Next Global Ensemble Forecast System

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Acknowledgements:
Jiayi Peng, Malaquias Pena, Yucheng Song, Yan Lou and Jun Du

Ensemble Team

http://wwwt.emc.ncep.noaa.gov/gmb/yzhu/html/imp/201109_imp.html

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- Next GEFS configuration
- GFS version 9.01
- Initialization
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Proposal Changes

- Model and initialization
  - Using GFS V9.01 instead of GFS V8.00
  - Improved Ensemble Transform with Rescaling (ETR) initialization
  - Improved Stochastic Total Tendency Perturbation (STTP)
- Configurations
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  - T190 (70km horizontal resolution for 192-384 hours (same as current opr)
  - L42 vertical levels for 0-384 hours (from L28)
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- Unchanged:
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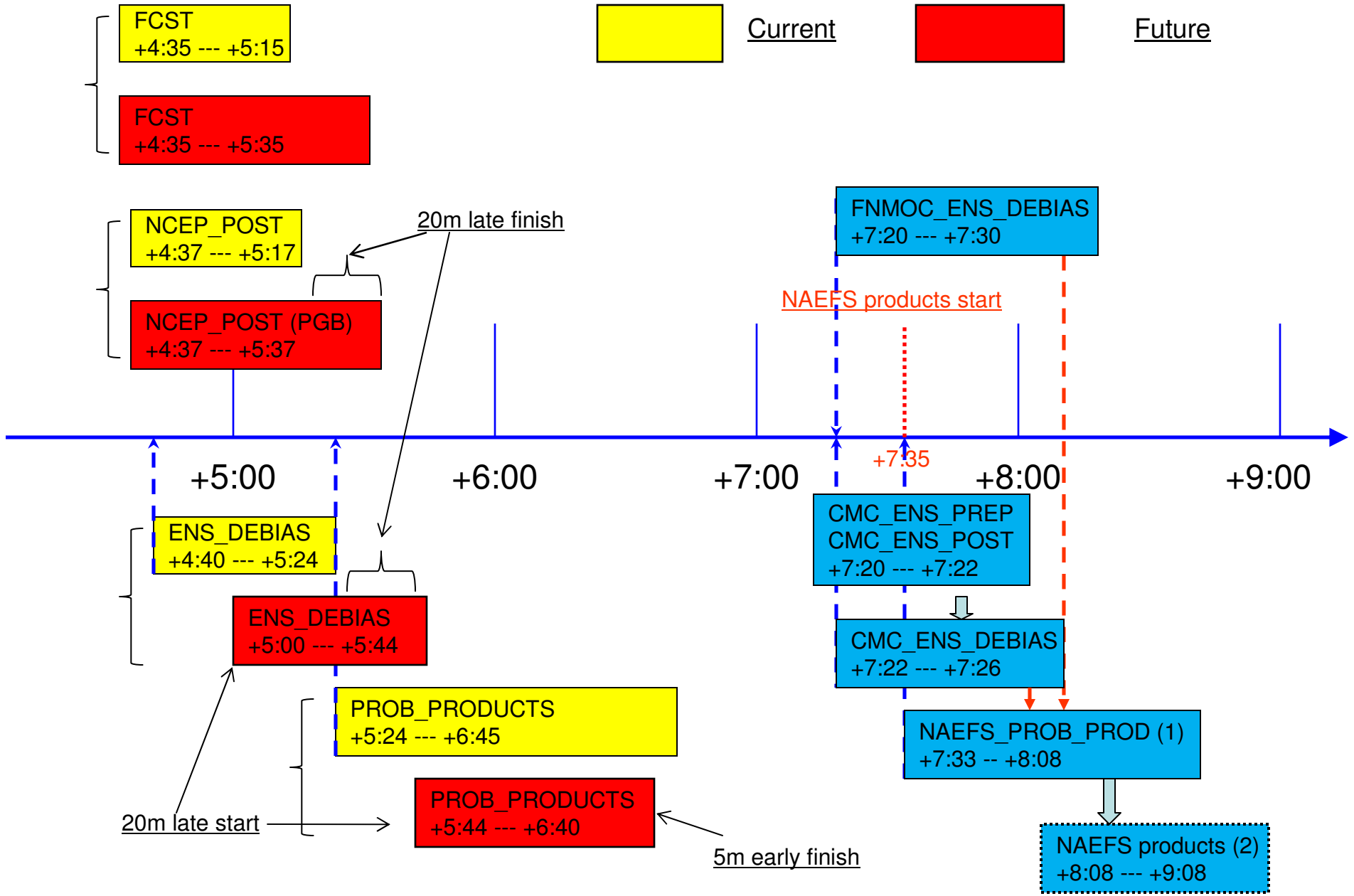
  - pgrb file output at 1*1 degree every 6 hours
  - GEFS and NAEFS post process output data format
- Why do we make this configurations?
  - Considering the limited resources
  - Resolution makes difference (example of T126 .vs T190)
- What do we expect from this implementation?
  - Preliminary results (NH 500hPa and SH 500hPa height and tracks)

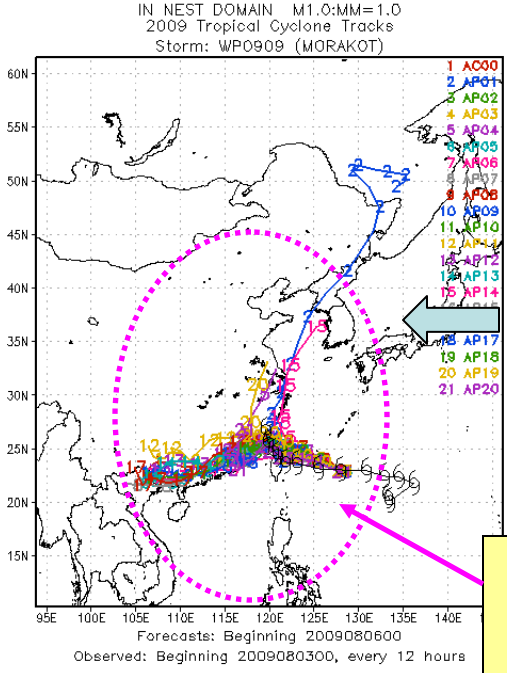
GSI/GFS Changes (Fall 2010)

- **Assimilation Changes**
  - Assimilate tropical storm pseudo sea-level pressure obs
  - GPSRO changes - improved QC, re-tuned obs errors.
  - Give more weight to profile data in upper troposphere / lower stratosphere
  - Change evaporation efficiency parameter in SASCNV forward model to be consistent with current global_fcst model
  - Extend satinfo to include N19 hirs/4, amsua, mhs (no N19 assimilation)
  - Extend ozinfo and update code to recognize and read in N19 sbuv/2, GOME, and OMI ozone (no assimilation)
  - Ability to process RARS (currently only EARS) 1b data
  - Extensions to allow global_gsi to run from T878L91 spectral coefficient files
  - Code optimization
- **Model Changes:**
  - Restructure the Global Model code
  - Code unification between GFS & GEFS
  - Consolidate Global Post codes used in GFS & GDAS
  - Upgrade to ESMF 3.1.02rp
  - Modify low cloud definition
  - Output additional parameters for TIGGE & ICAO
  - Introduce more accurate algorithm for several diagnostic variables



GEFS/NAEFS 6-hr window flow chart

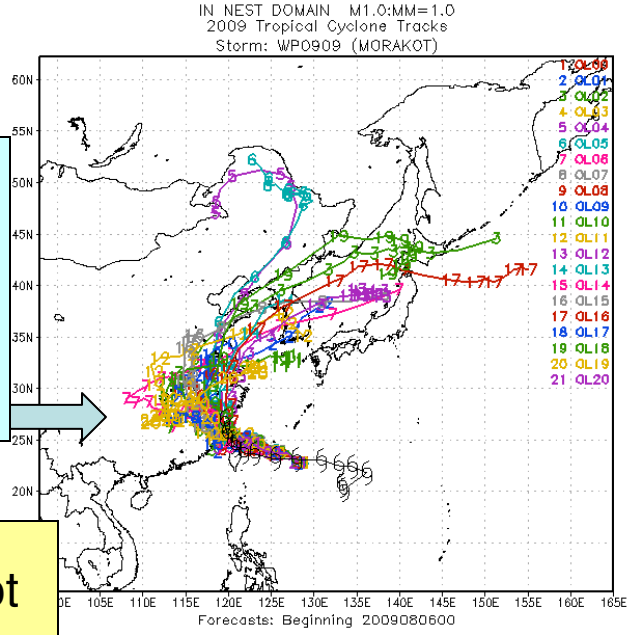
Resolution makes difference for Typhoon Morakot



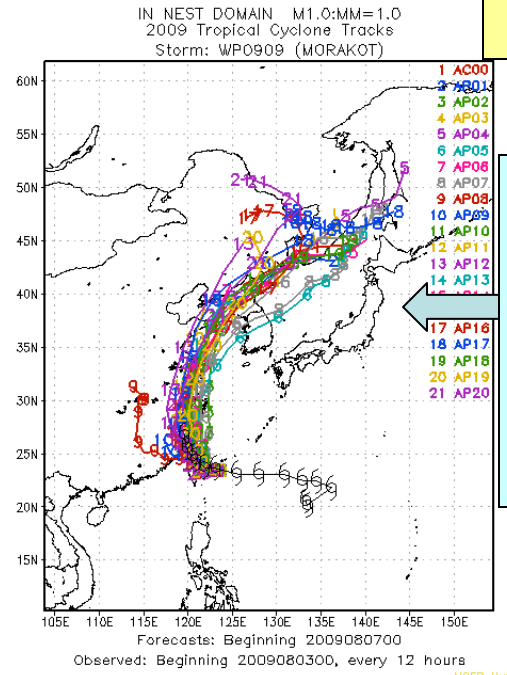
Ini: 2009080600

T126 ensemble

T190 ensemble



Most models do not make right forecasts



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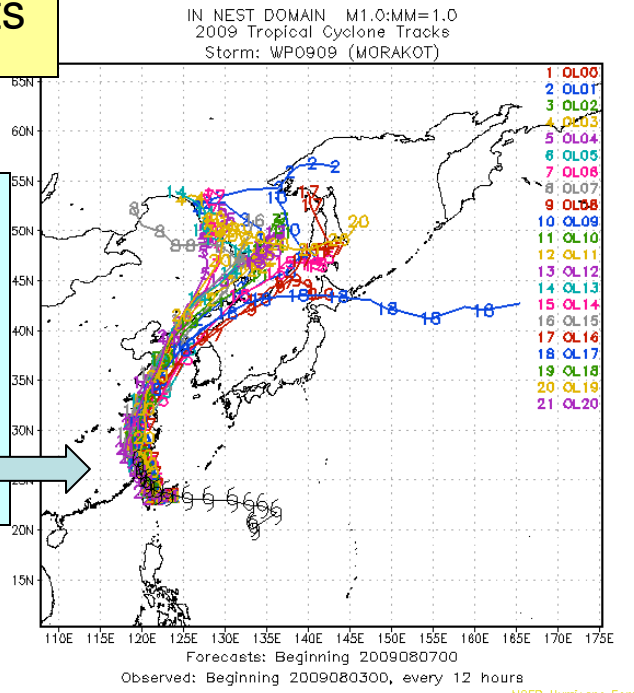
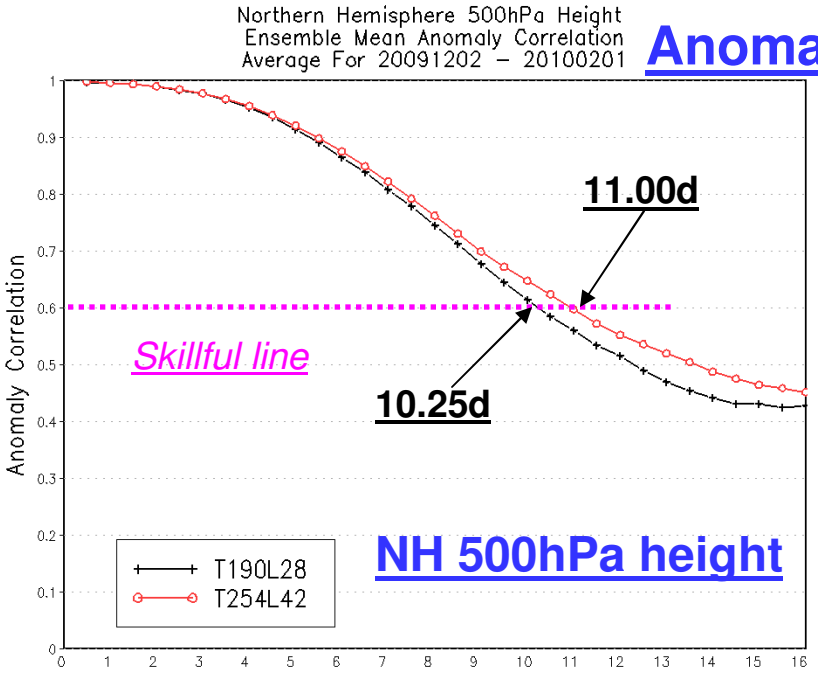
T126 ensemble

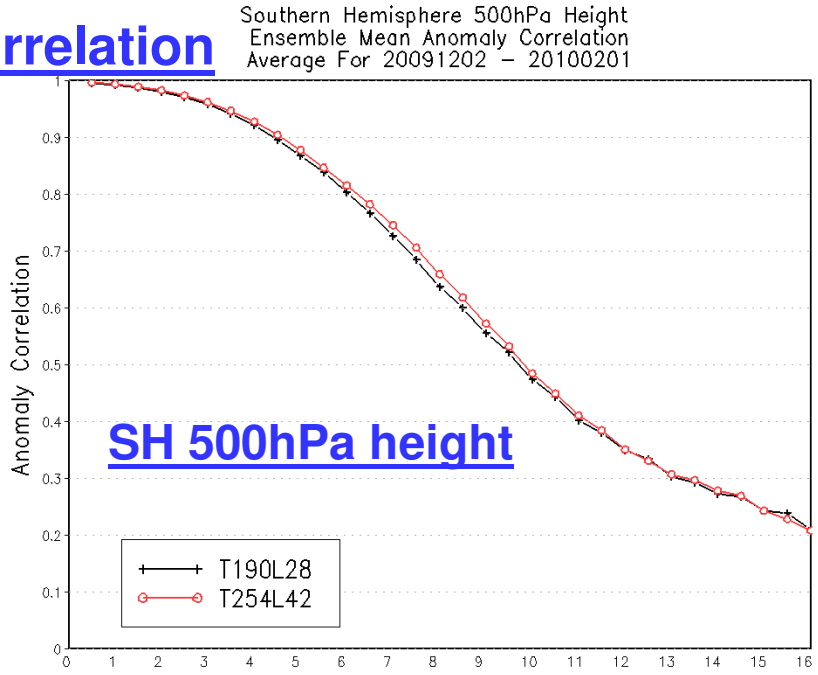
T190 ensemble



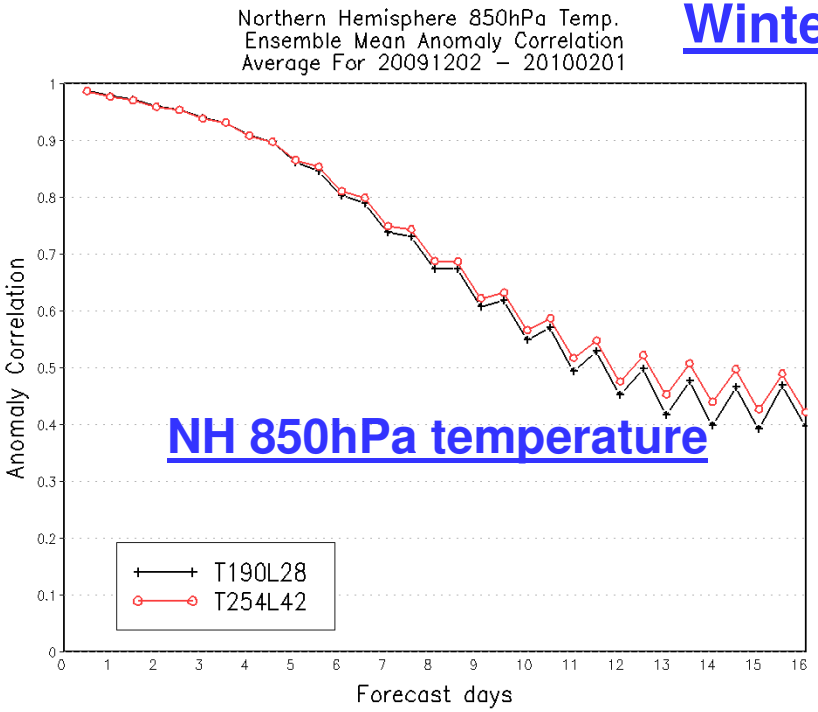
NCEP Hurricane Forecast Project

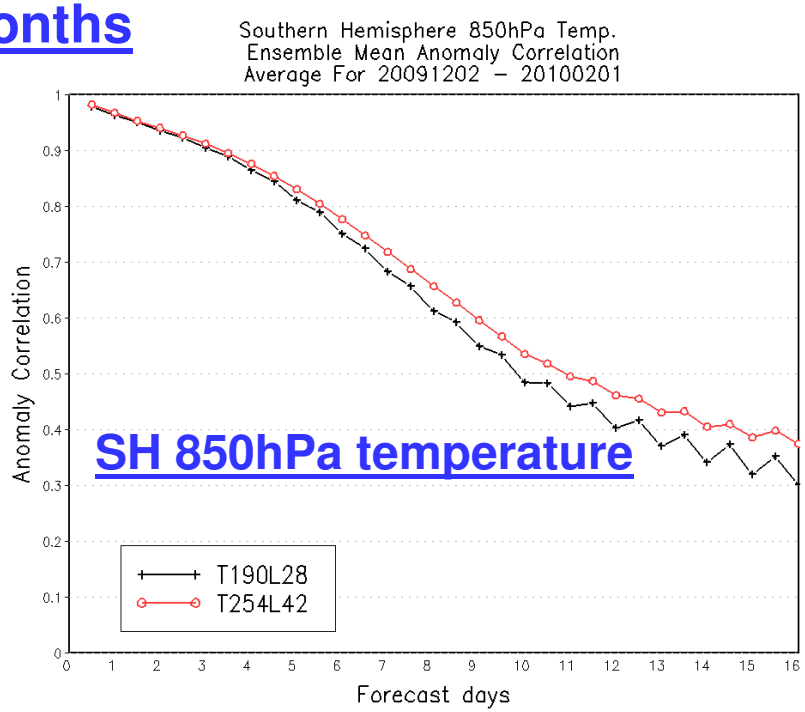
Anomaly Correlation



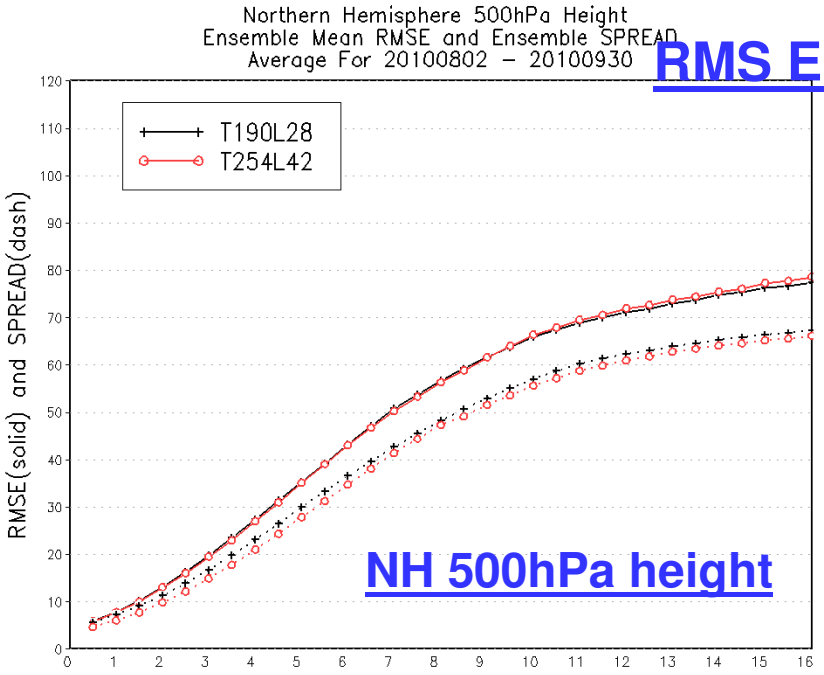


Winter 2 months

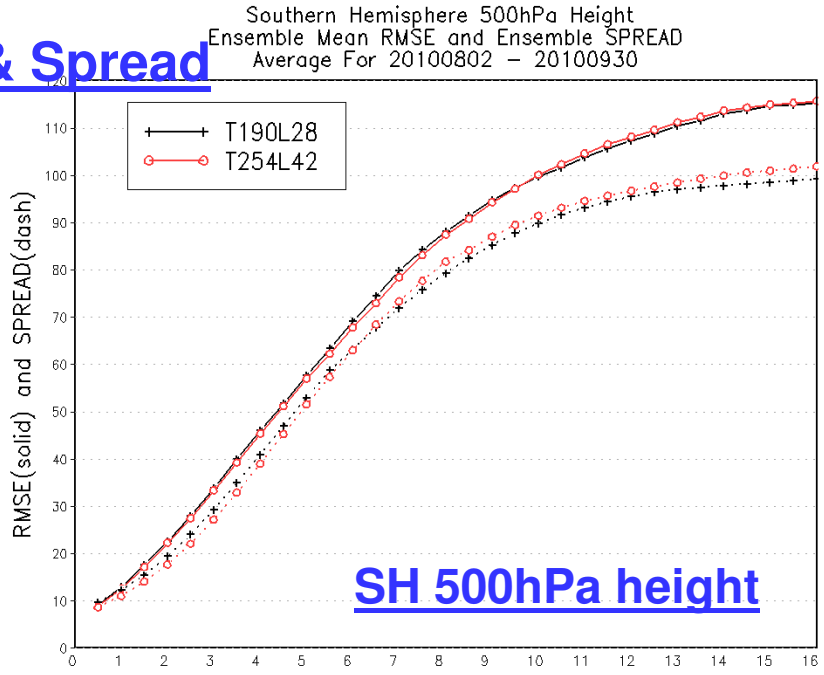




RMS Error & Spread

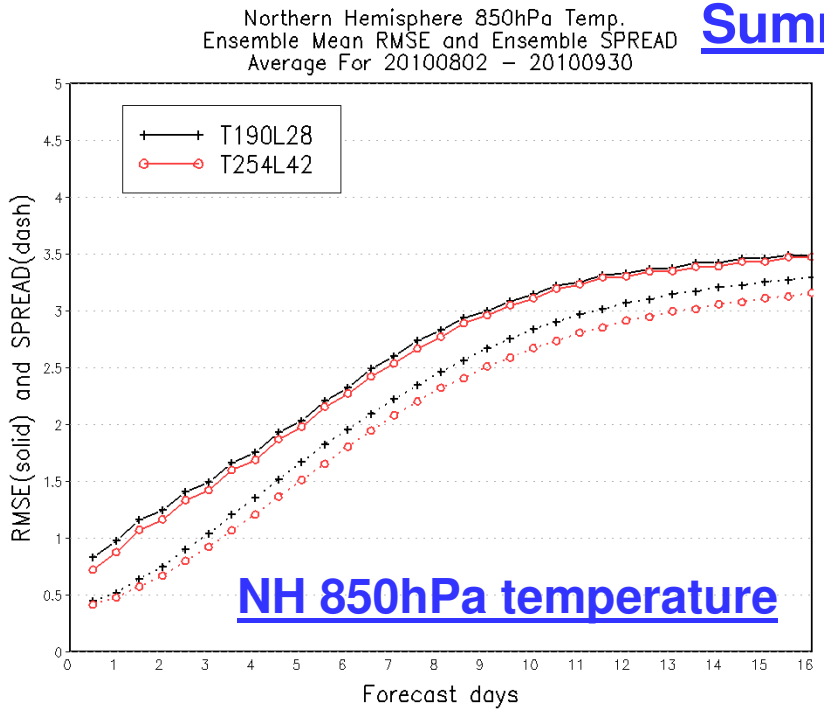


NH 500hPa height

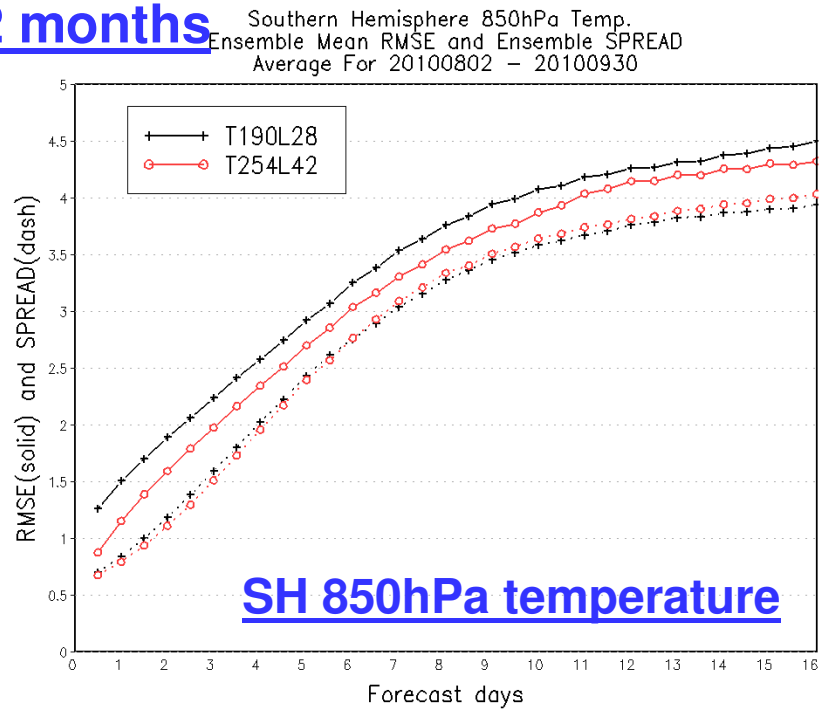


SH 500hPa height

Summer 2 months

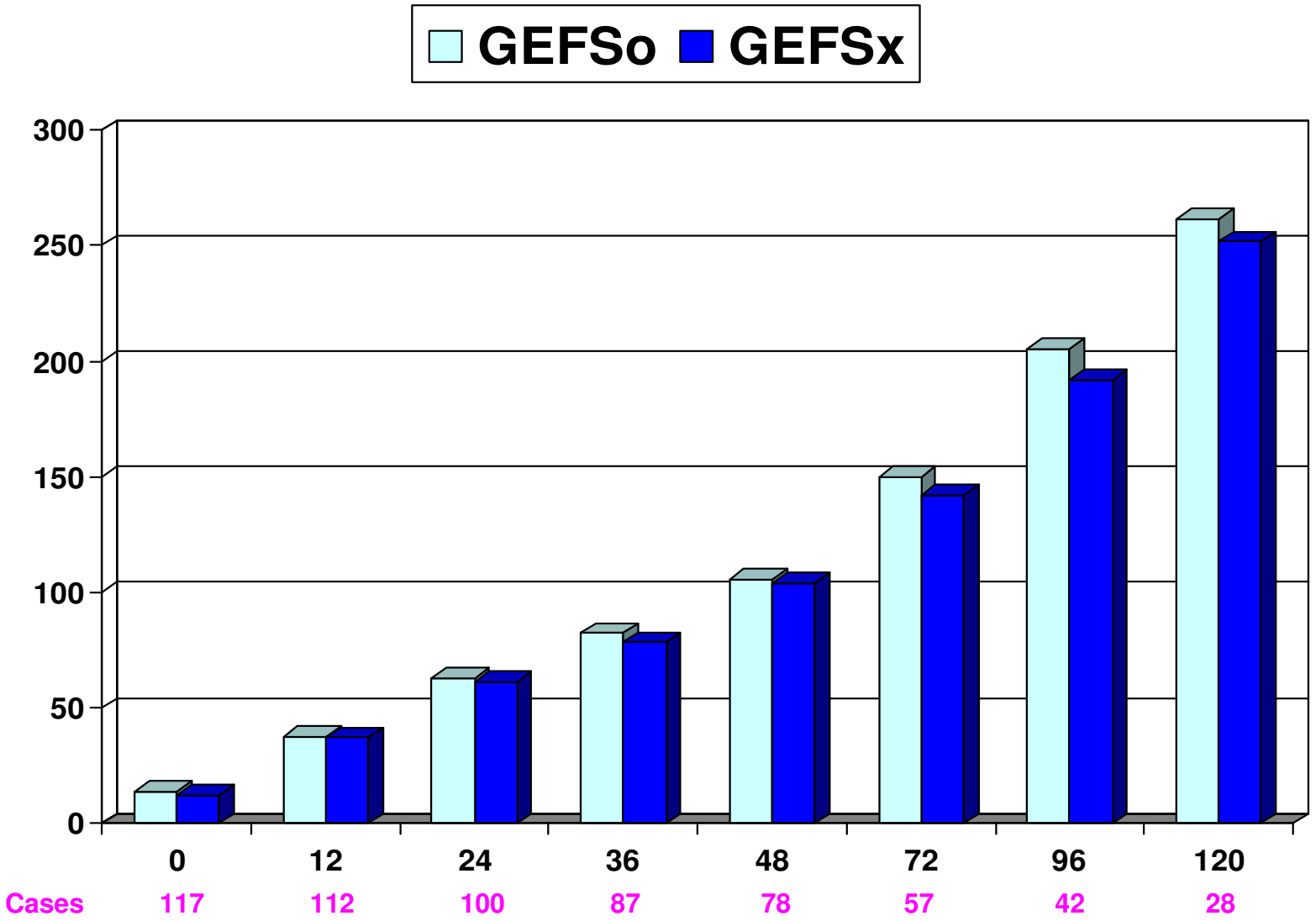


NH 850hPa temperature



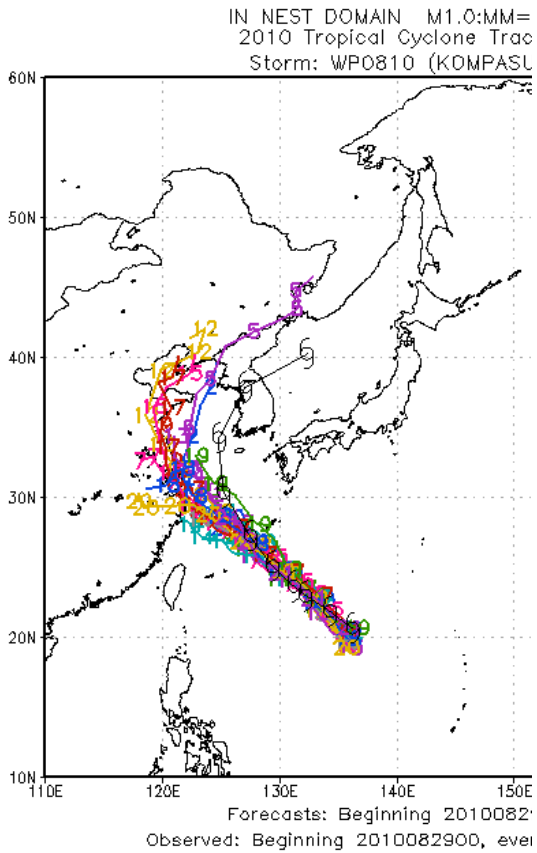
SH 850hPa temperature

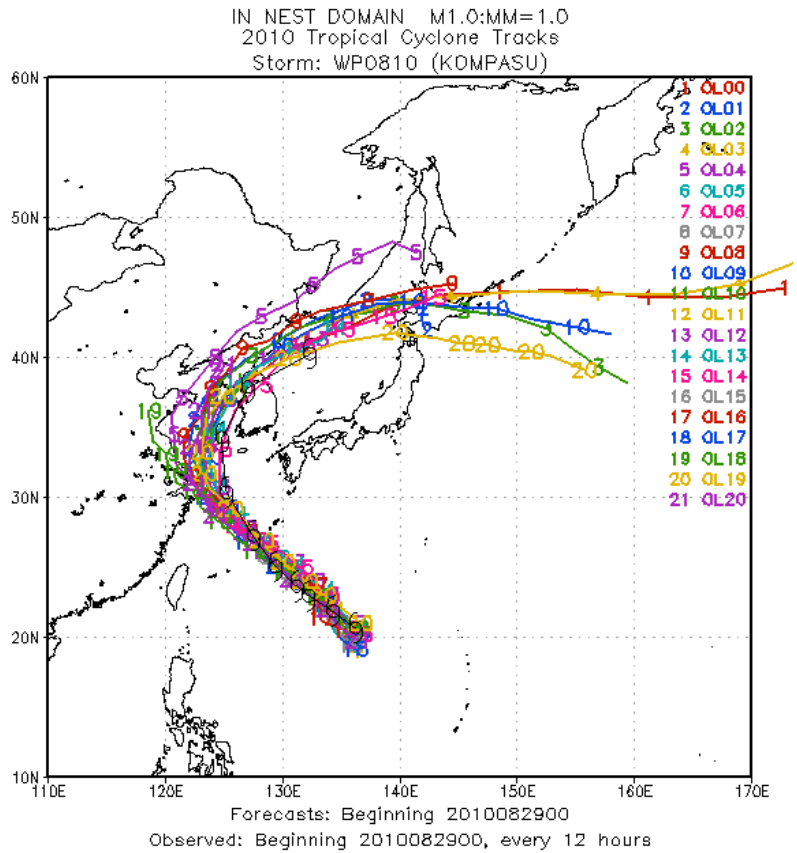
Track forecast error for 2010 season (AL+EP+WP)



Period: 08/02 – 09/25/2010

Contributed by Dr. Jiayi Peng (EMC/NCEP)





Ensemble track forecast for hurricane Kompasu

Left: Current GEFS operation

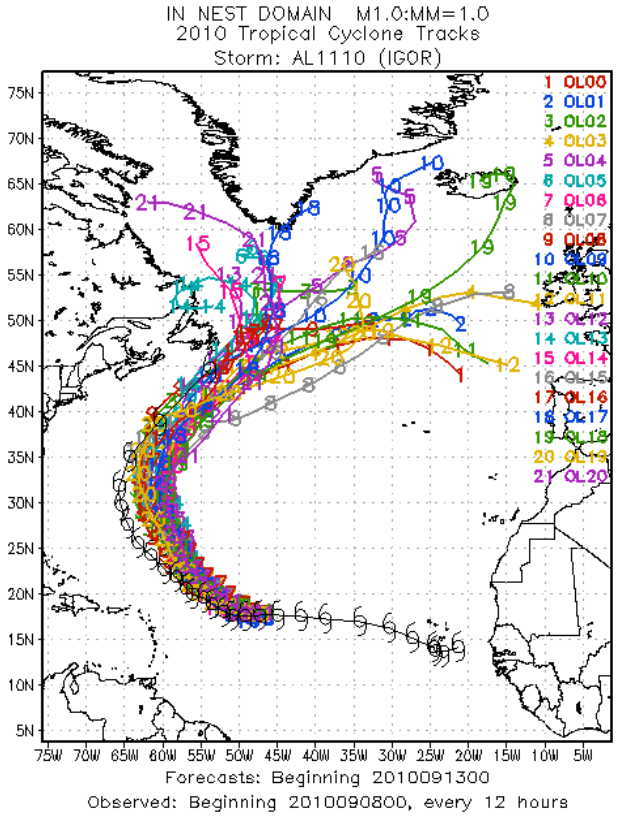
T190L28 (GFS V8.0)

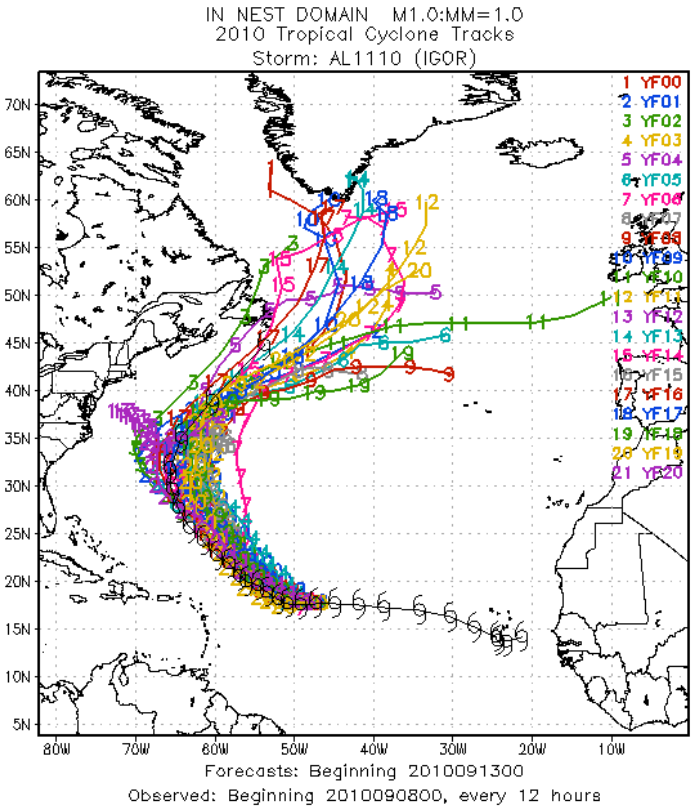
Right: Future GEFS

T254L42 (0-192 hours)

T190L42 (192-384 hours)

GFS V9.0





Ensemble track forecast for hurricane IGOR

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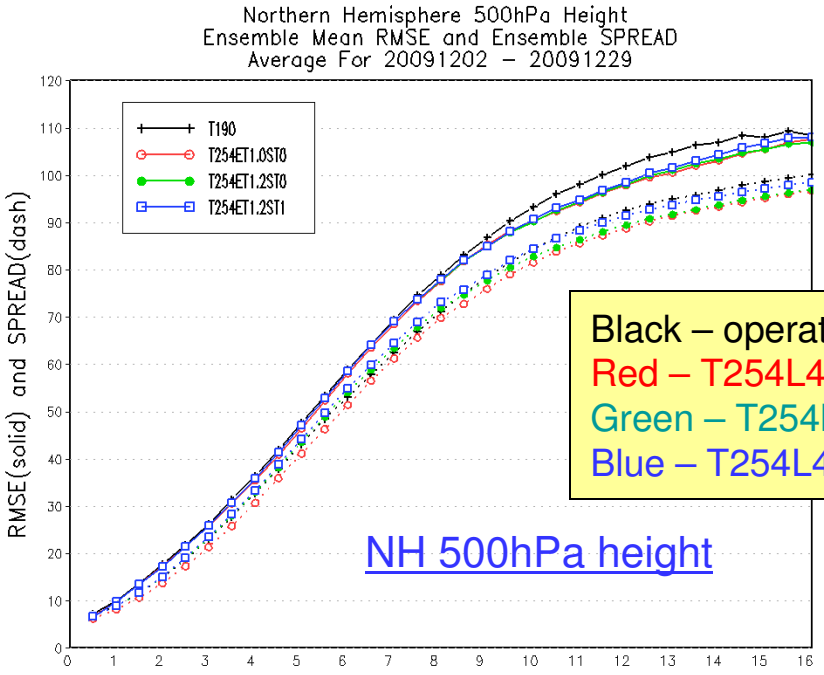
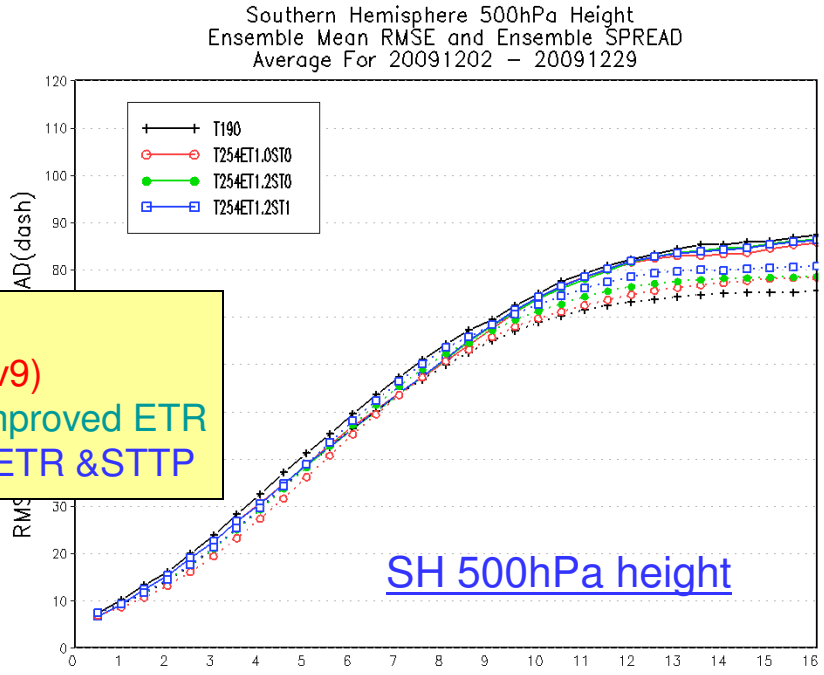
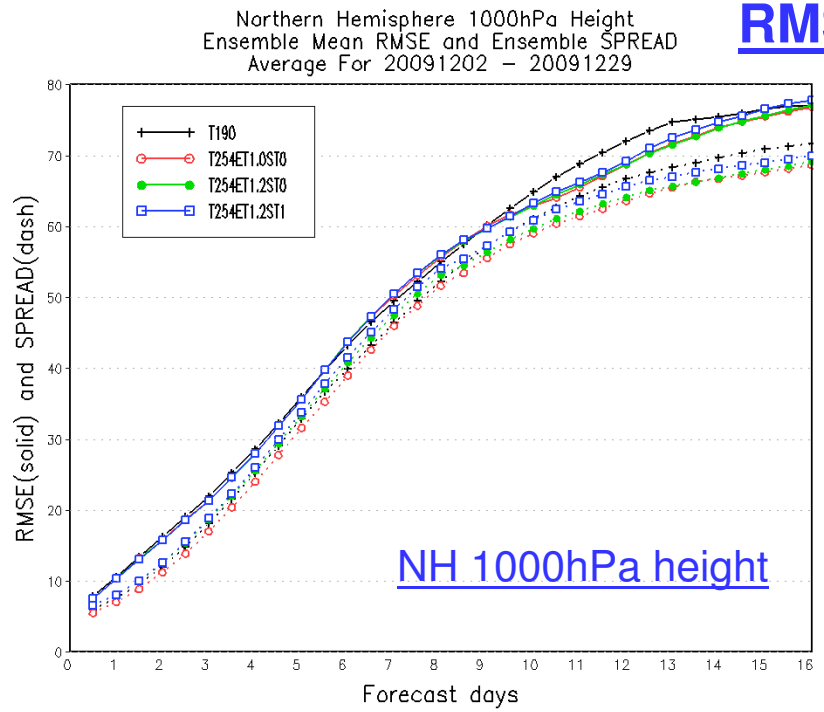
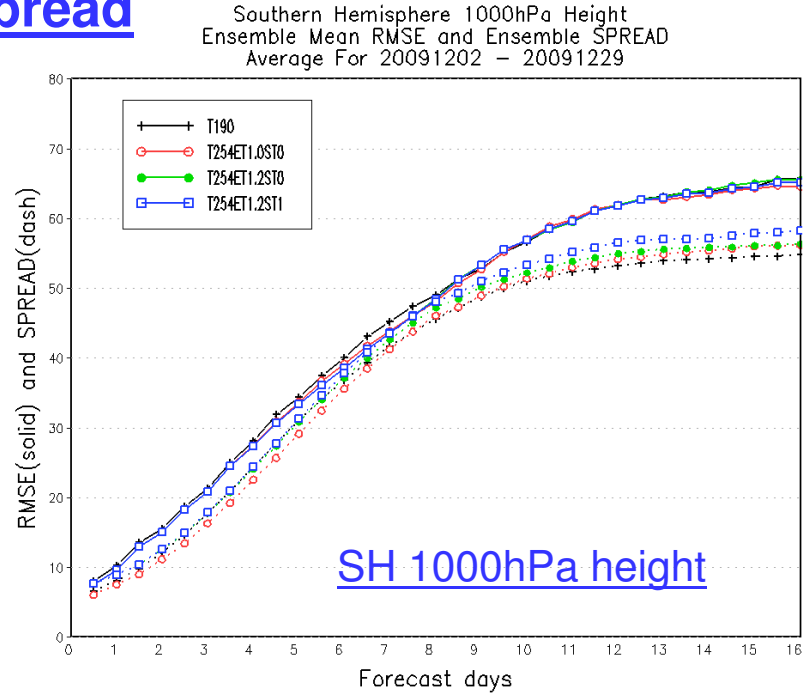
RMS & Spread

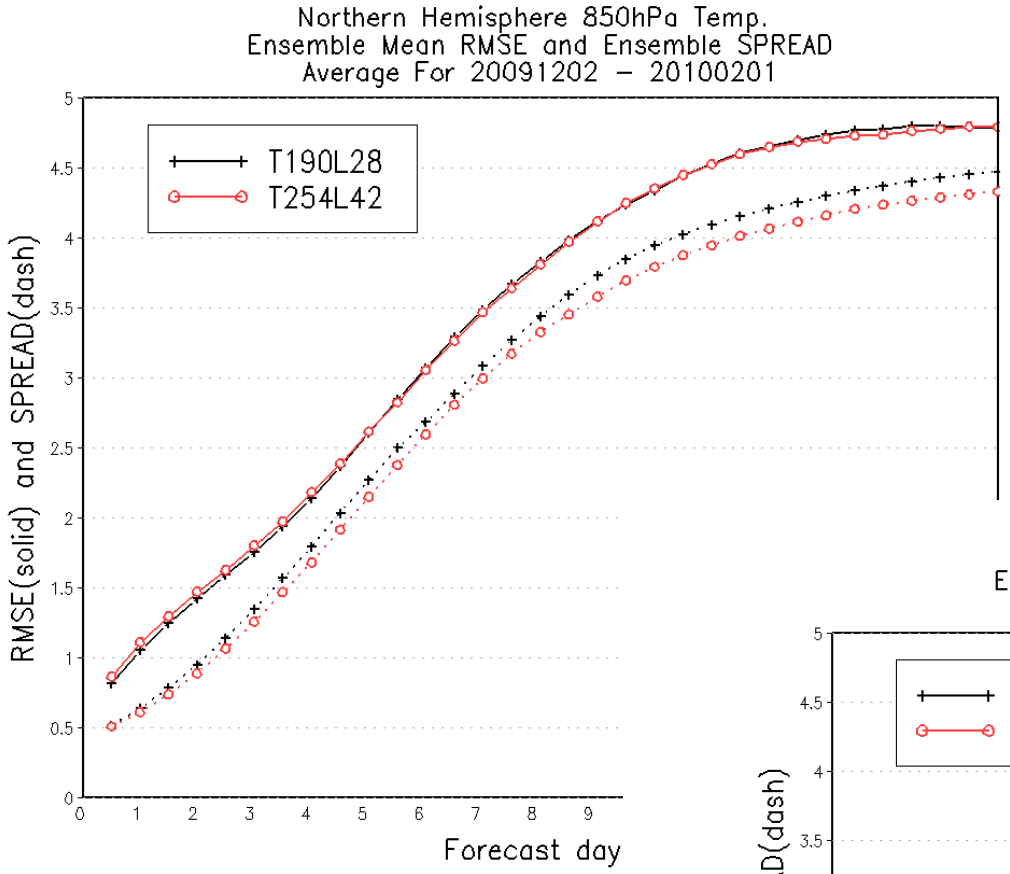




Black – operation
Red – T254L42 (GFSv9)
Green – T254L42 + improved ETR
Blue – T254L42+imp ETR &STTP



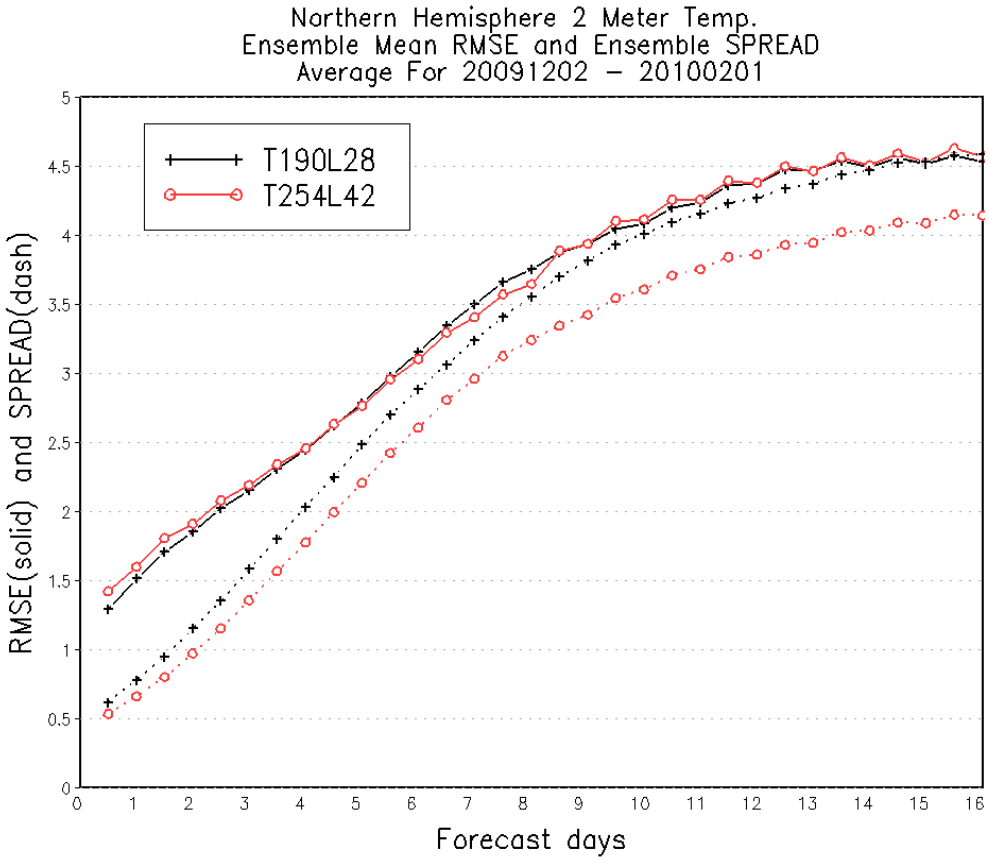




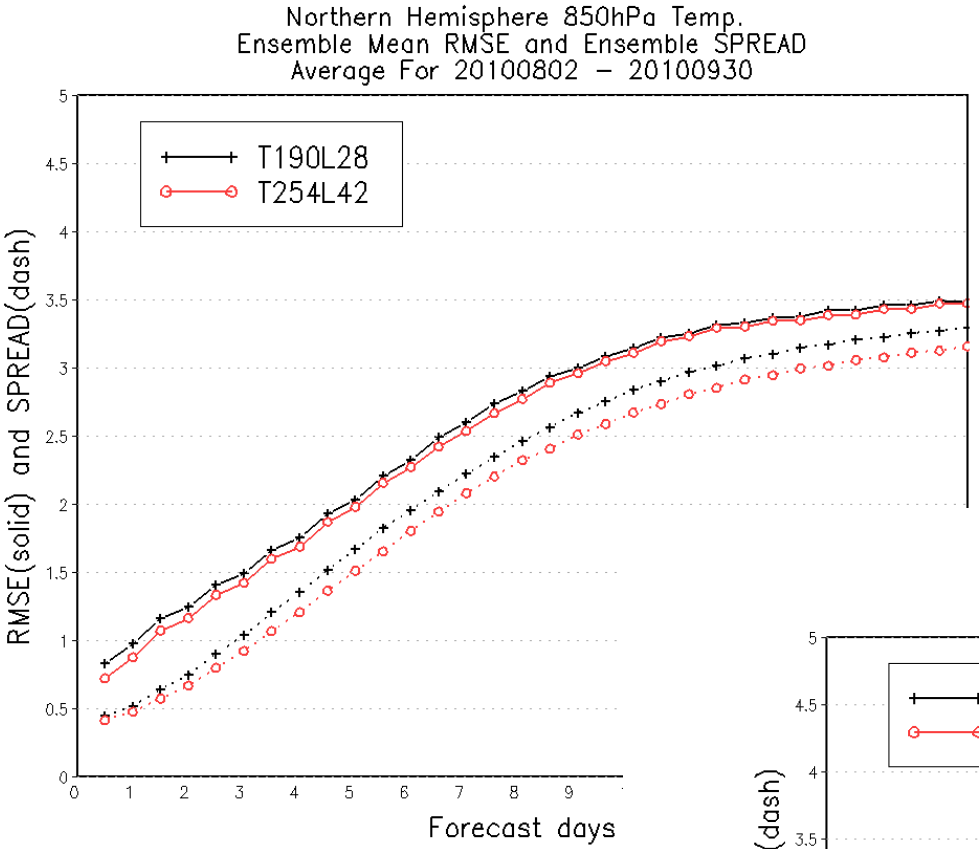
2009-2010 winter 2 months

T190L28 – similar to current GEFS set up. But GFS analysis and forecast are matched (V8.0)

T254L42 – GFS analysis and forecast are matched (V9.0)

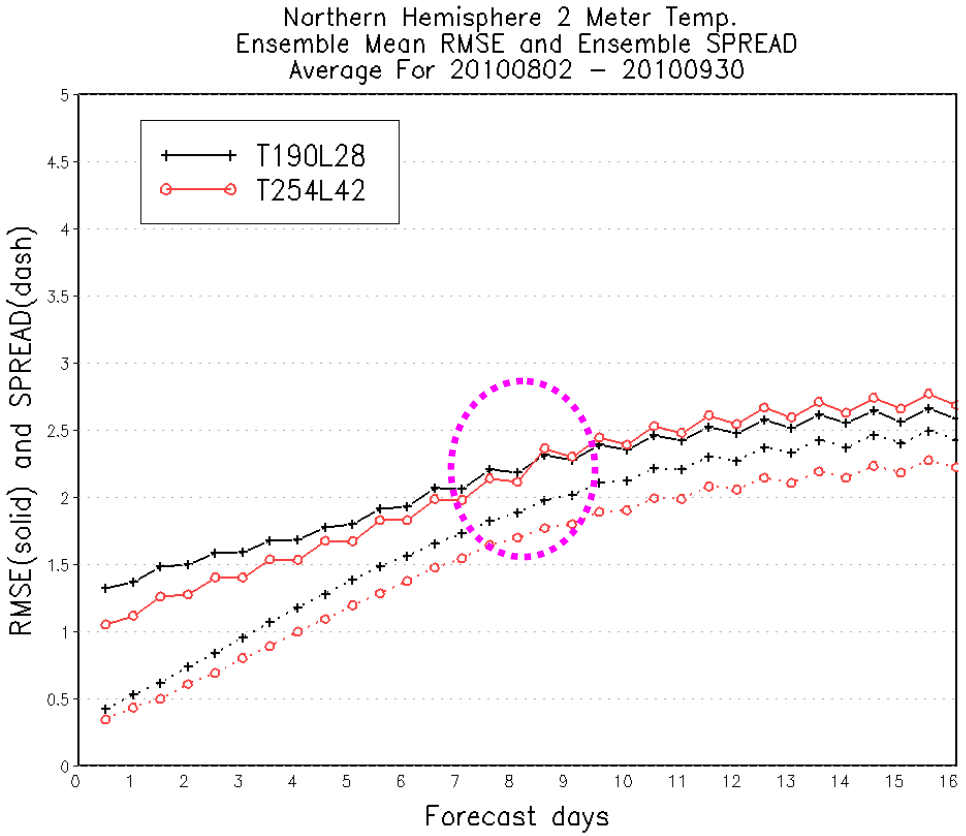


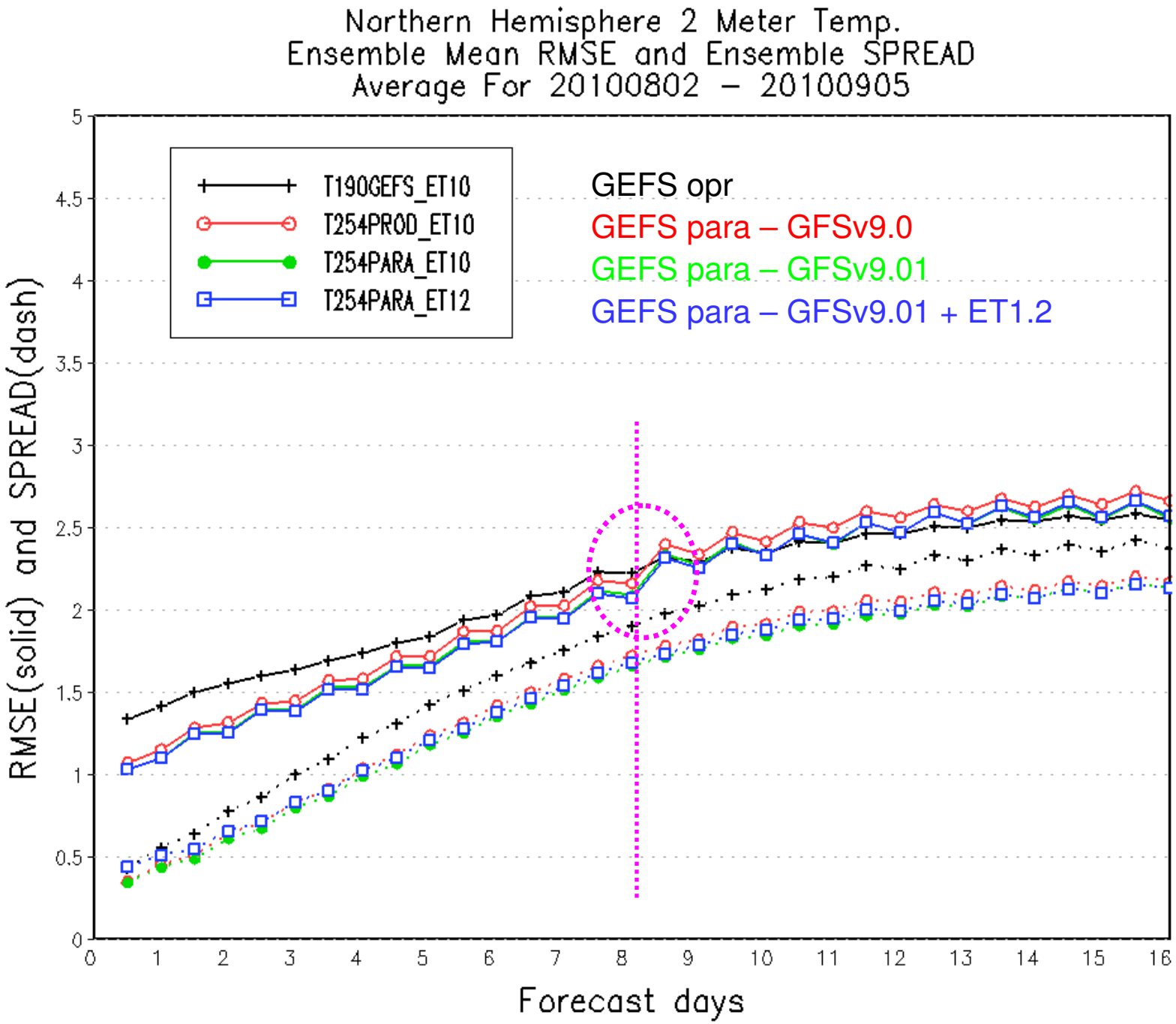
2010 Summer 2 months

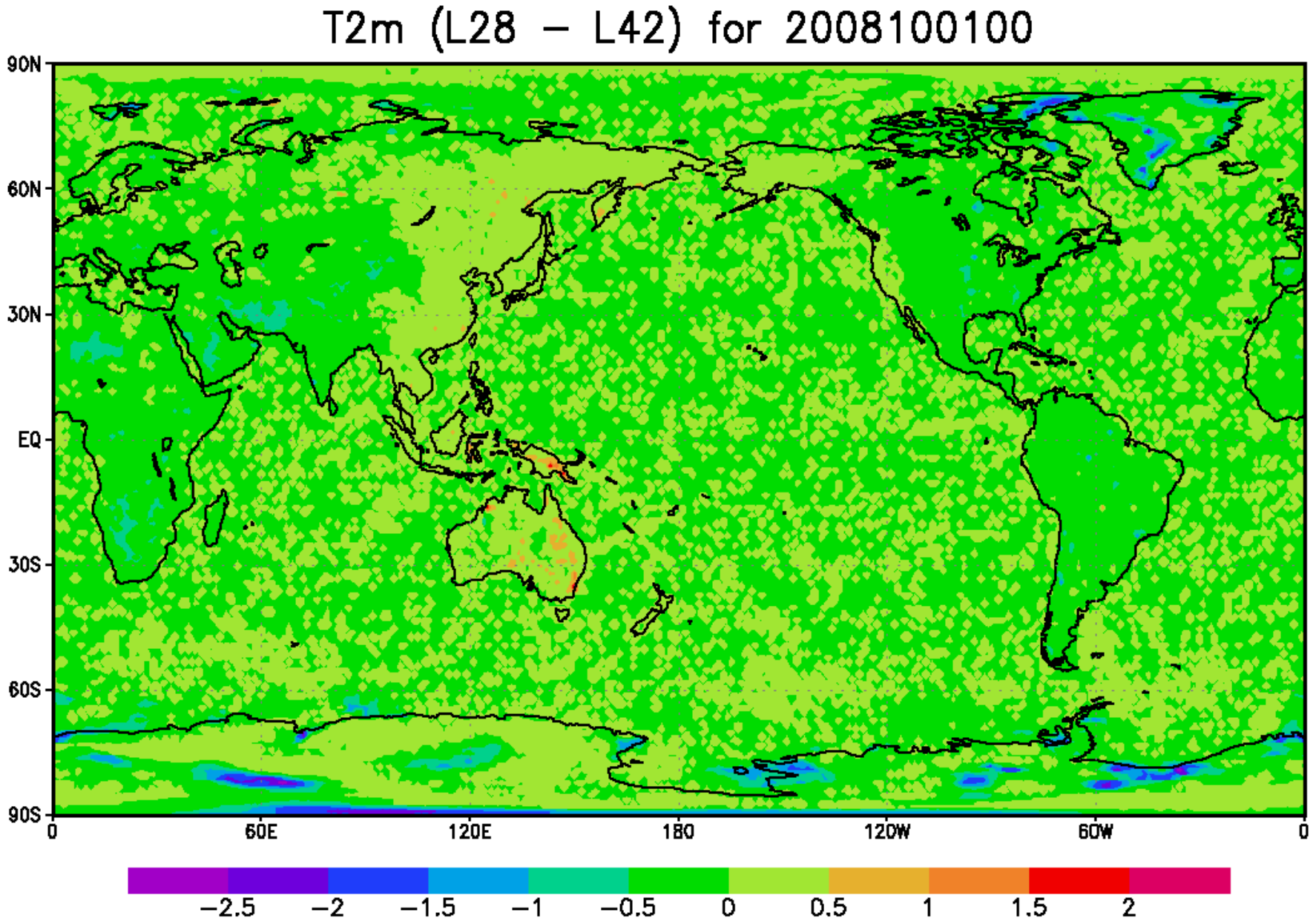


T190L28 – Current GEFS set up. But GFS analysis (V9.0) and forecast (V8.0) are not matched.

T254L42 – GFS analysis and forecast are matched (V9.0)




Northern Hemisphere 2 Meter Temp.
Ensemble Mean RMSE and Ensemble SPREAD
Average For 20100802 – 20100905
T190GEFS_ET10
T254PROD_ET10
T254PARA_ET10
T254PARA_ET12
GEFS opr
GEFS para – GFSv9.0
GEFS para – GFSv9.01
GEFS para – GFSv9.01 + ET1.2
RMSE(solid) and SPREAD(dash)
Forecast days
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16


T2m (L28 – L42) for 2008100100
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2