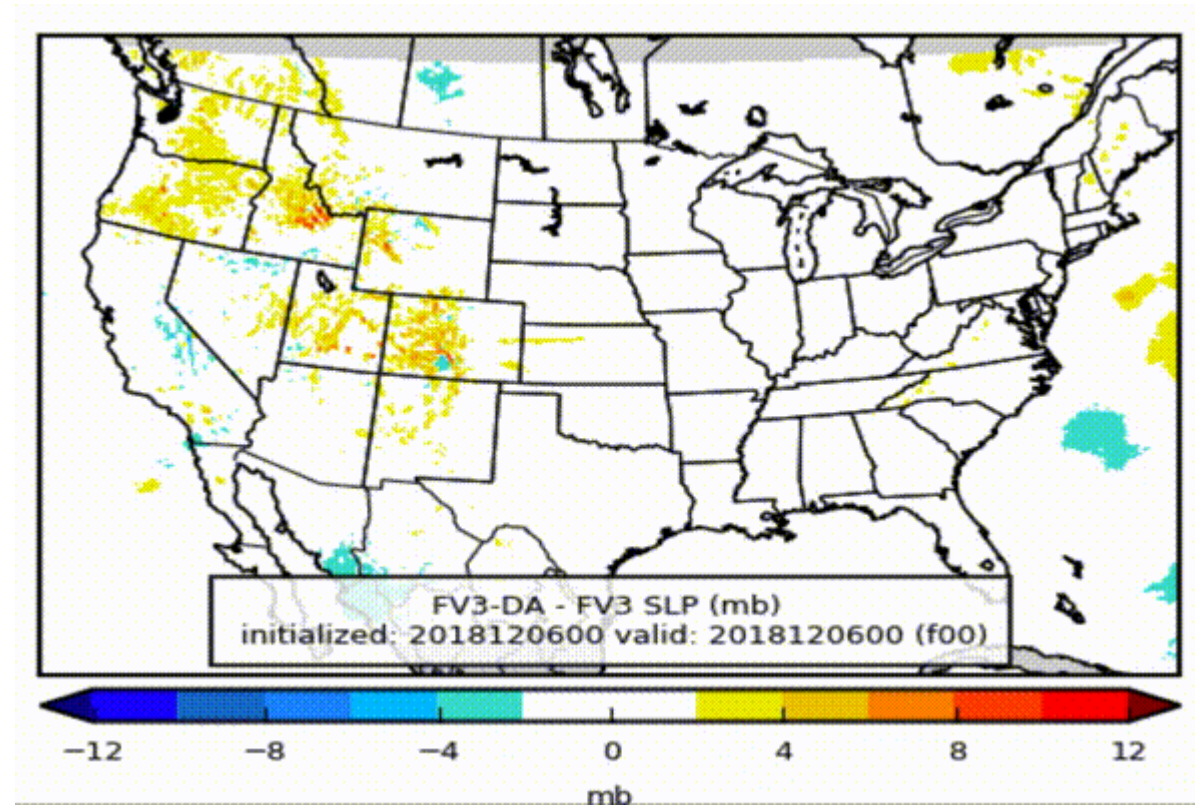


Imbalance Issue Update

[Material from Xiaoyan Zhang and Eric Rogers]



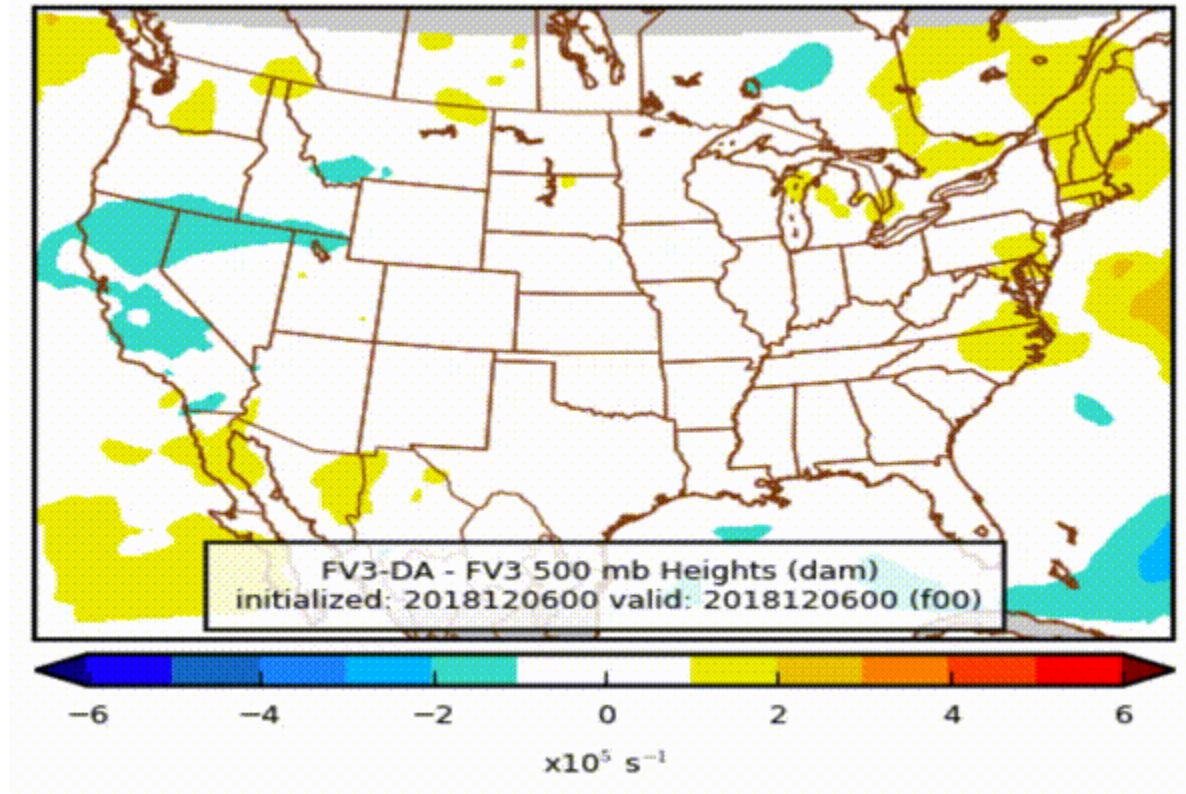
FV3SAR DA Runs and model noise - SLP



<https://www.emc.ncep.noaa.gov/mmb/bblake/fv3/>



FV3SAR DA Runs and model noise - 500 hPa Hgts





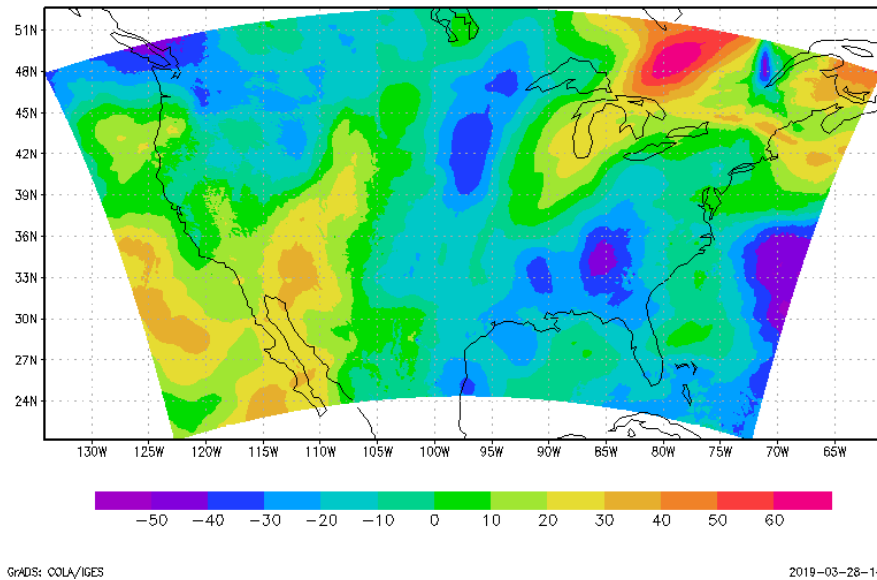
Test for identifying the pressure increment

- Is there an issue for how pressure is updated in the analysis?
- Conduct a single run without the increment update for *delp*
- `#call gsi_fv3ncdf_writeps`

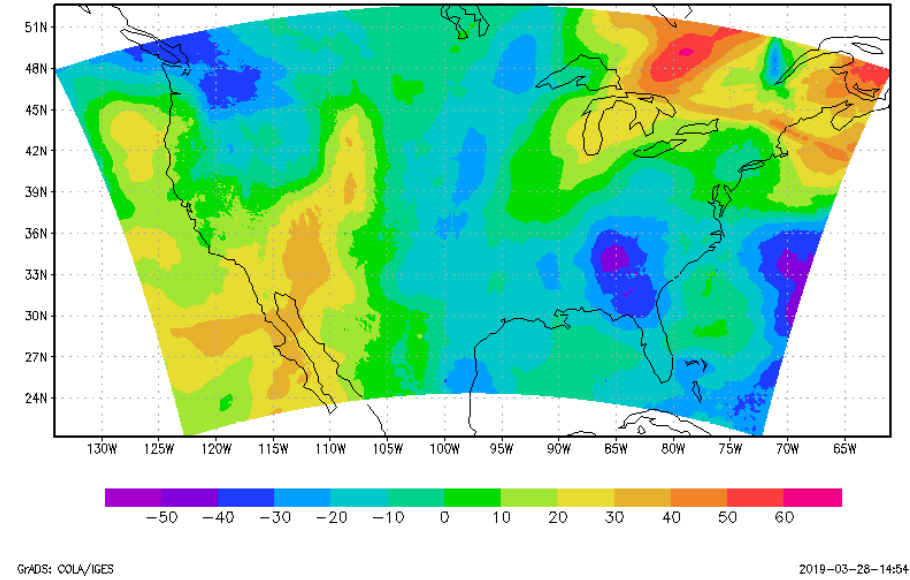
This will not write out analyzed "*delp*" to `fv_core.res.nest02.tile7.nc`, and keep the pressure same as the guess

FV3SAR DA Runs and model noise - 500 hPa Hgts

FV3SAR No delp update DA – No DA



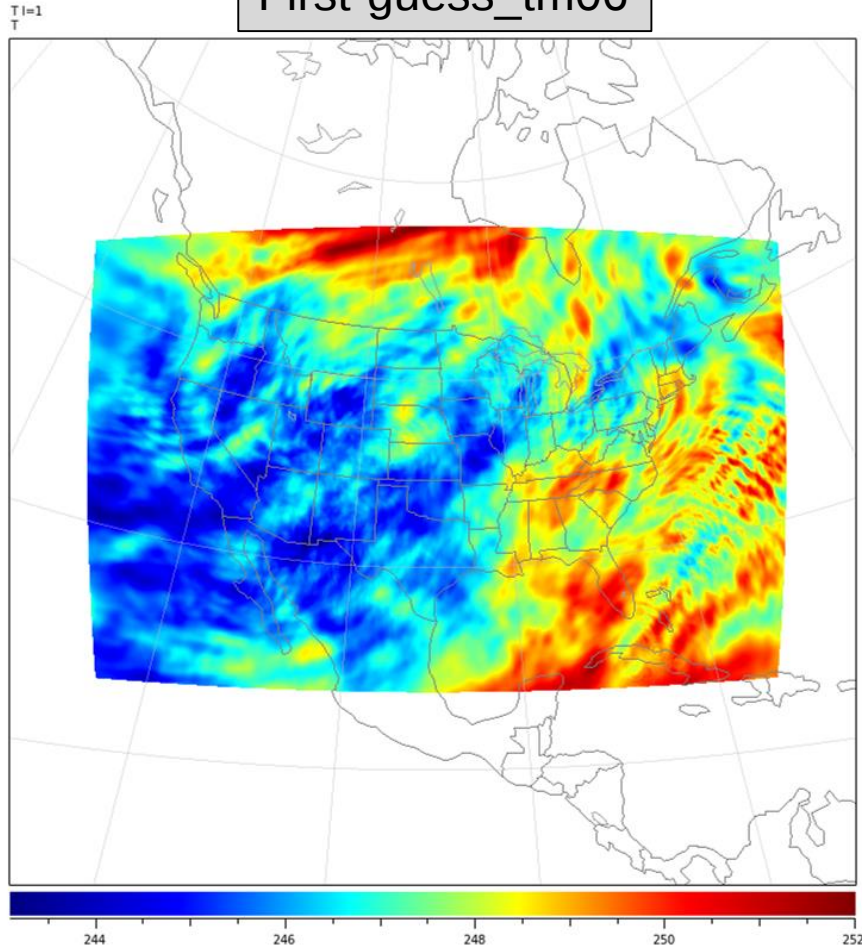
FV3SAR DA – No DA



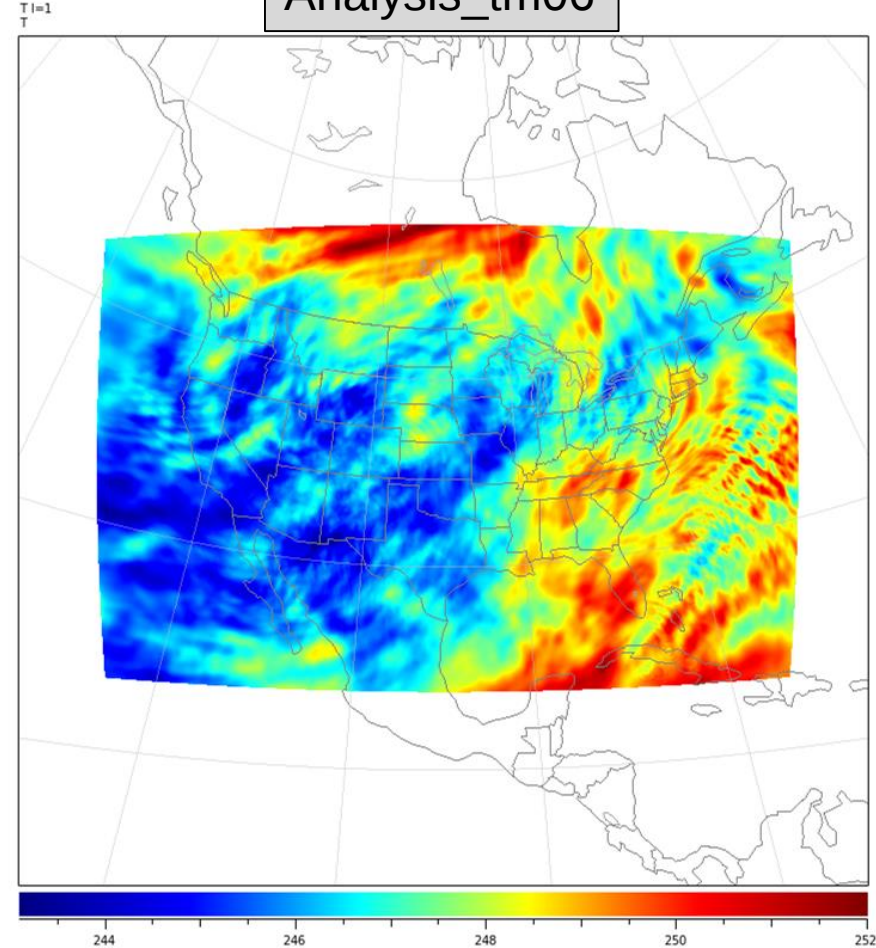
The same pattern of instability in SLP and 500 hPa Height persists, even if there is no *delp* increment update

What do the lateral boundaries look like?

First-guess_tm06



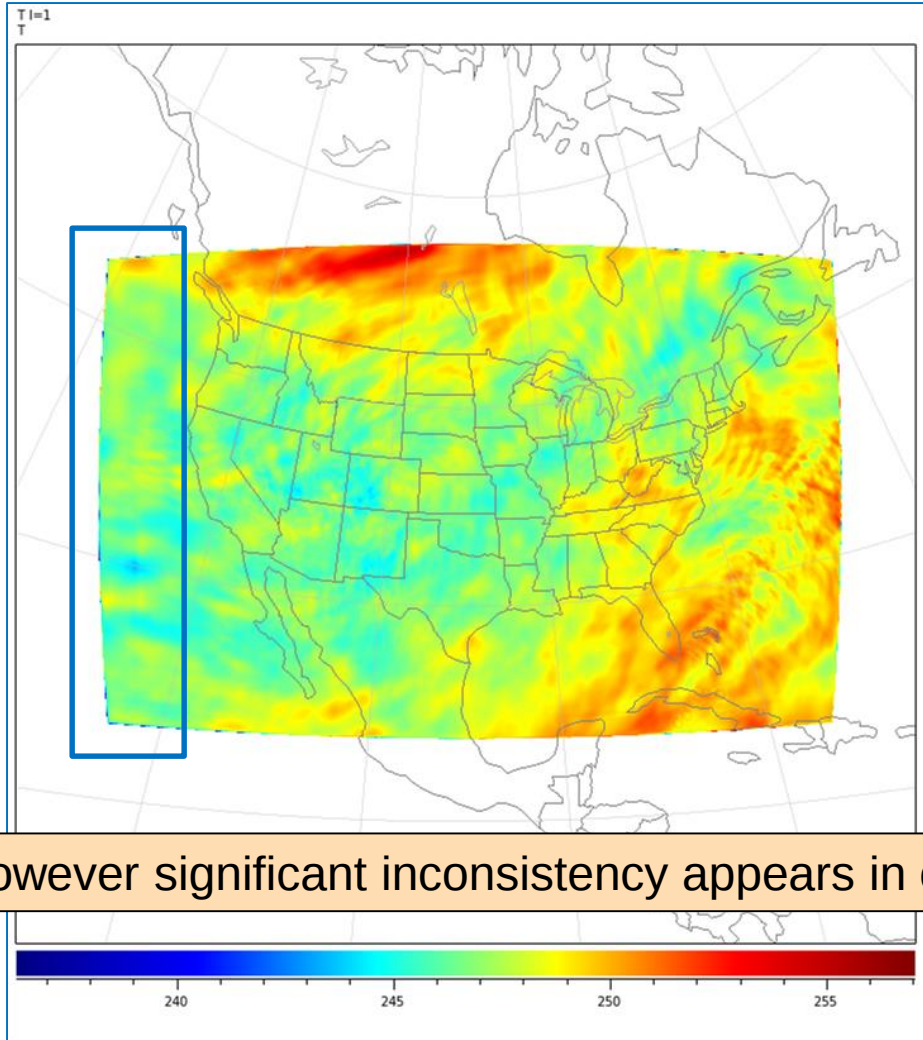
Analysis_tm06



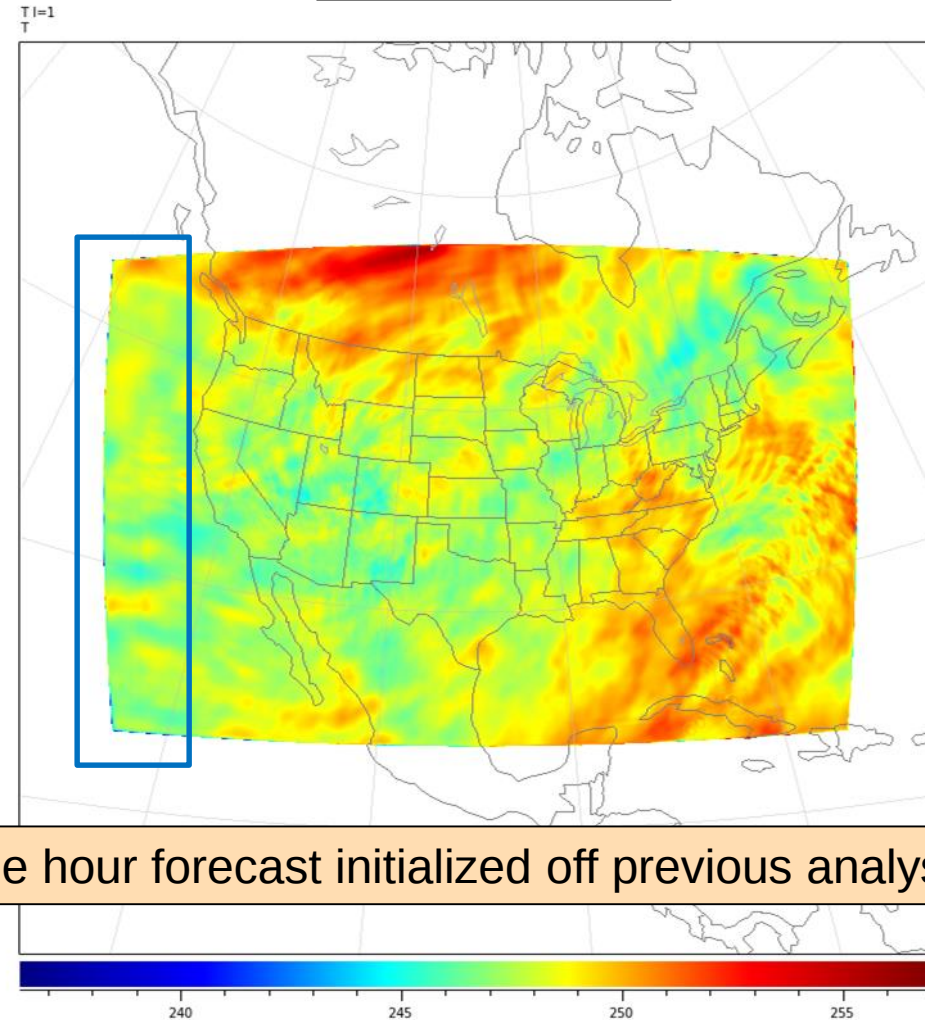
LBCs look fine for temperature at level 1 for the first guess and analysis....

What do the lateral boundaries look like?

First-guess_tm05



Analysis_tm05

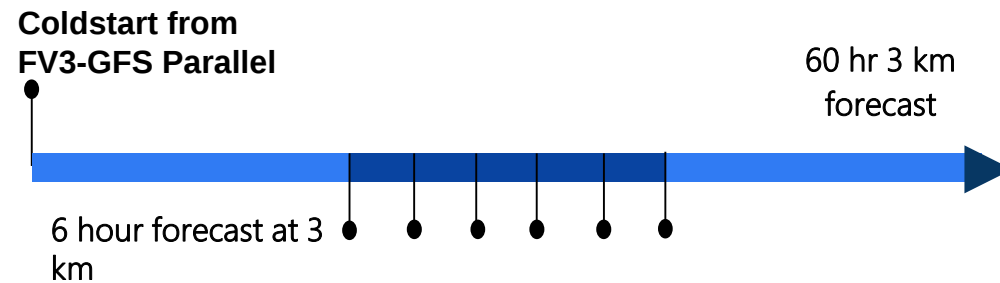


However significant inconsistency appears in one hour forecast initialized off previous analysis.



Updating the LBCs

- Following the analysis the LBCs are not consistent with interior integration domain
 - Gets worse with each successive analysis
 - No blending zone employed to dampen the discrepancy



- **Solution:** Update the LBCs so that they are consistent with the analysis following DA
- The full state is stored in the LBCs – no need for us to adjust tendencies, model handles it
 - Working on adding this capability now