Exploring the Practical Limits of Surface Perturbation Magnitudes

HIWPP Task 3.1.1 Update

Gary Bates

March 2016

Stochastic physics perturbations

- SPPT
- SHUM
- SKEB

Surface parameters perturbed

- Roughness length for momentum (z0)
- Roughness length for heat (zt)
- Soil hydraulic conductivity (SHC)
- Leaf area index (LAI)

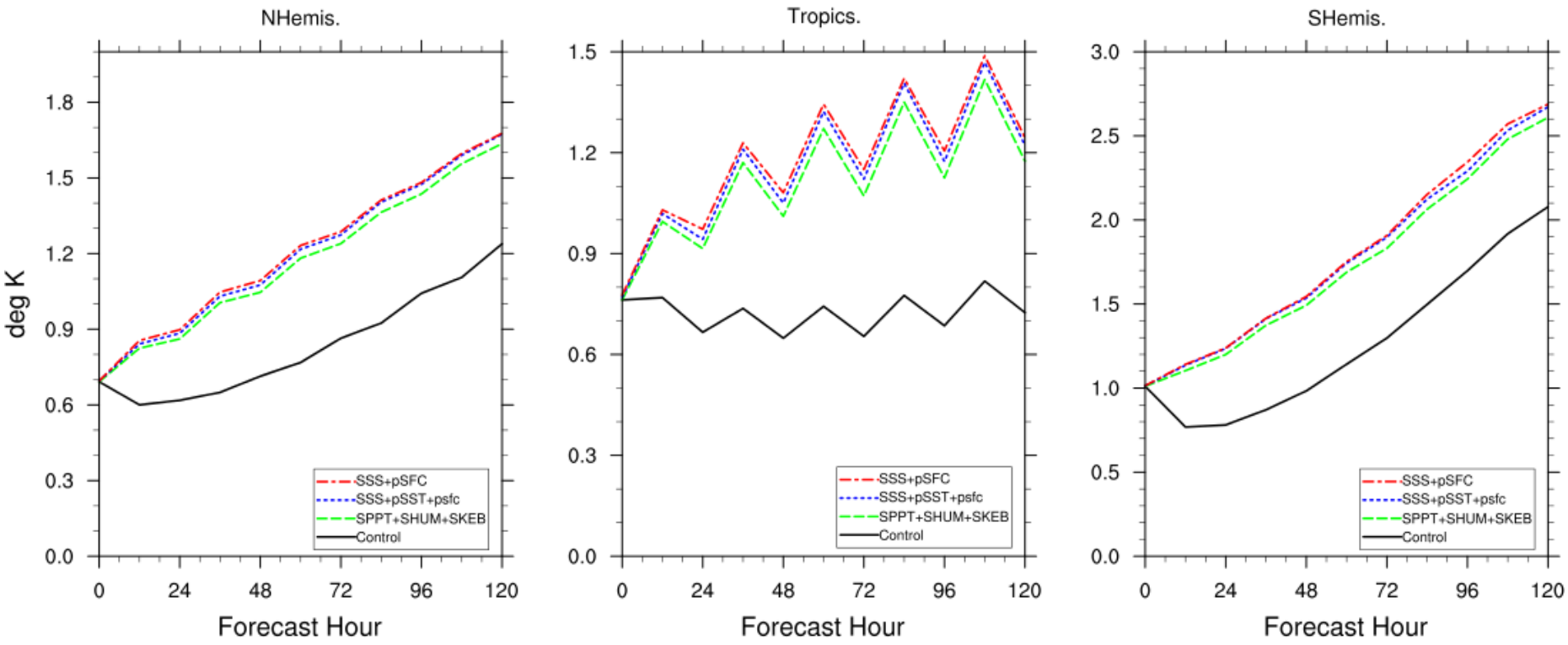
Experimental details

- Comparison of 4 experiments
  - Control (IC atmospheric perts only)
  - SPPT + SHUM + SKEB (SSS)
  - SSS + SST perts + SFC perts (40% of orig values)

    Pert magnitudes: Z0=0.10, ZT=0.06, SHC=0.16, LAI=0.10, SST=0.25K
  - SSS + SFC perts

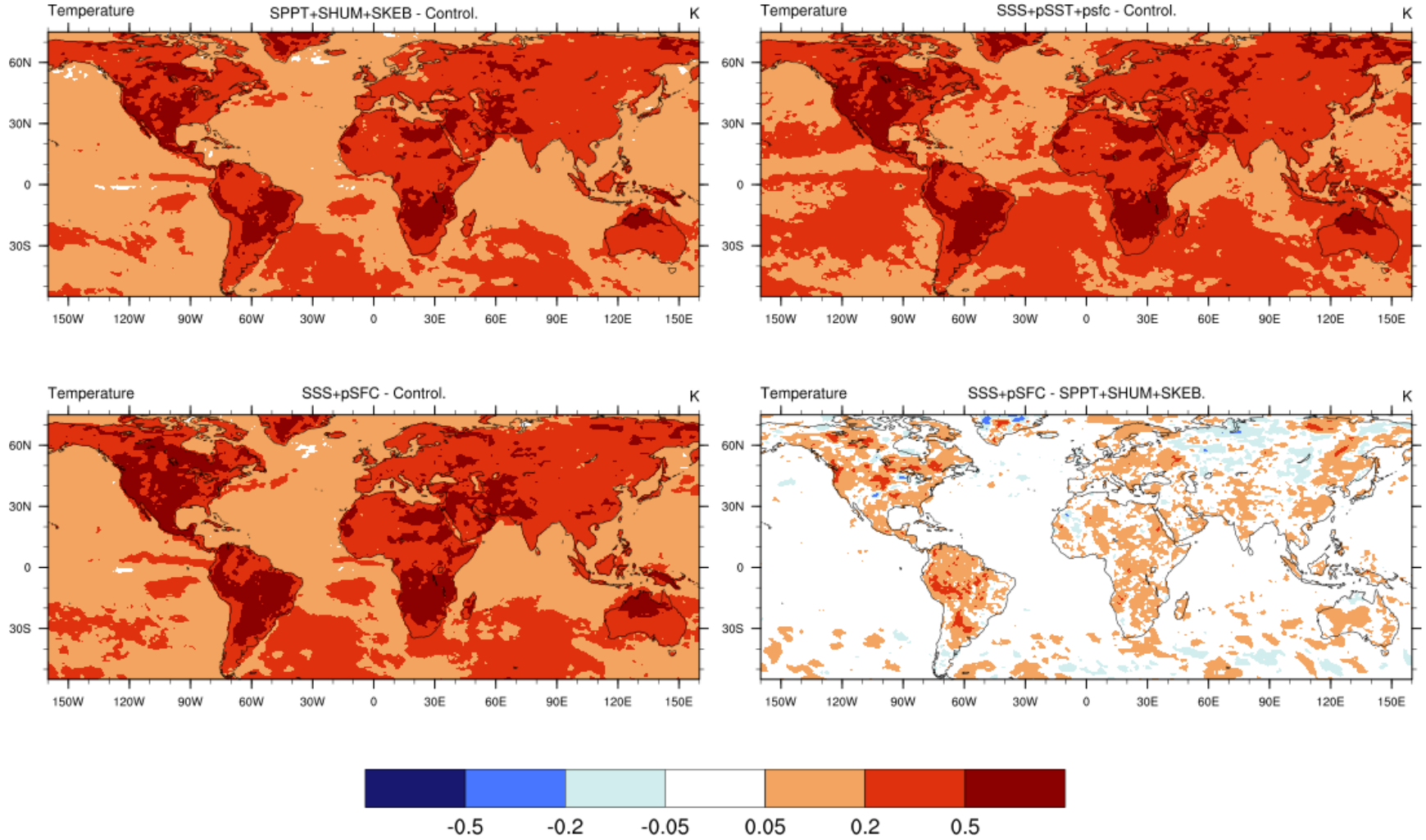
    Pert magnitudes: Z0=0.18, ZT=0.10, SHC=0.40, LAI=0.25 (no SST perts)
- Resolution
  - T574, Semi-Lagrangian
- Number/Length of experiments
  - 5 day forecasts
  - 31 cases, initialized everyday in Aug 2014
- 20 member ensembles

T2m, Spread, Land. 31 Cases, Aug 2014.



T2m, Spread Diff @ 120 hours.

31 Cases, Aug 2014.



T2m, Ensmean Diff @ 120 hours.

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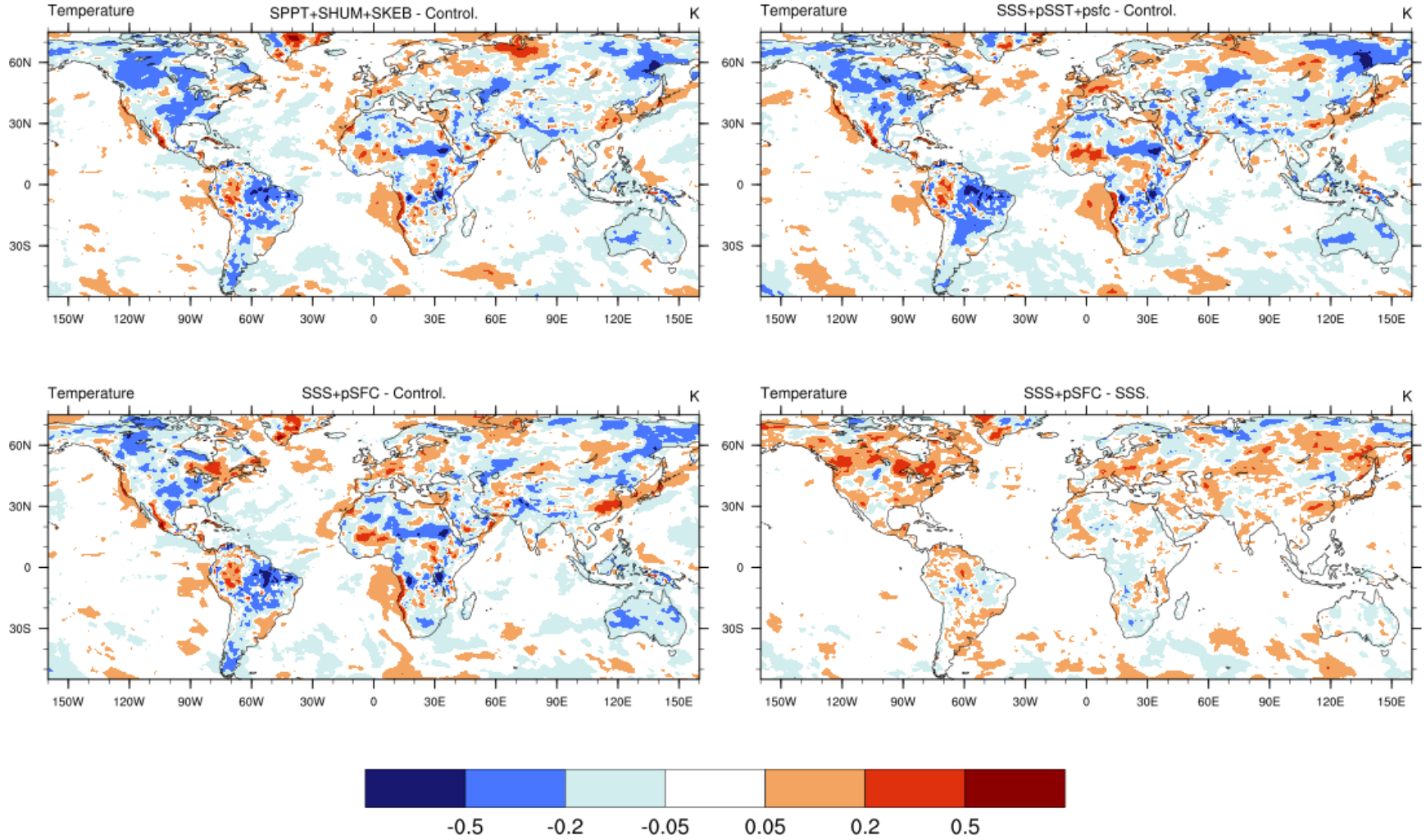
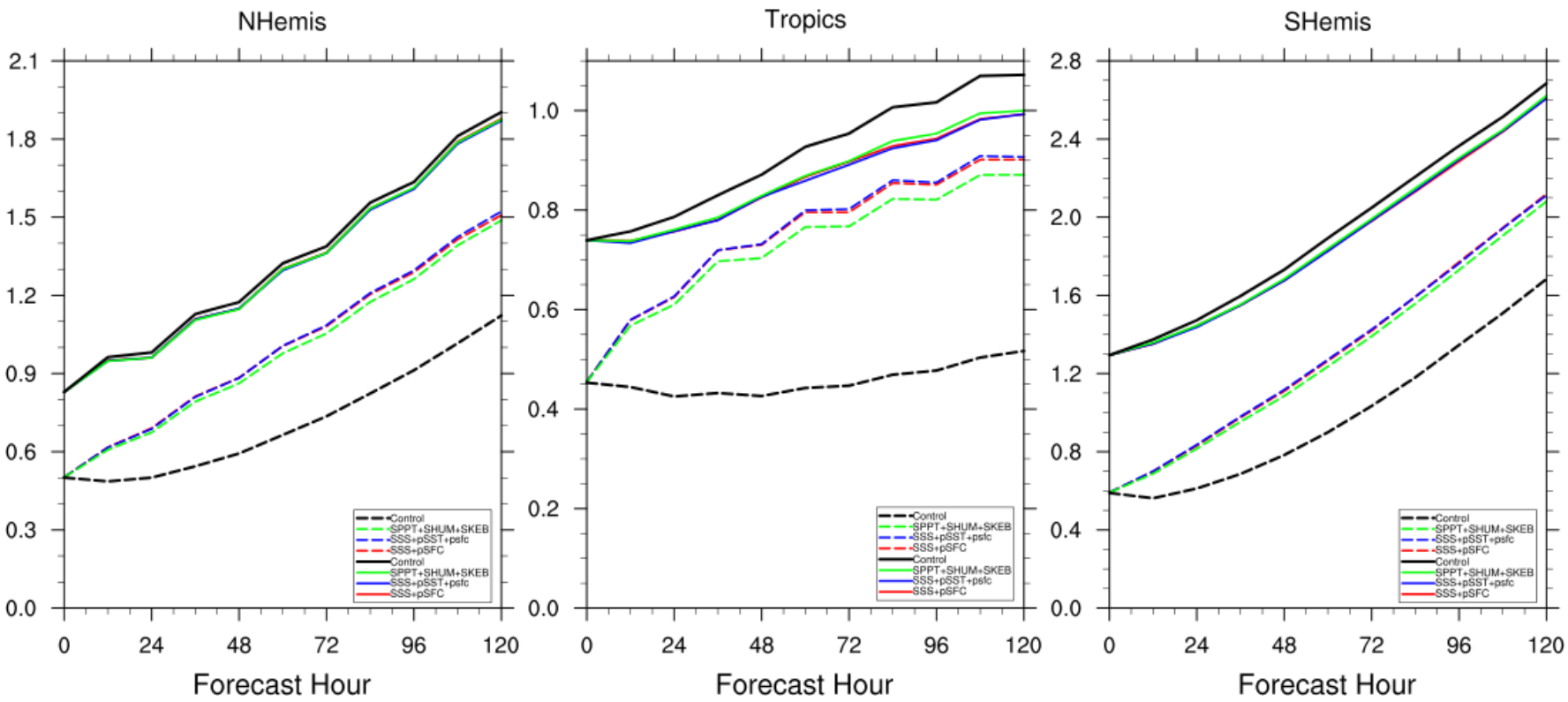


T850, RMSE(solid), Spread(dashed), 31 Cases, Aug 2014.



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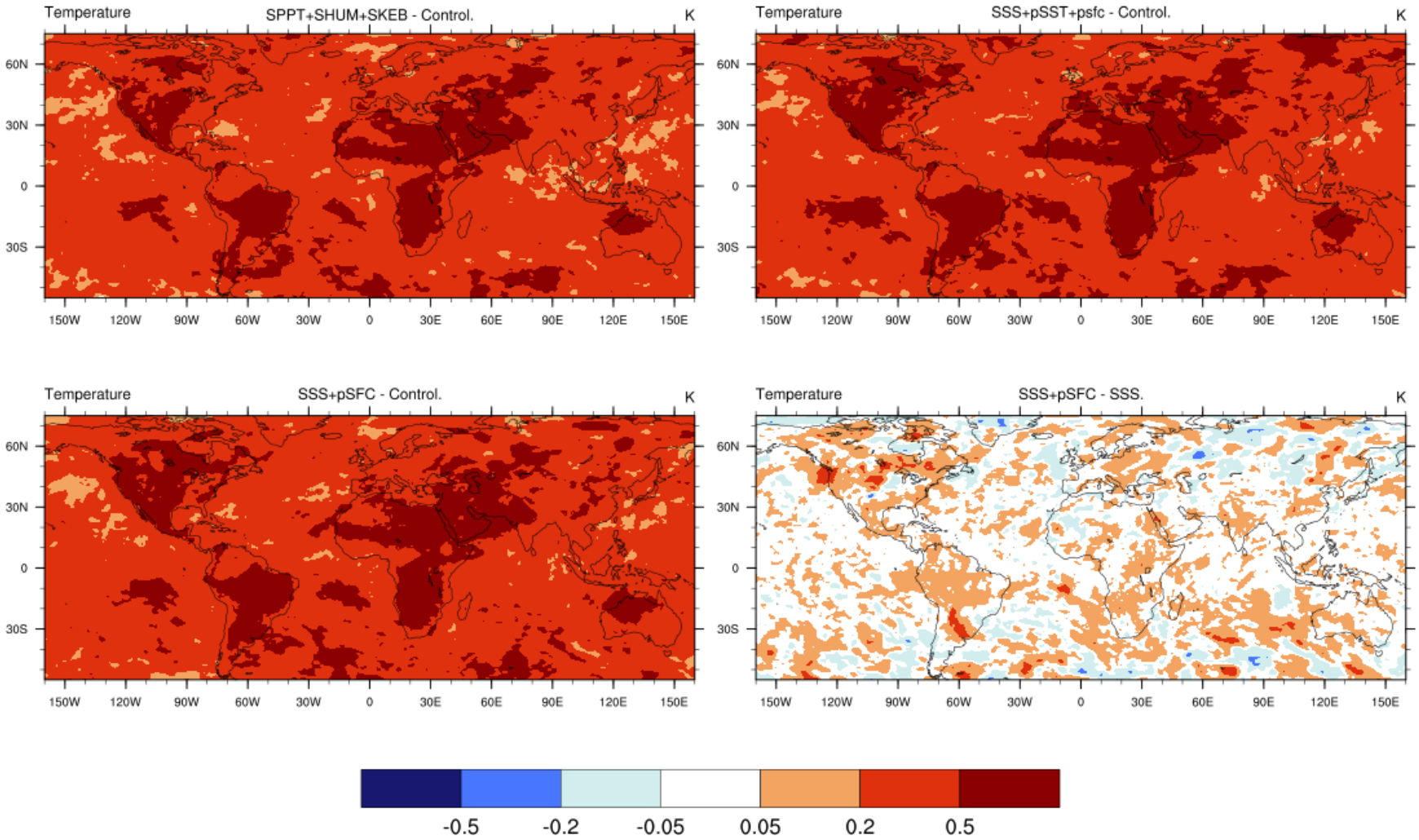
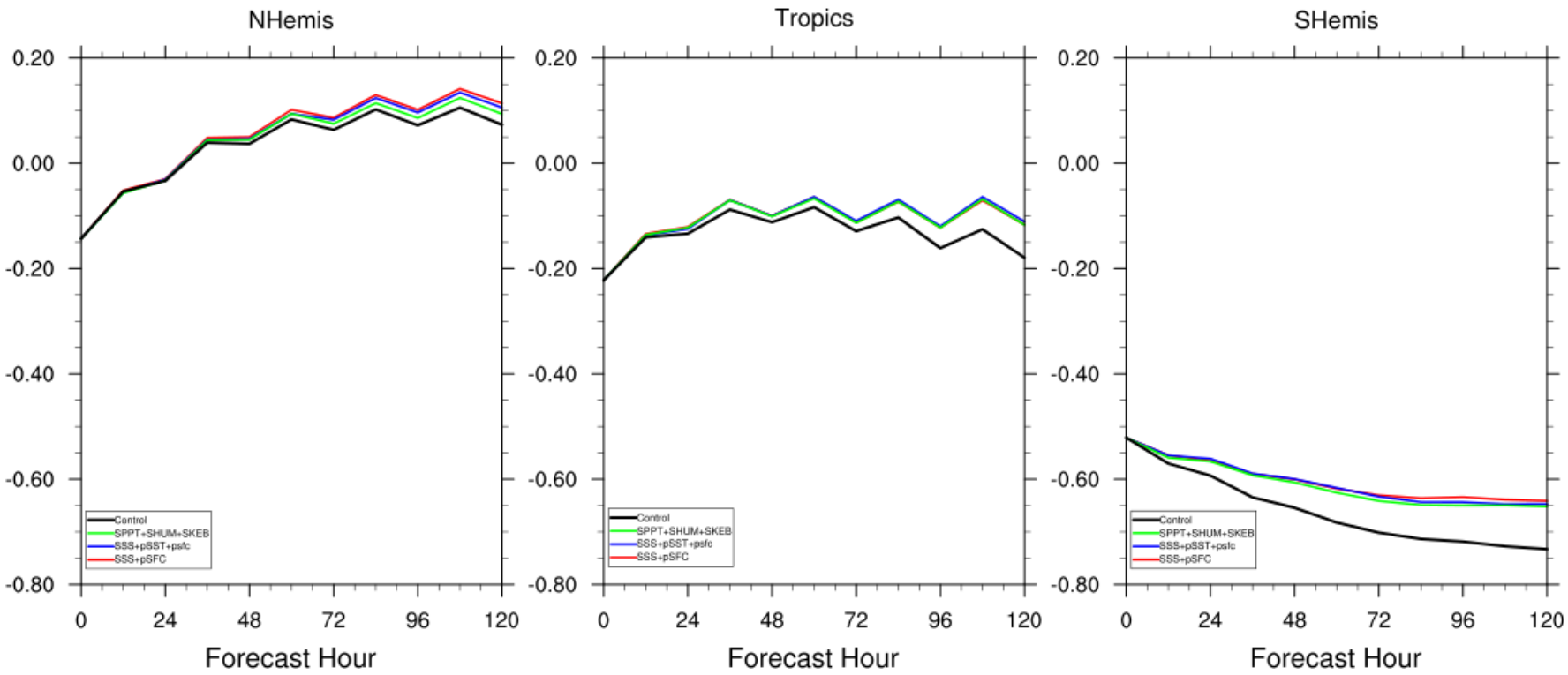


T850, Bias, 31 Cases, Aug 2014.



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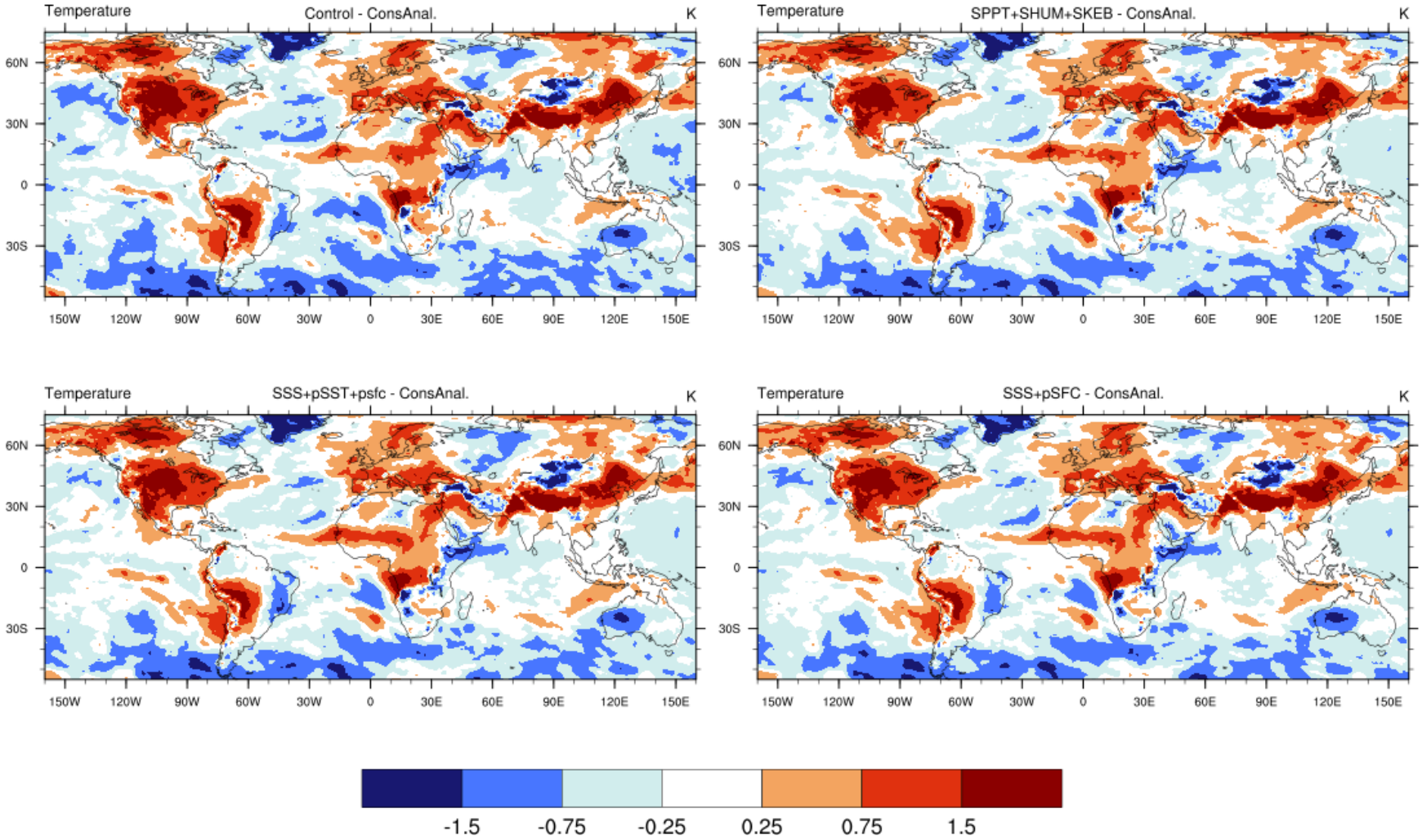
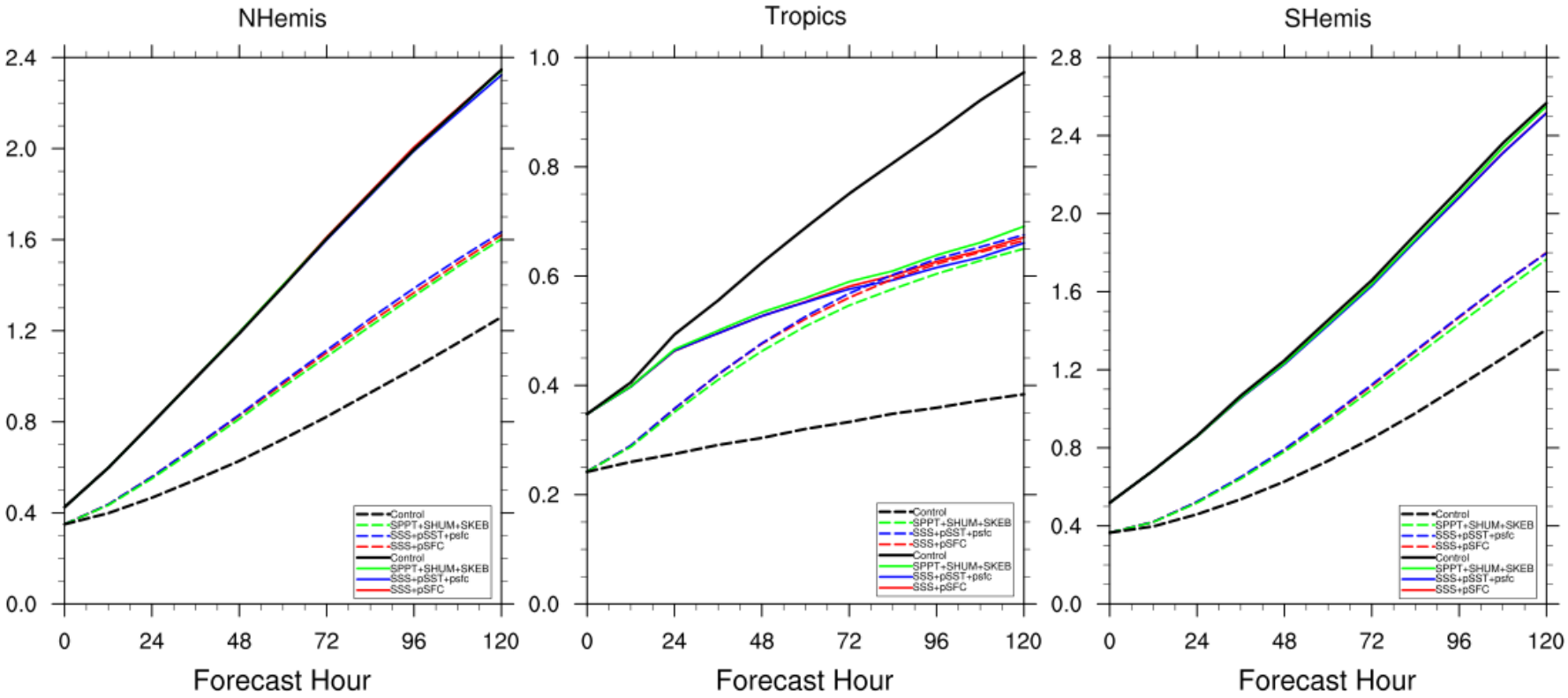


T200, RMSE(solid), Spread(dashed), 31 Cases, Aug 2014.



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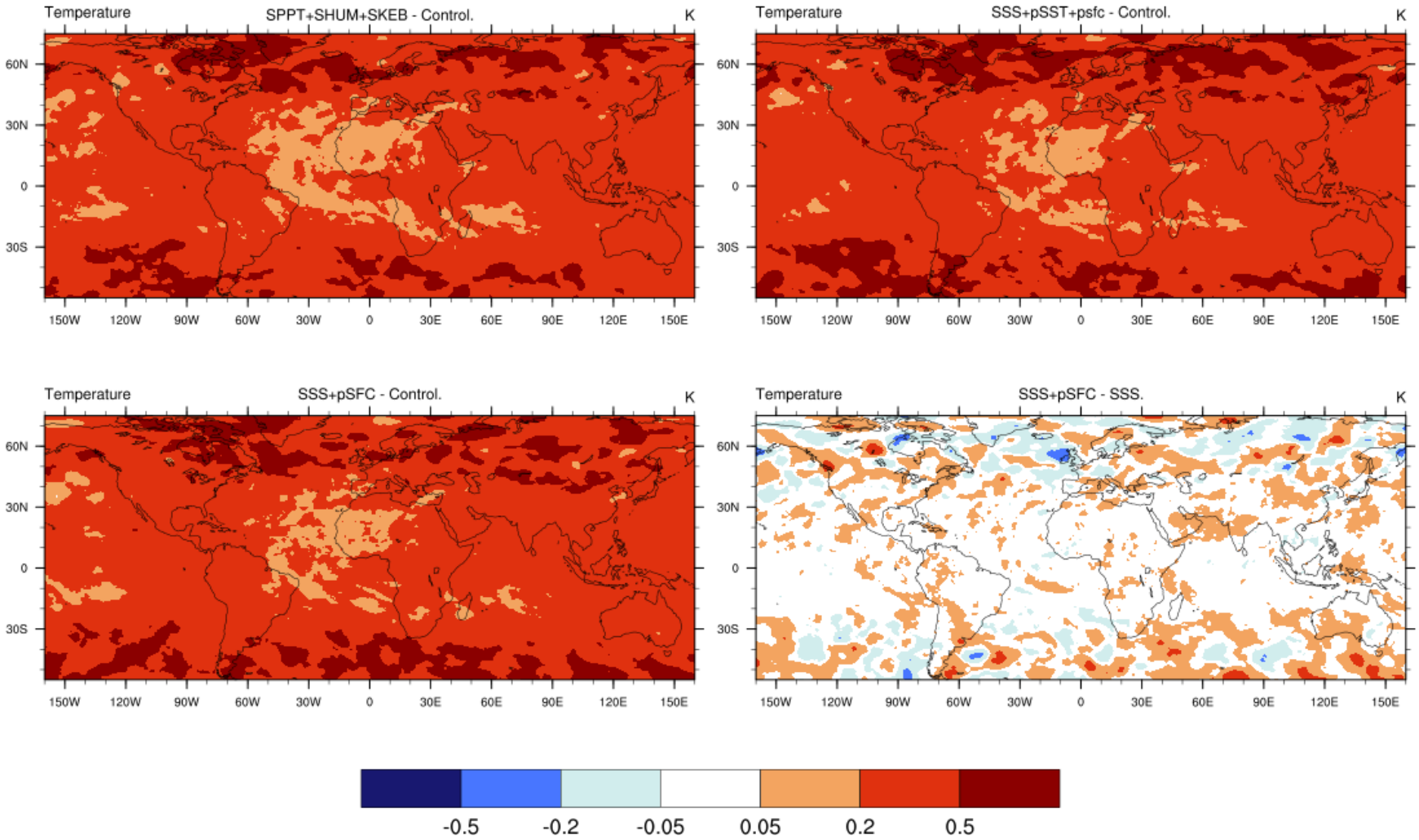

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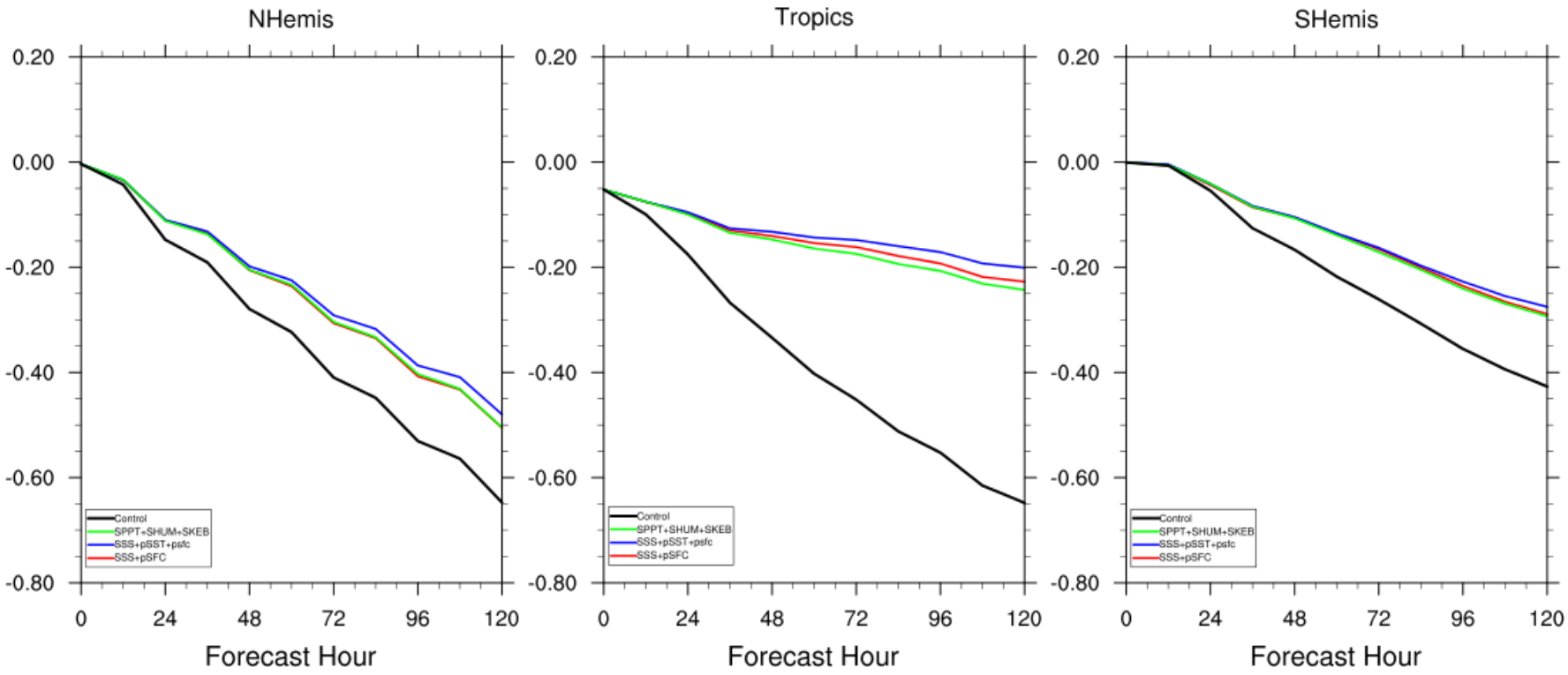

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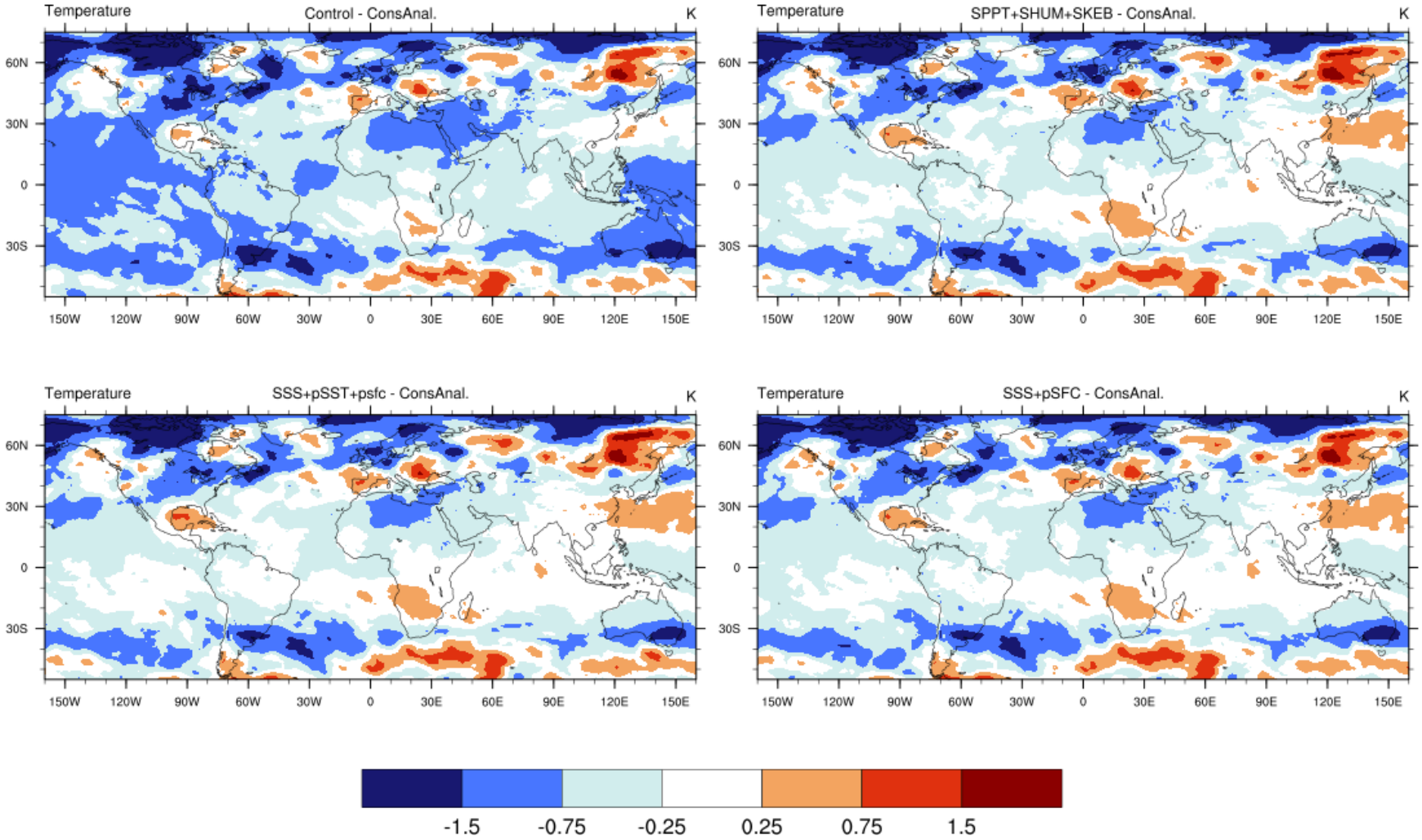

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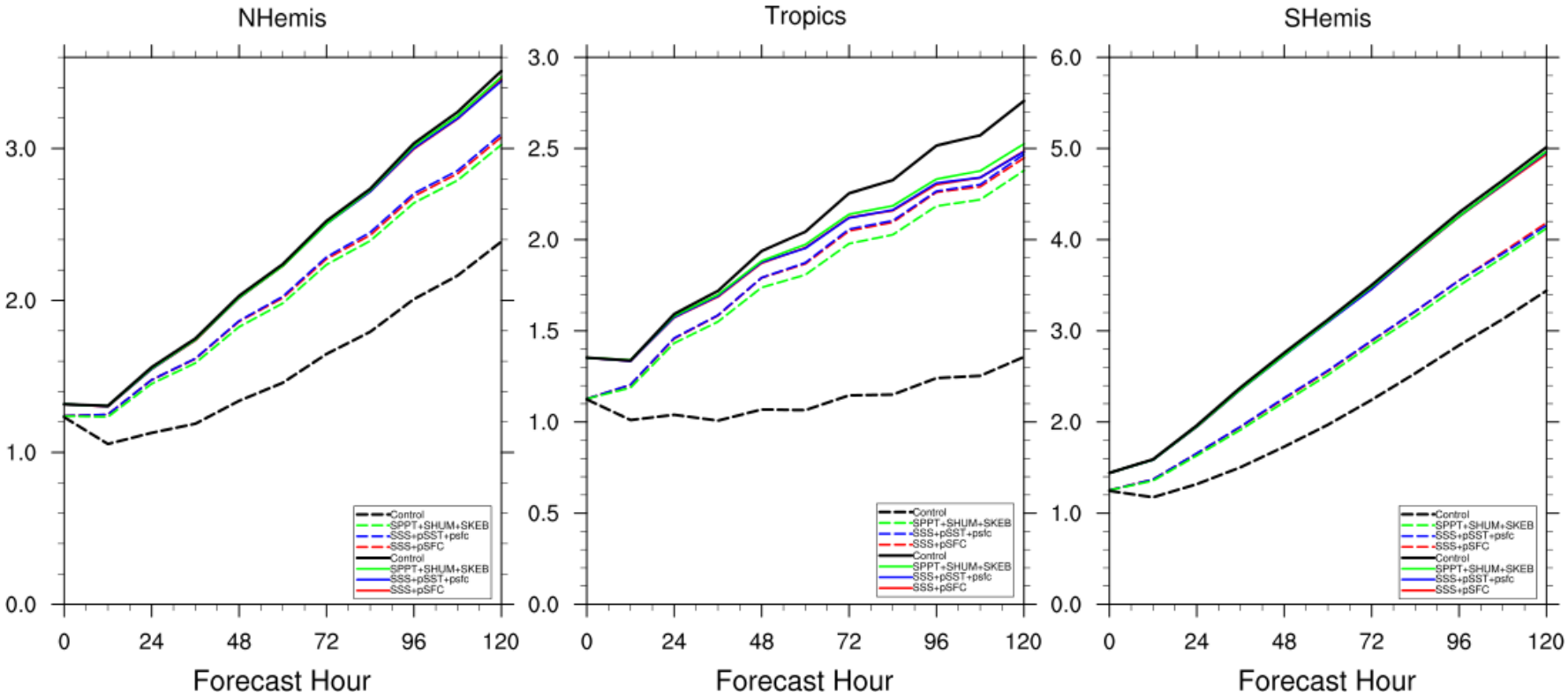

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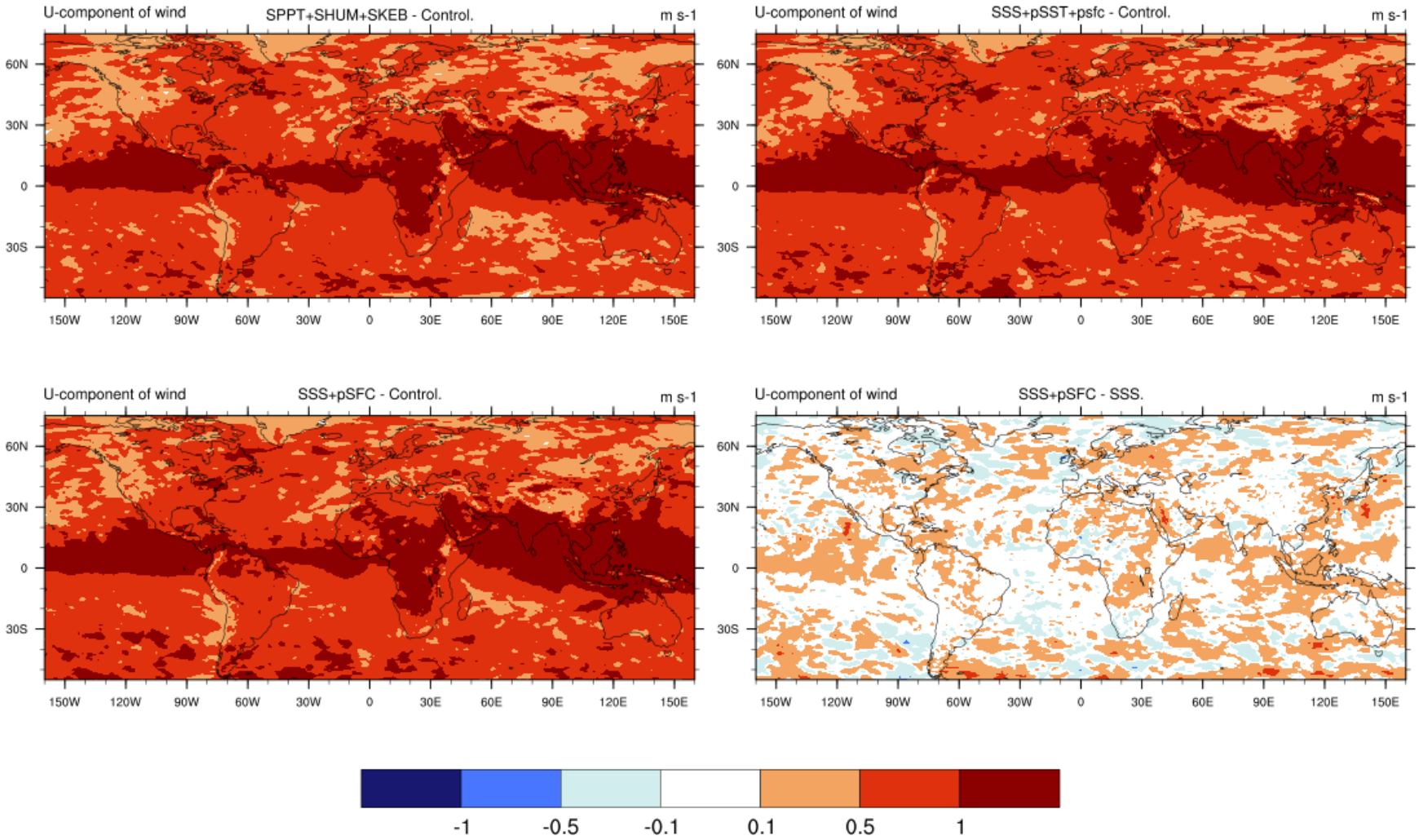
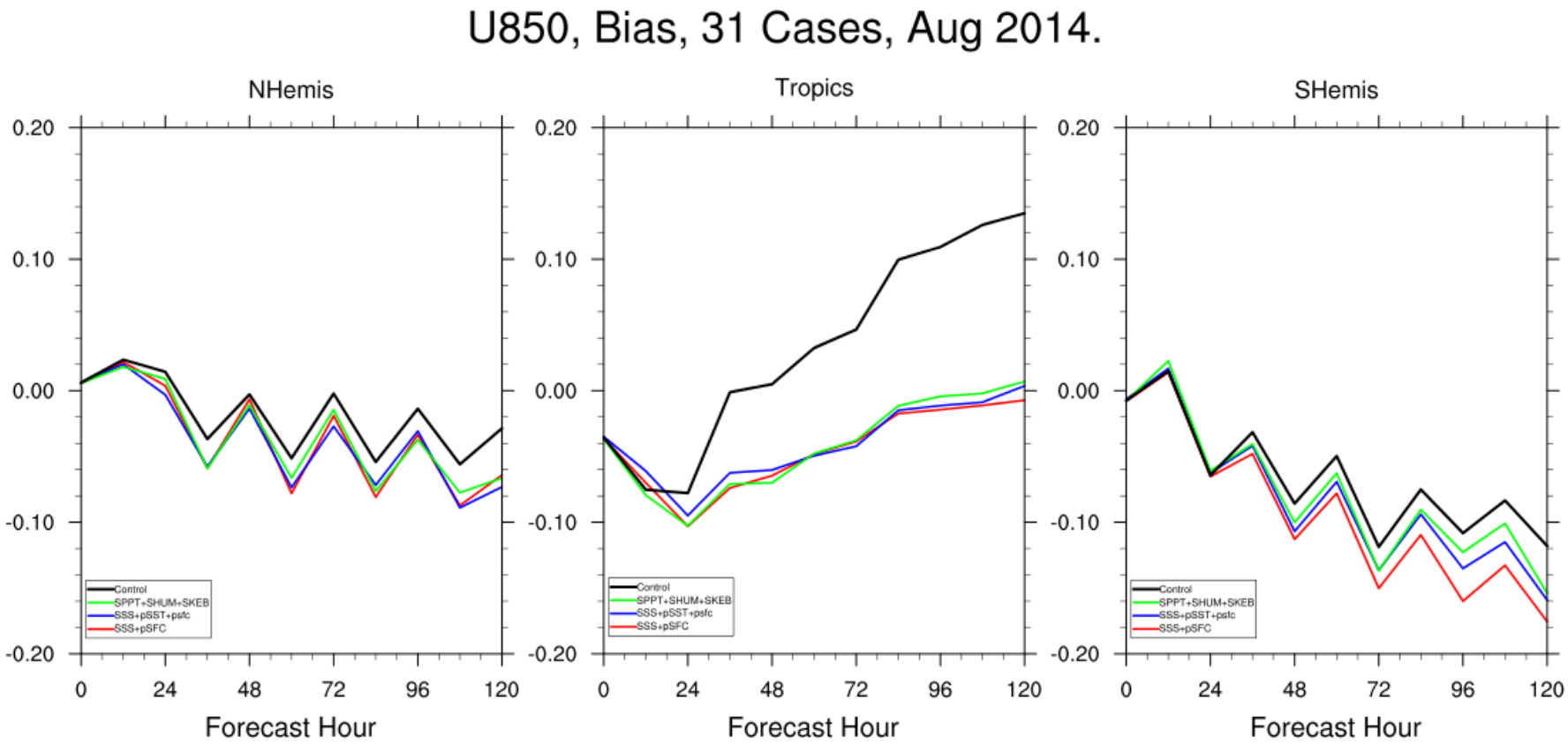
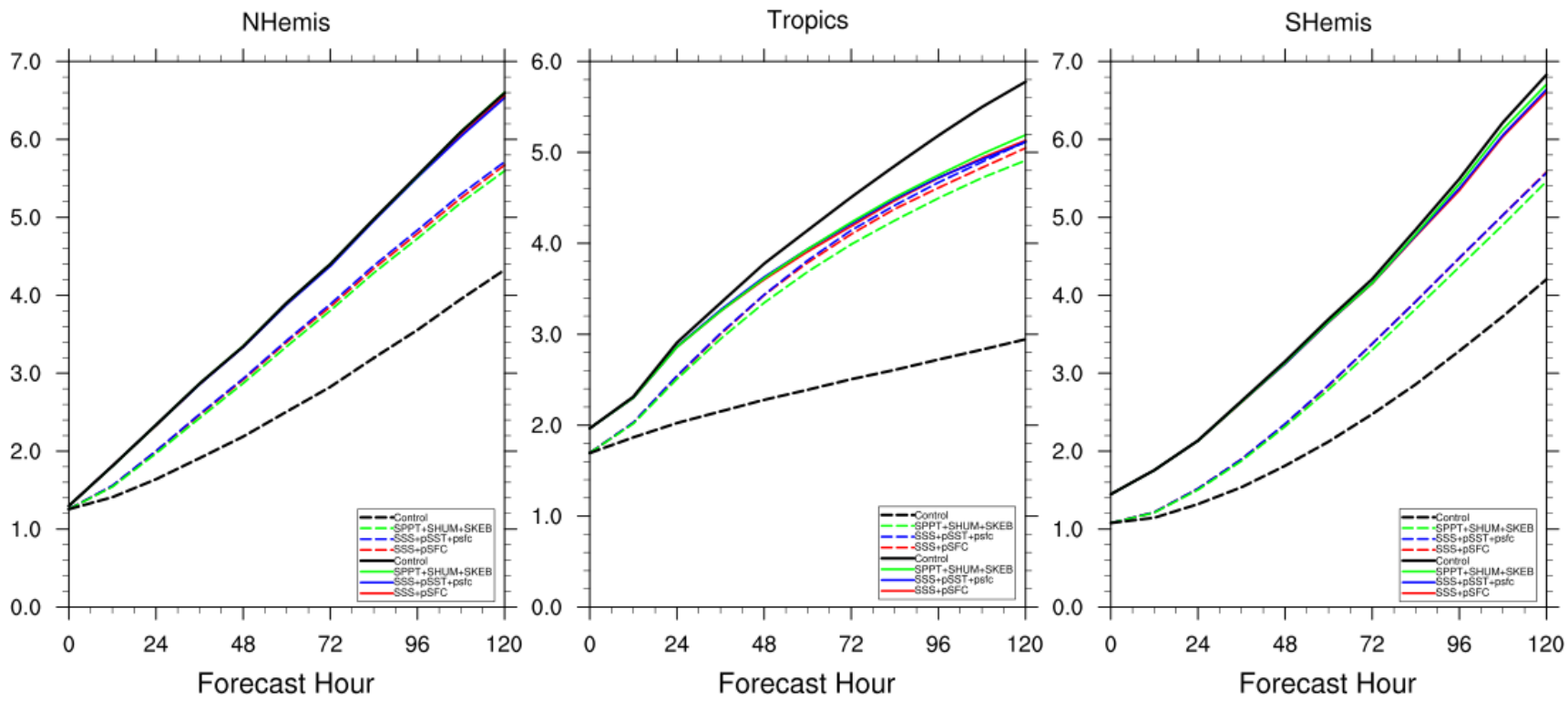



U850, Bias, 31 Cases, Aug 2014.
NHemis
Tropics
SHemis
0.20
0.10
0.00
-0.10
-0.20
0
24
48
72
96
120
Forecast Hour
Control
SPPT+SHUM+SKEB
SSS+pSST+psfc
SSS+pSFC

U200, RMSE(solid), Spread(dashed), 31 Cases, Aug 2014.



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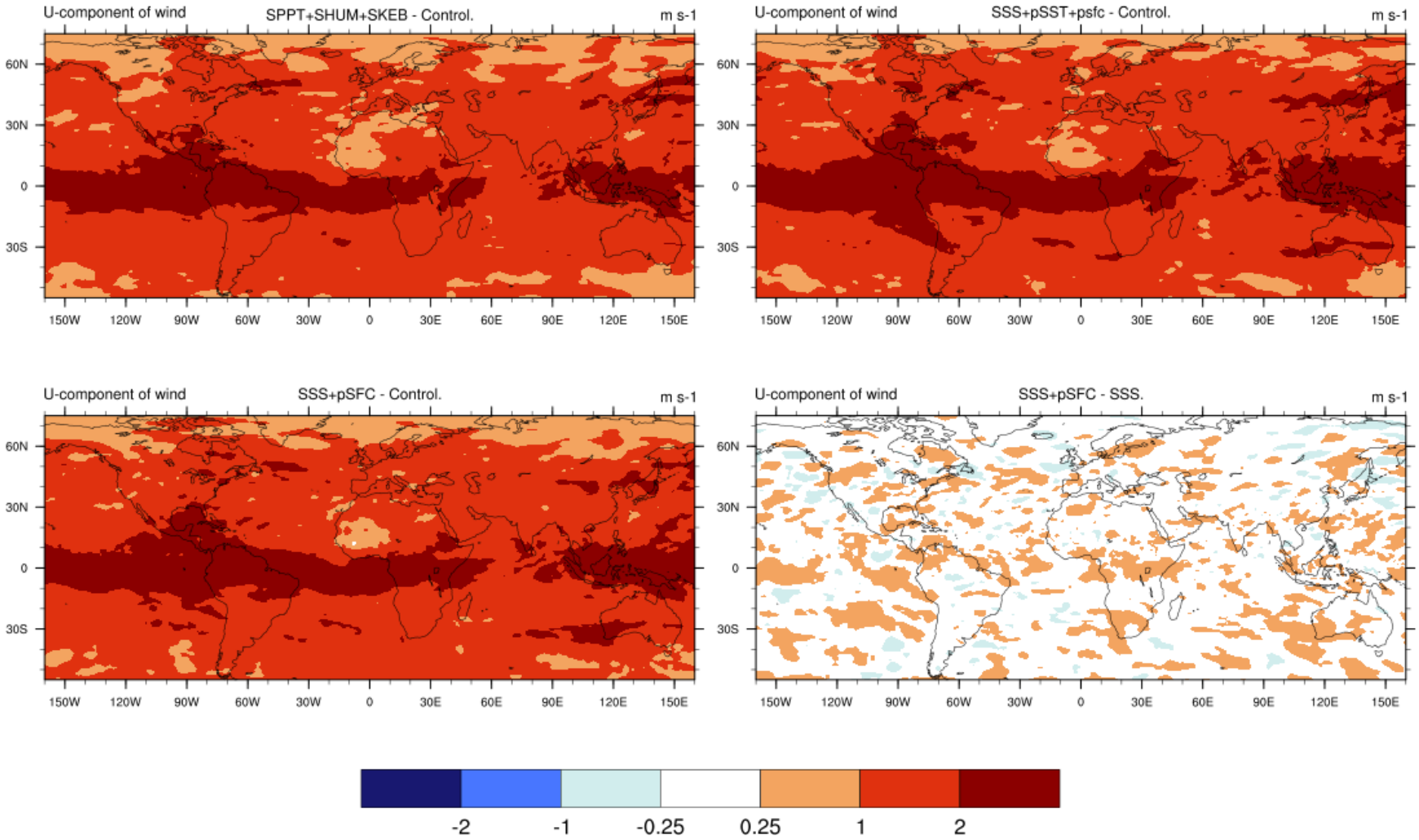
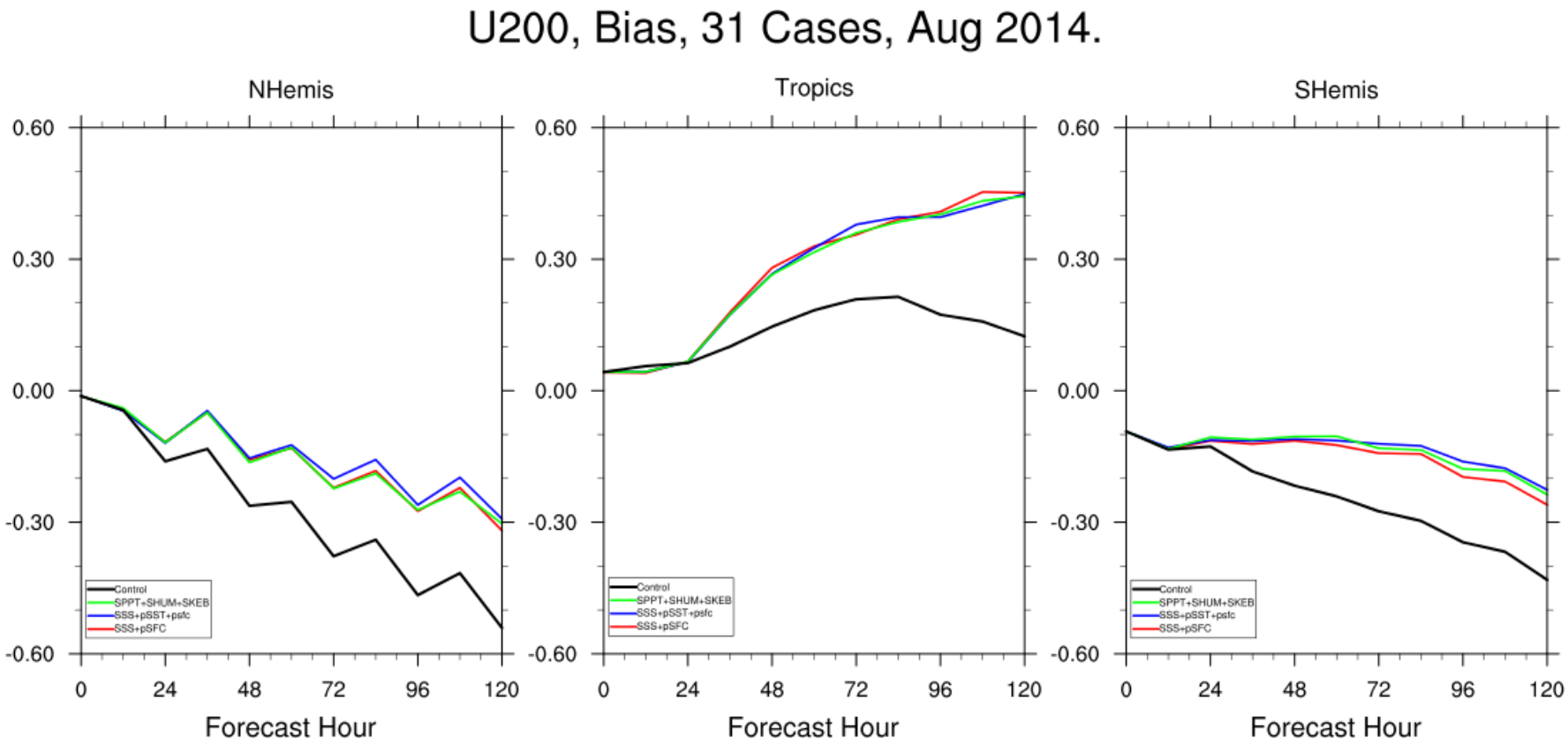
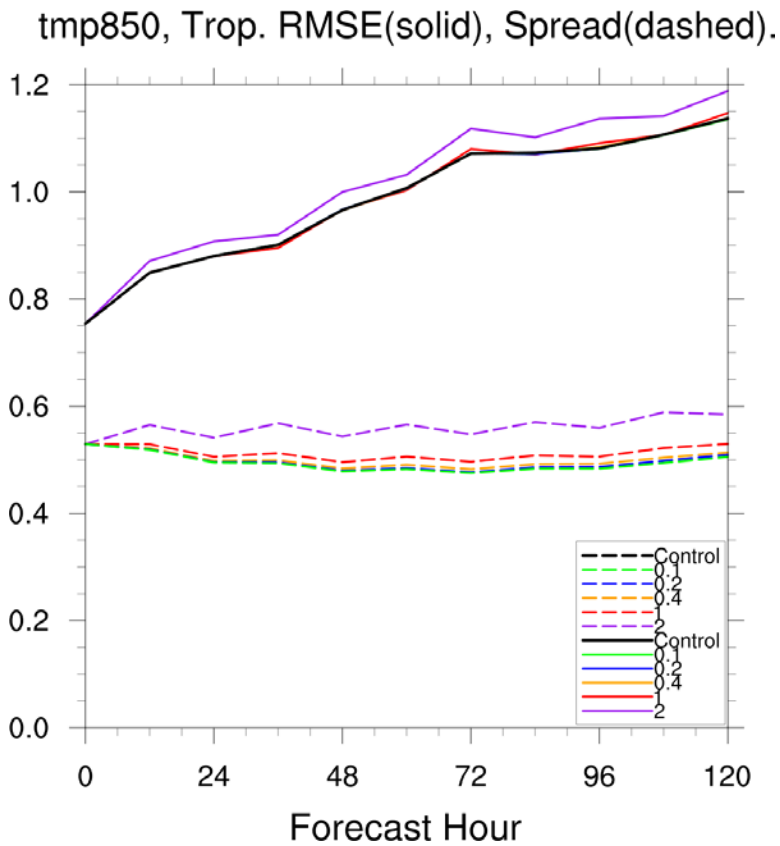
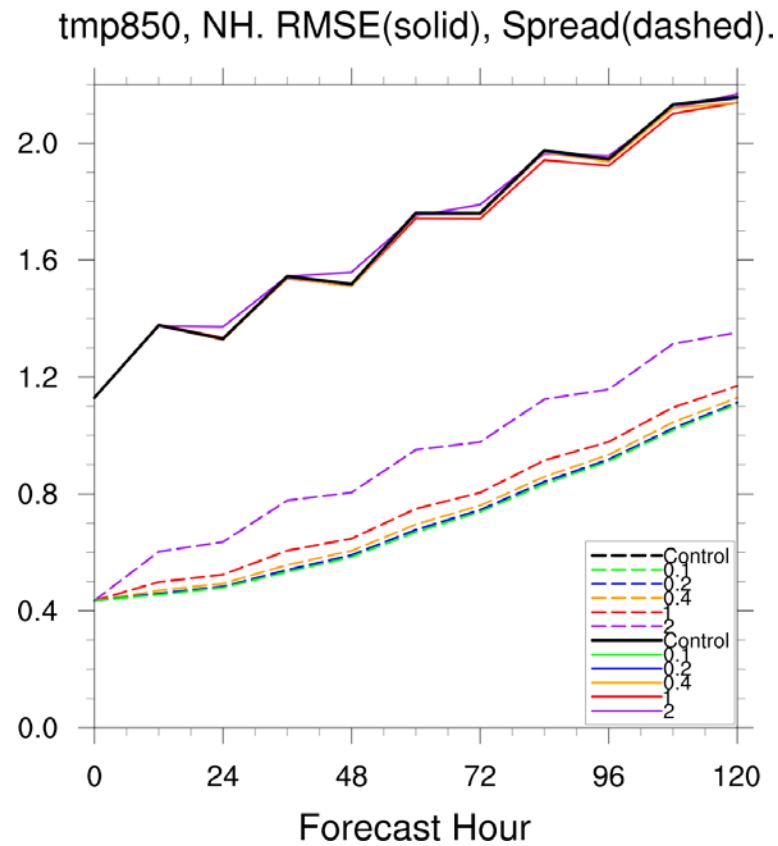



U200, Bias, 31 Cases, Aug 2014.
NHemis
Tropics
SHemis
0.60
0.30
0.00
-0.30
-0.60
0
24
48
72
96
120
Forecast Hour
Control
SPPT+SHUM+SKEB
SSS+pSST+psfc
SSS+pSFC

Conclusions

Effects of combining perturbations

- SPPT+SHUM+SKEB (SSS) produce the biggest increase in spread.
- Responses to land surface parameter perturbations generally small. However, the 2 runs with SFC perts show further improvement beyond SSS.
- The biggest improvements are in the tropics, where the RMSE are reduced noticeably. Impact of SFC perts was evident (though small) even at 200 mb.

Some preliminary results from albedo perturbations (Maria)