

FV3GFS C384 Sensitivity Experiments

- 1) Orographic Gravity Wave Drag and Mountain Blocking
- 2) Non-hydrostatic .vs. hydrostatic

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Acknowledgements:
Fanglin Yang et al.

Experiment Design

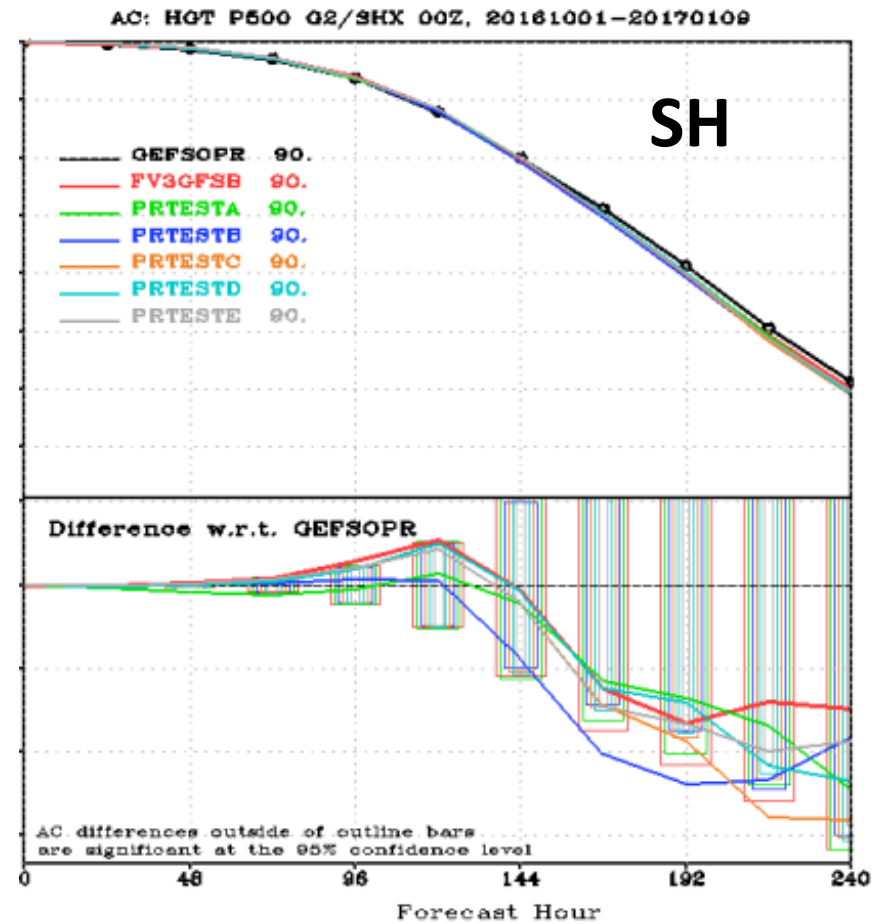
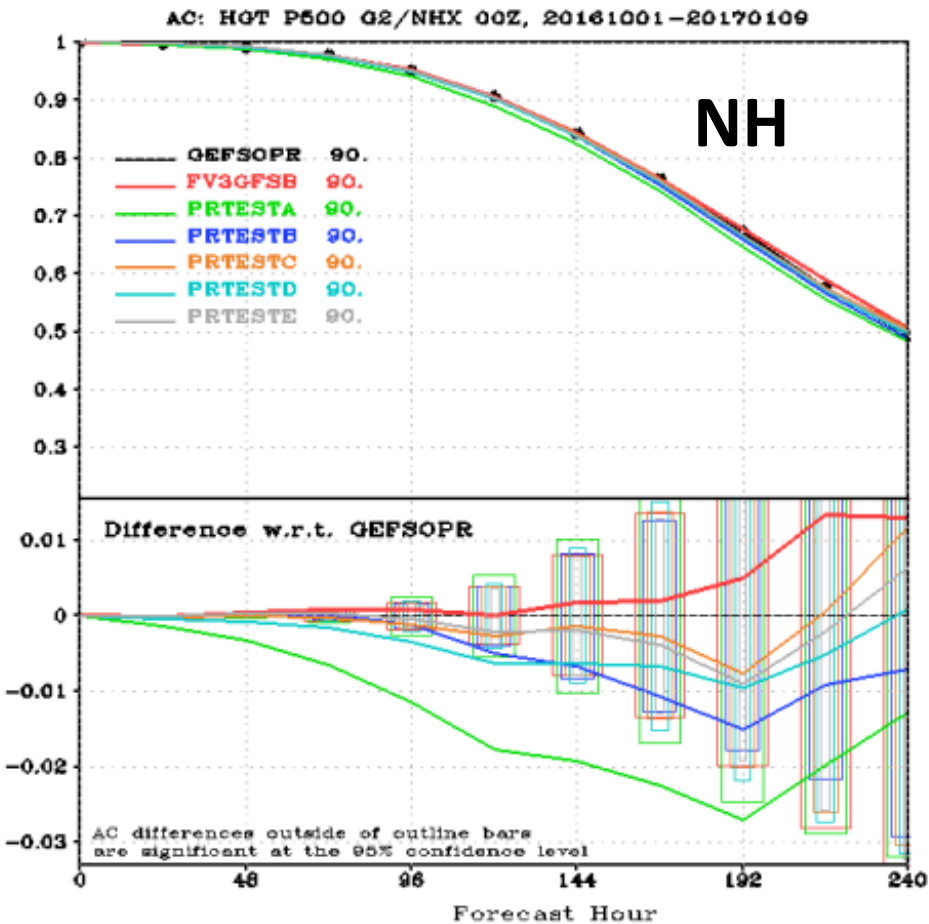
- FV3GFS trunk (r86557)
- C384 (~25km) 64 layers
- Non-Hydrostatic
- 32-bit precise
- Initialized with GFS production analysis
- 10 day forecasts
- 20161001-20170110 (00Z only)
- 16 nodes, about 60 mins for 10-day forecast
(sometimes it is more than 70 mins)

Experiments

- **Exp A:** cdmbgwd=3.5,0.25 (13km setting)
- **Exp B:** cdmbgwd=0.25,2.0 (T574's setting)
- **Exp C:** cdmbgwd=1.0,1.2
- **Exp D:** cdmbgwd=1.5,0.8
- **EXP E:** cdmbgwd=0.8,1.5

- **Verification web page:**
http://www.emc.ncep.noaa.gov/gmb/wx11wm/nems_gefs/fv3_1/

500 HGT AC

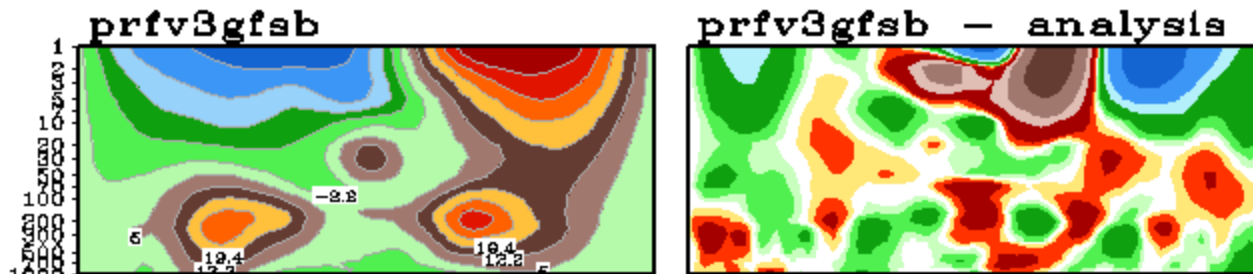


Black: GEFSOPR- T574L64, GEFS operational control
Red: FV3GFSB- C768, from Fanglin

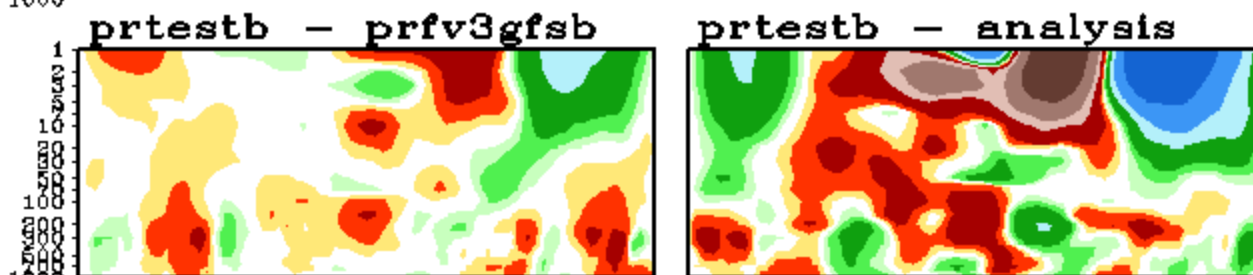
U (m/s), 00Z-Cyc 01Nov2016-30Dec2016 Mean
Post-Hour 1240

Zonal mean
U
F240 hr

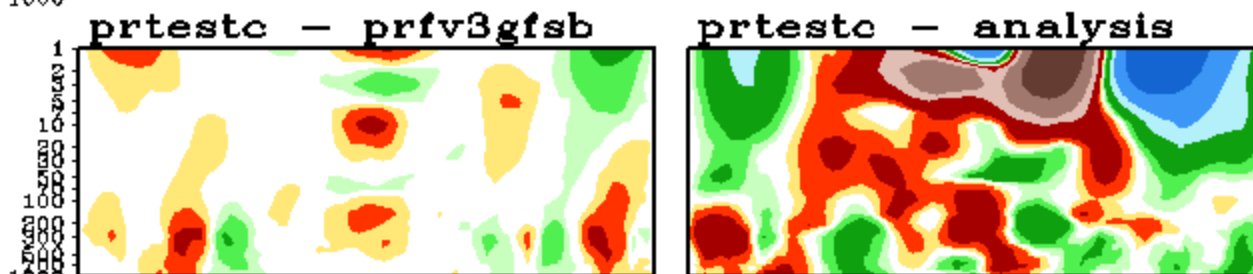
C768



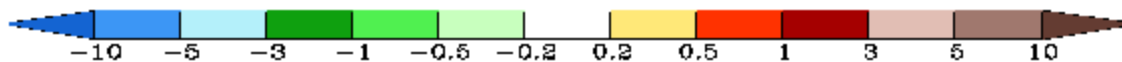
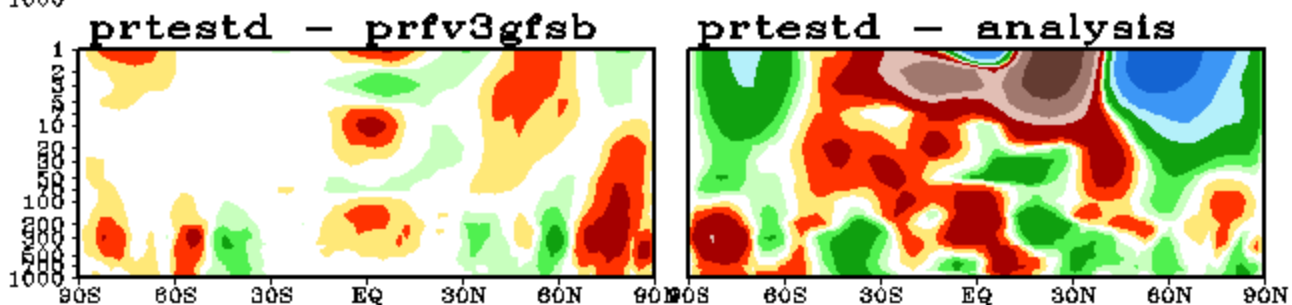
Exp B



Exp C

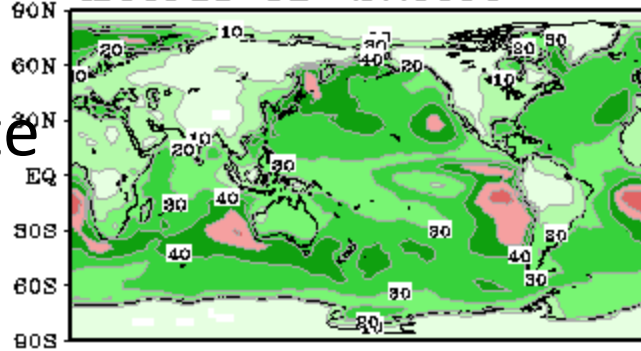


Exp D

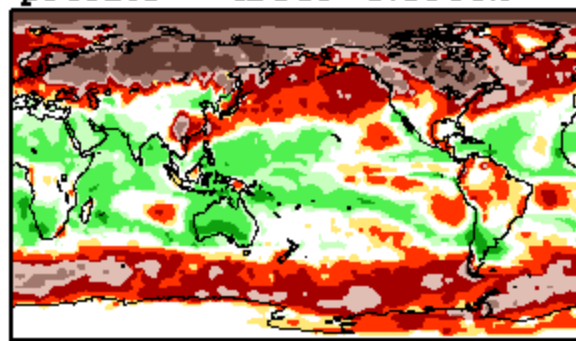


Low Cloud, 00Z—Cyc 01Nov2016—30Dec2016 Mean
(f222 f228 f234 f240) Post-Hour Average

ISCCP85-93 27.9894

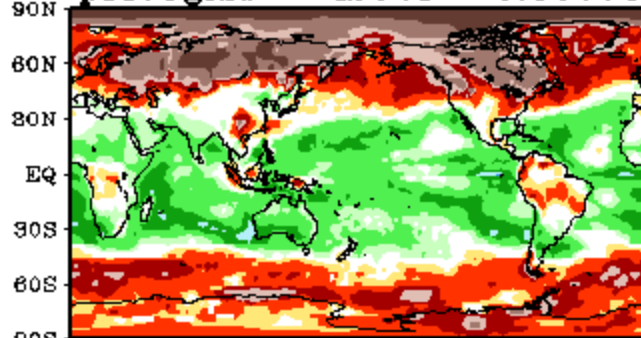


prtests - ISCCP 6.19092

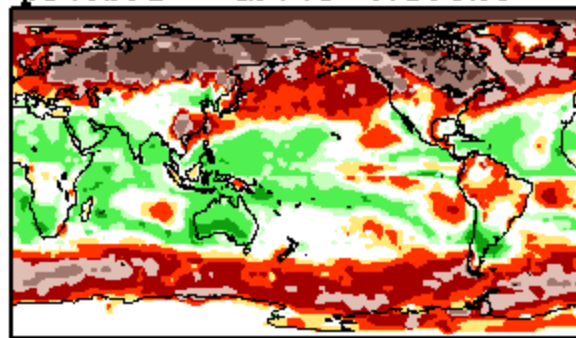


Exp C

prfv3gfsb - ISCCP -0.306789

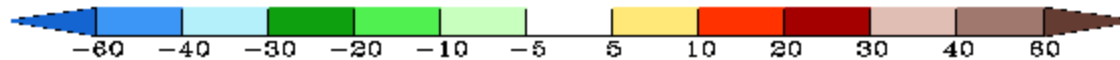
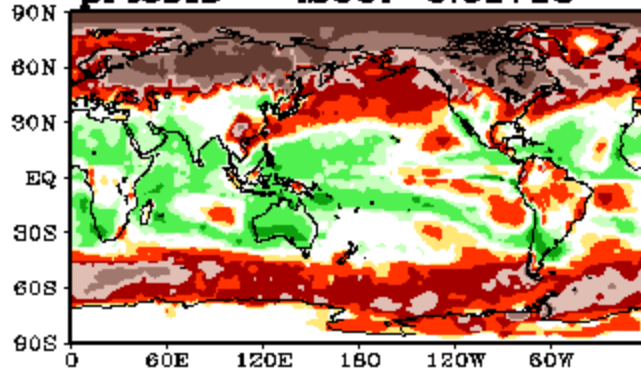


prtestd - ISCCP 6.10525



Exp D

prtestb - ISCCP 6.68783



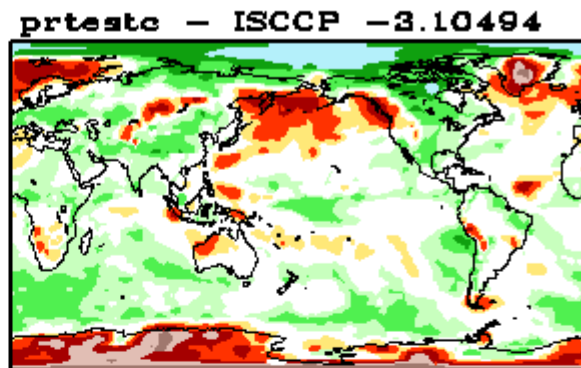
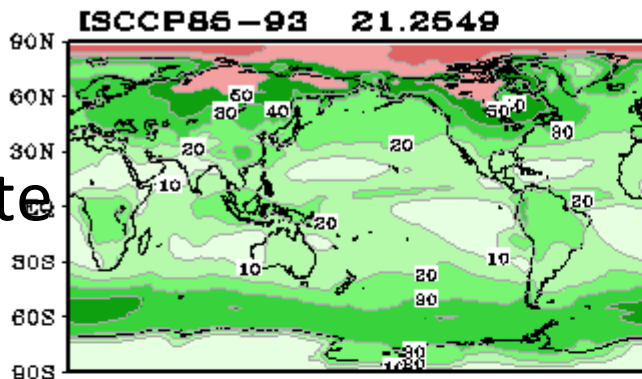
Climate

C768

Exp B

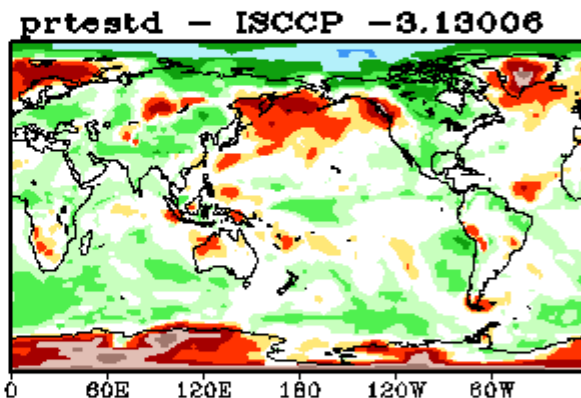
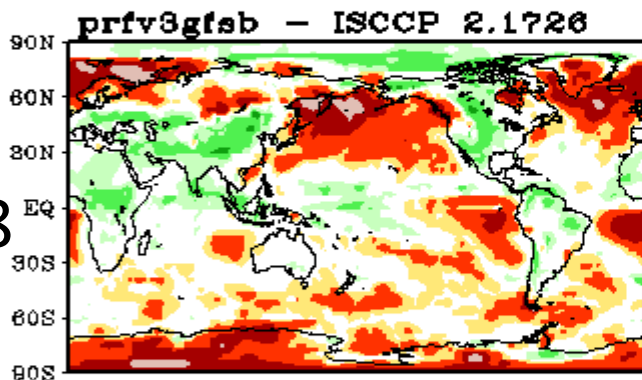
Middle Cloud, 00Z-Cyc 01Nov2016-30Dec2016 Mean
(f222 f228 f234 f240) Post-Hour Average

Climate



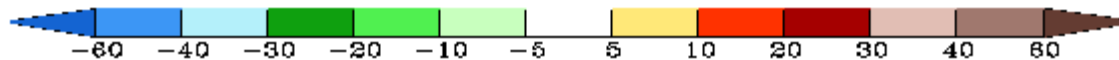
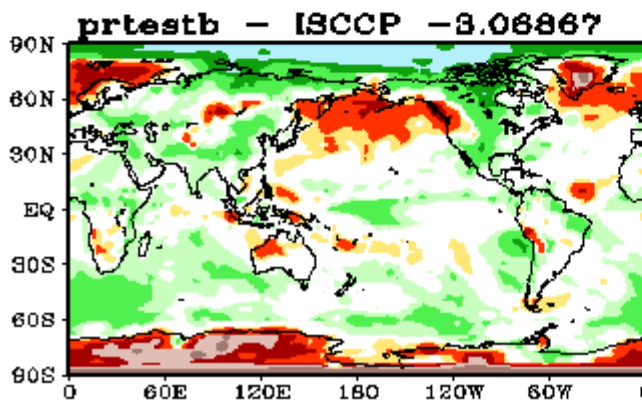
Exp C

C768



Exp D

Exp B



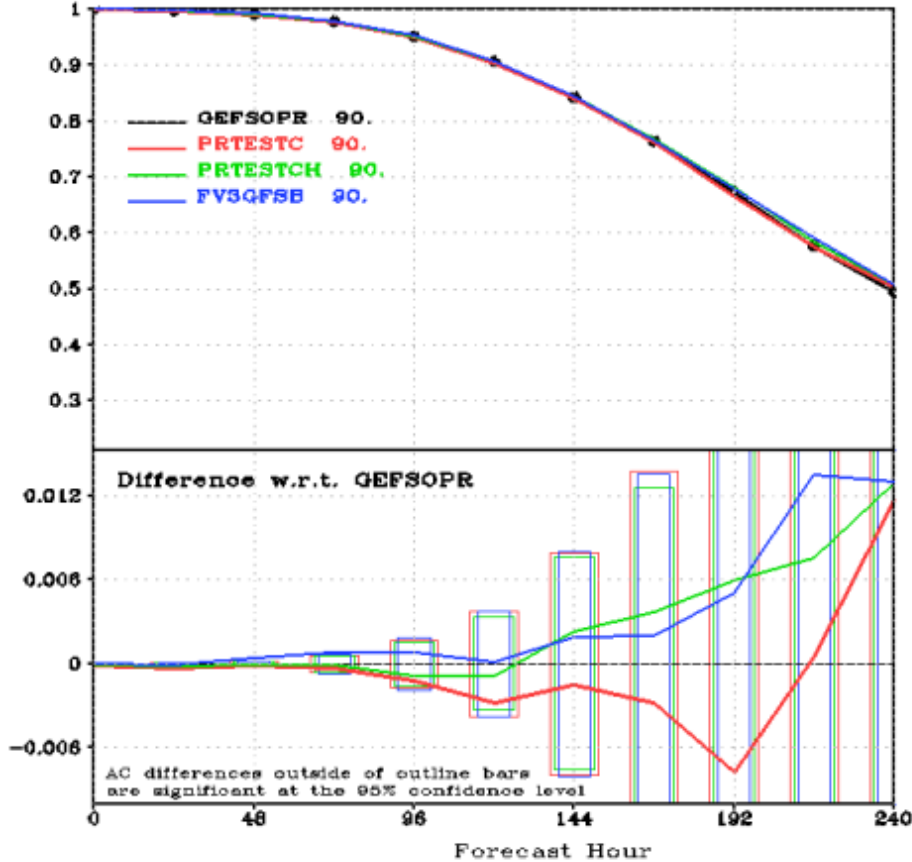
- **Non-hydro .vs. hydrostatic**

- **EXP C:** cdmbgwd=1.0,1.2, non-hydro
- **EXP CH:** As Exp C, except for hydrostatic
- http://www.emc.ncep.noaa.gov/gmb/wx11wm/nems_gefs/fv3_2/

500 HGT AC

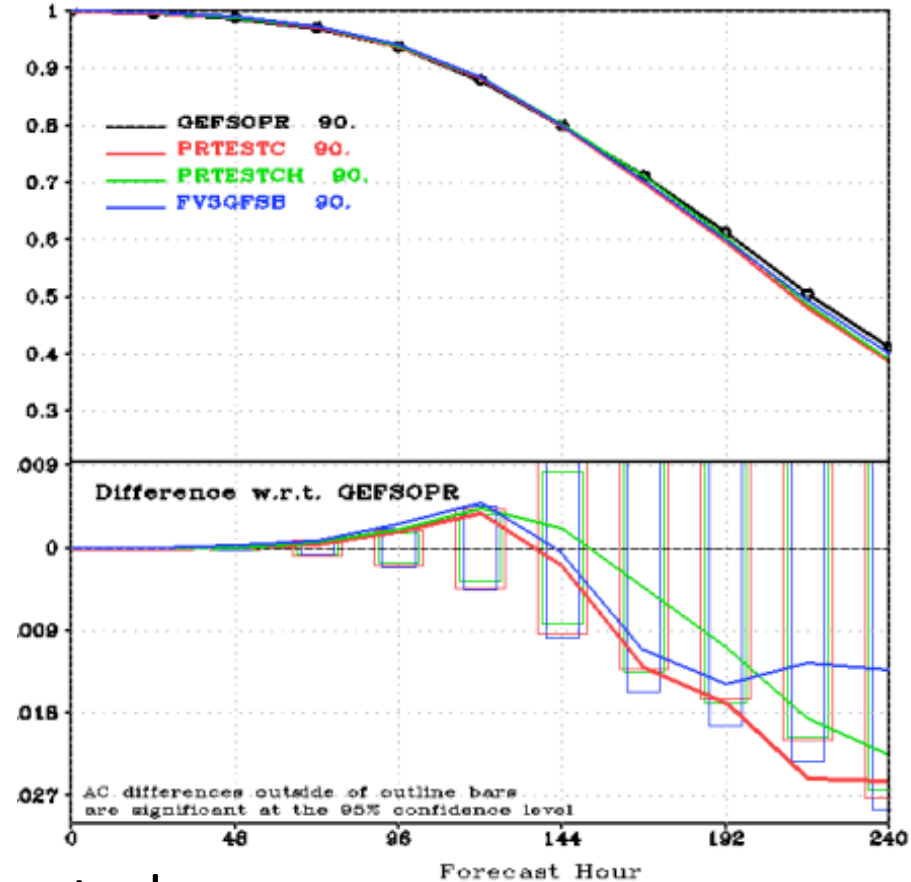
NH

AC: HGT P500 Q2/NHX 00Z, 20161001-20170109



SH

AC: HGT P500 Q2/SHX 00Z, 20161001-20170109



Black: T574L64, GEFS operational control

Red: C384, non-hydro

Green: C384, hydro

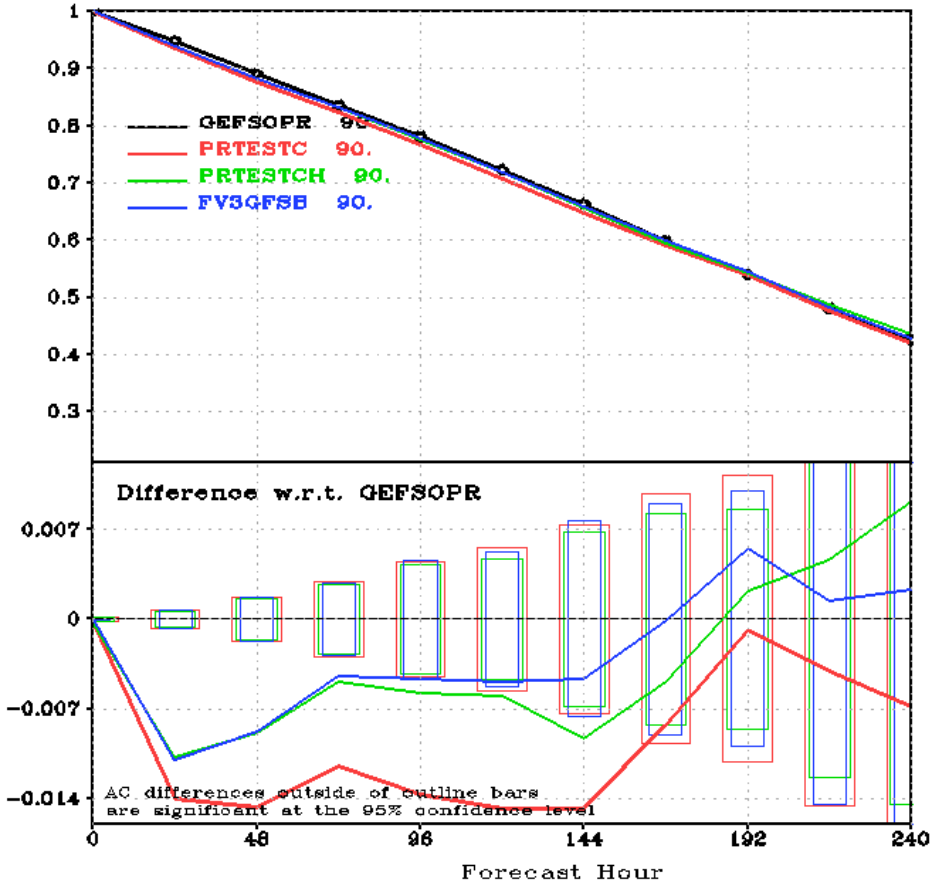
Blue: C768, non-hydro

Tropical vector wind AC

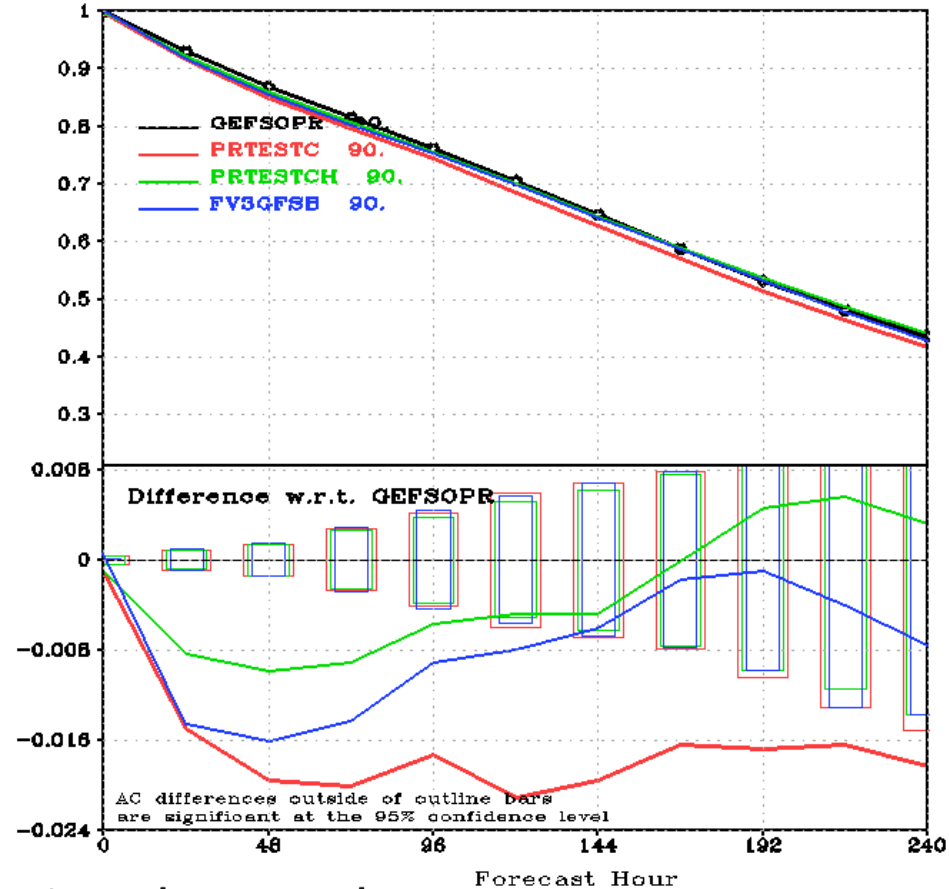
250 hPa

850 hPa

AC: WIND P250 G2/TRO 00Z, 20161001-20170109



AC: WIND P850 G2/TRO 00Z, 20161001-20170109



Black: T574L64, GEFS operational control

Red: C384, non-hydro

Green: C384, hydro

Blue: C768, non-hydro

Conclusions

- EXP “C” and “E” have best scores from others.
 - Exp C: $cdmbgwd=1.0,1.2$
 - EXP E: $cdmbgwd=0.8,1.5$
- Hydrostatic is better than non-hydrostatic for C384
- C384 has better low and middle cloud cover than C768
- FV3GFS C384 with the hydrostatic option and tuned $cdmbgvd$ is comparable with C768 and GEFsv11
- Degradation of tropical wind forecast at the first week in FV3GFS

Future plans

- Use new FV3GFS version
- Use C384 and C192 parameter settings provided by GFDL
- Test C192 for the GEFS second segment forecast
- Test FV3 NEMS version when ready

(Will the parameter tuning based on FV3GFS be valid?)