The Convergence of Analyses Produced by Overlapping Data Assimilation Streams

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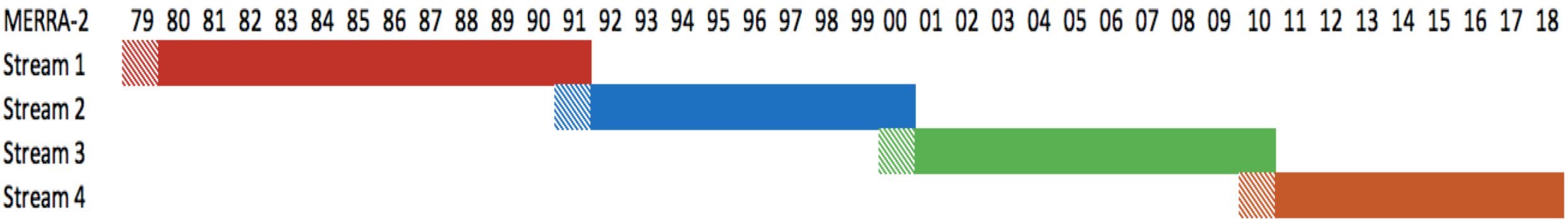
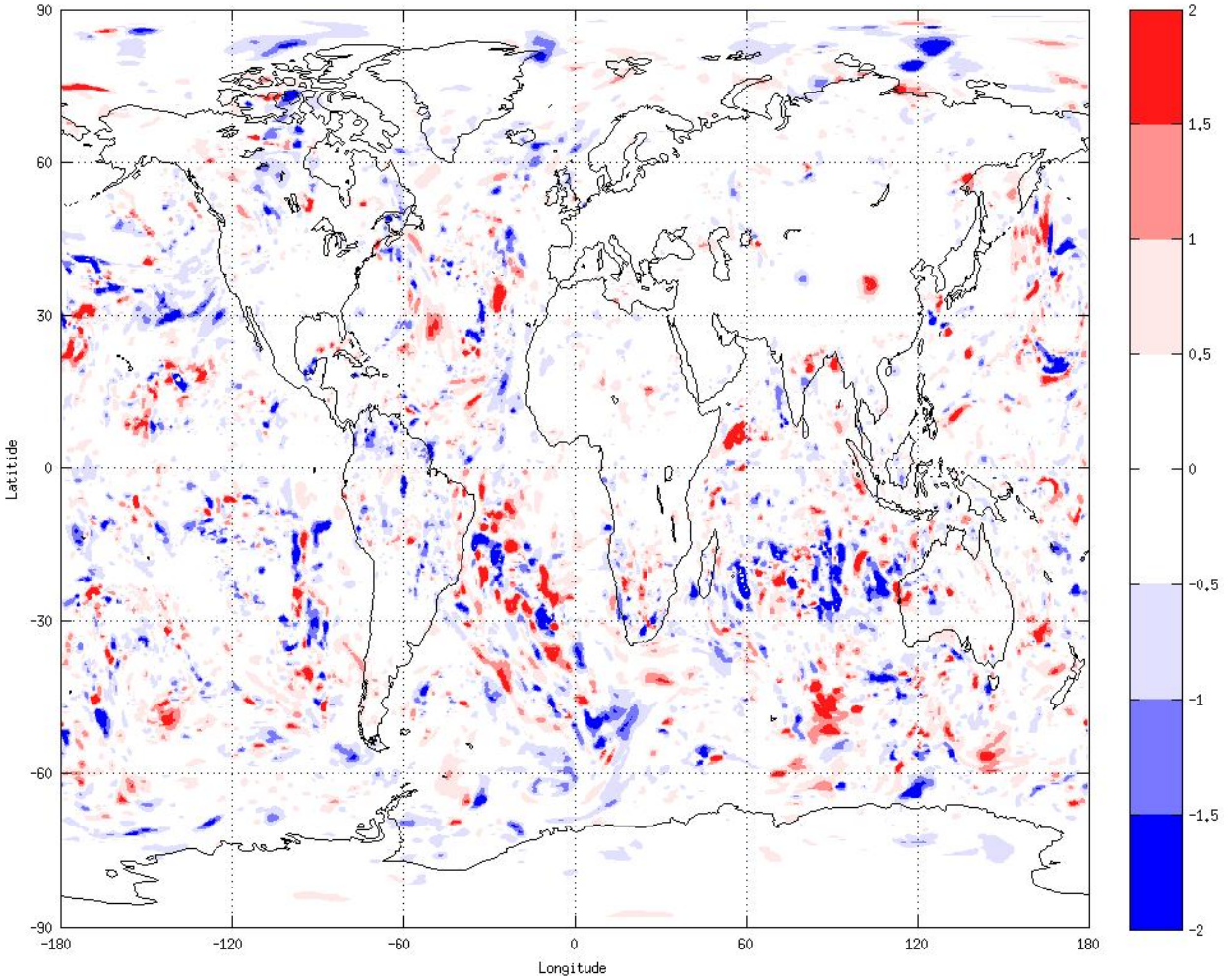
The 4 overlapping MERRA-2 streams by year

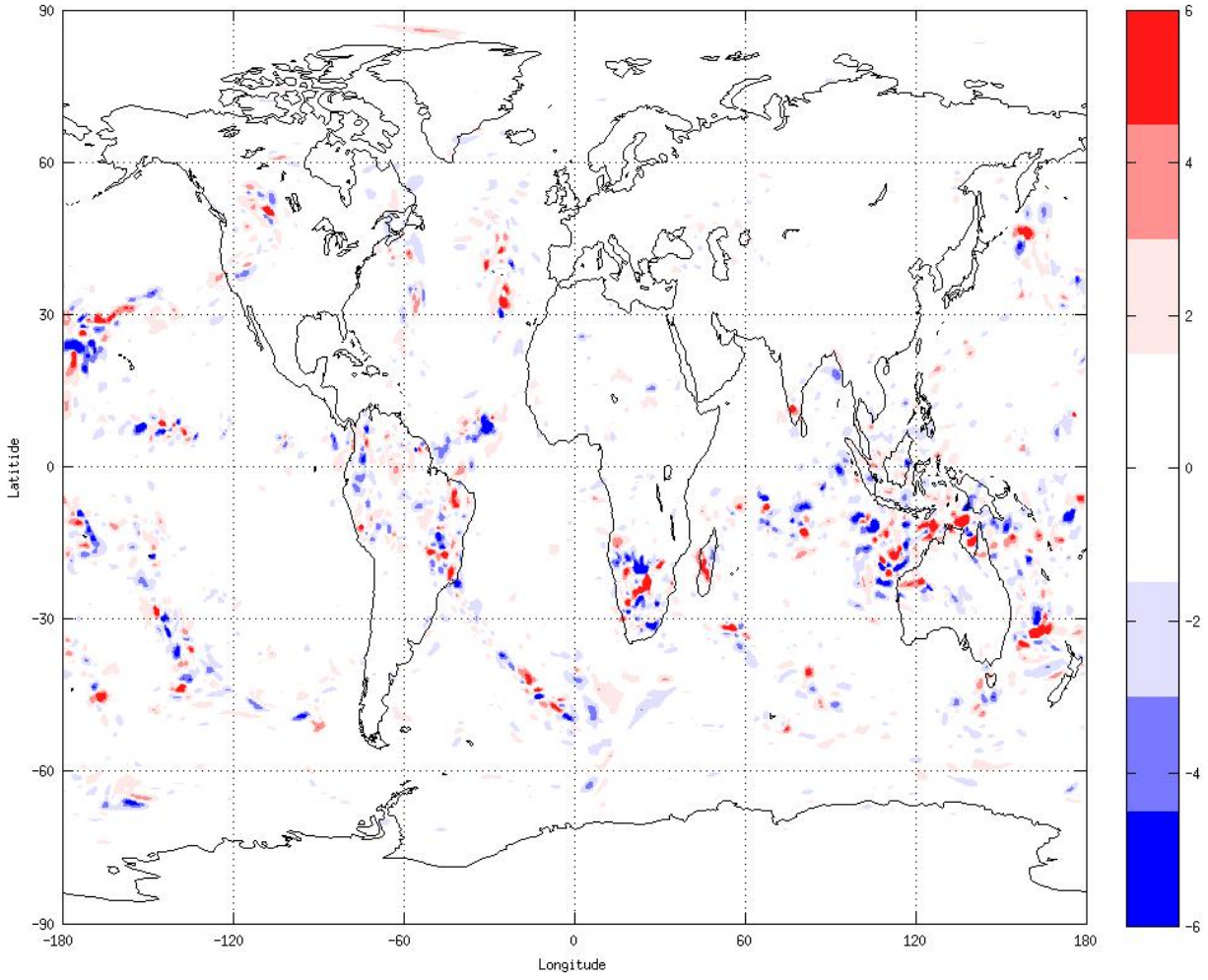


Instantaneous difference between streams at 0Z 15 December 2010

T at η=780

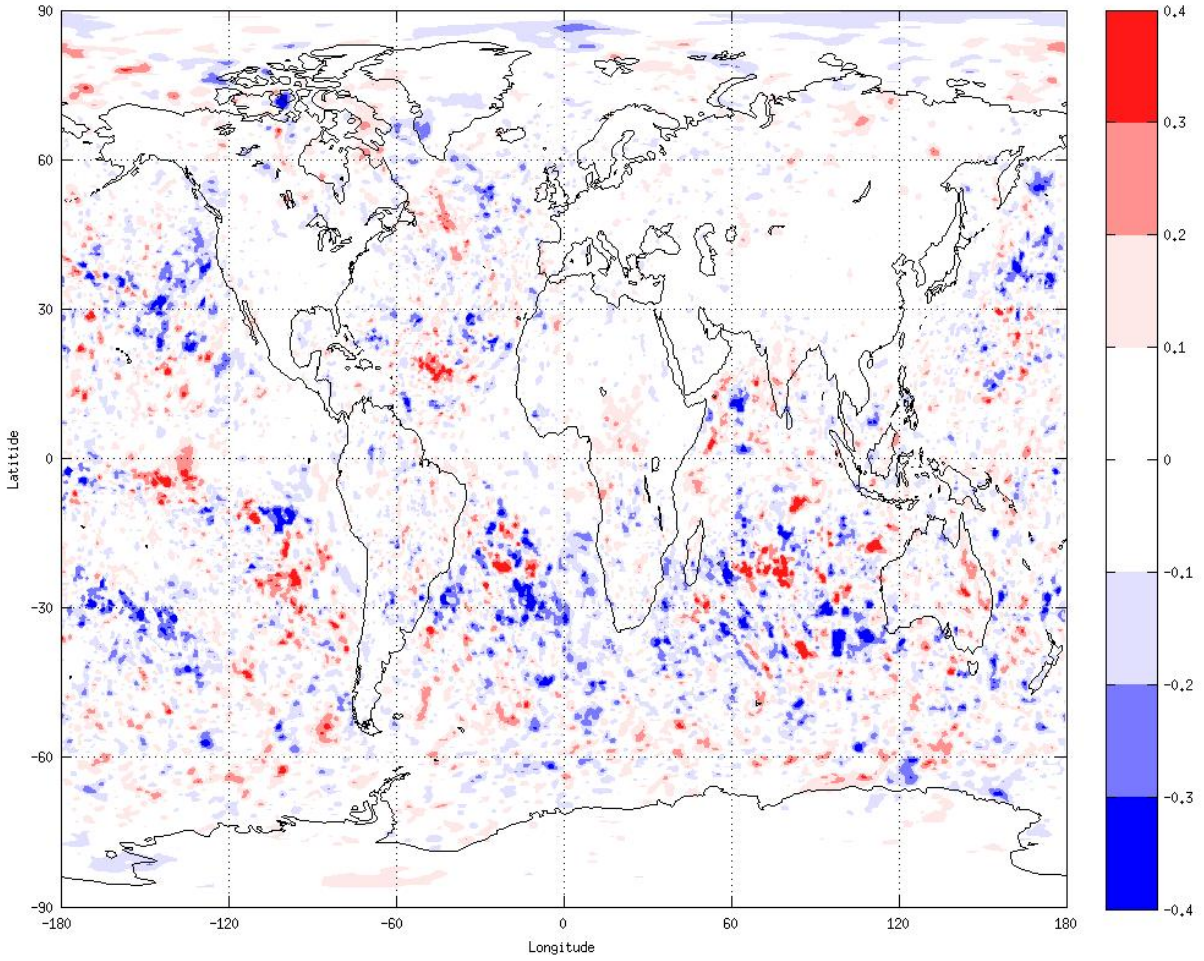


u at η=780

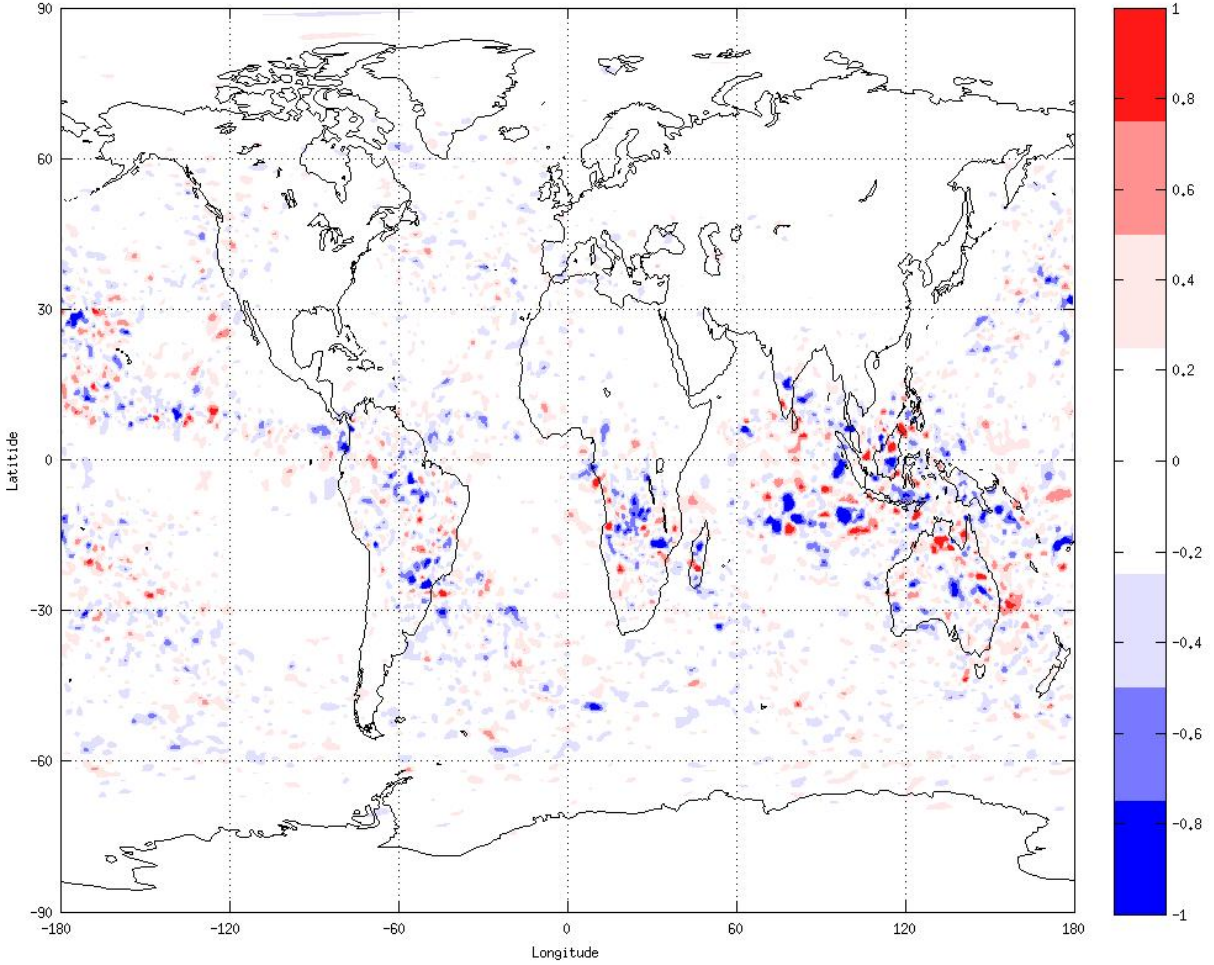


Monthly mean difference for 0Z 1-28 December 2010

T at η=780

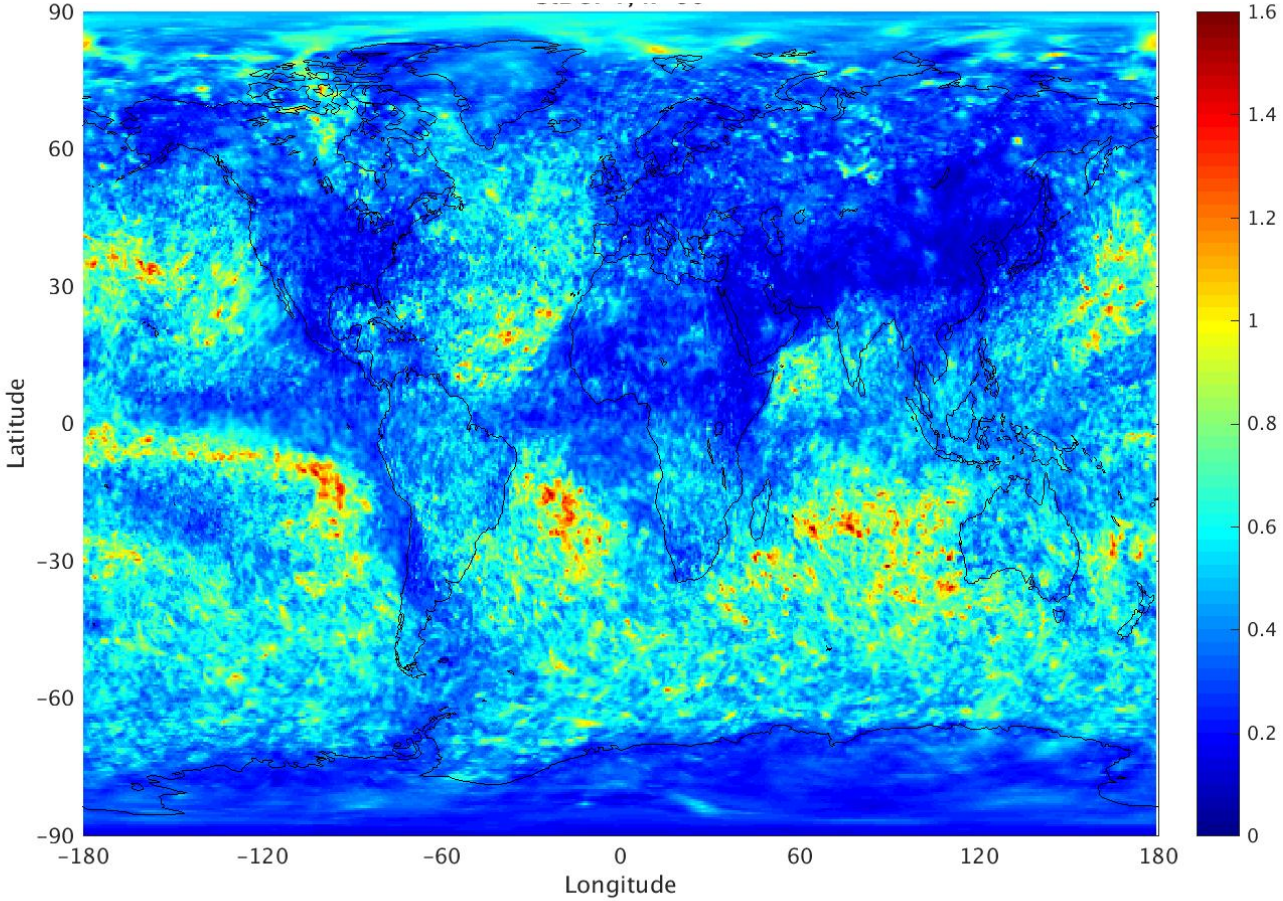


u at η=780

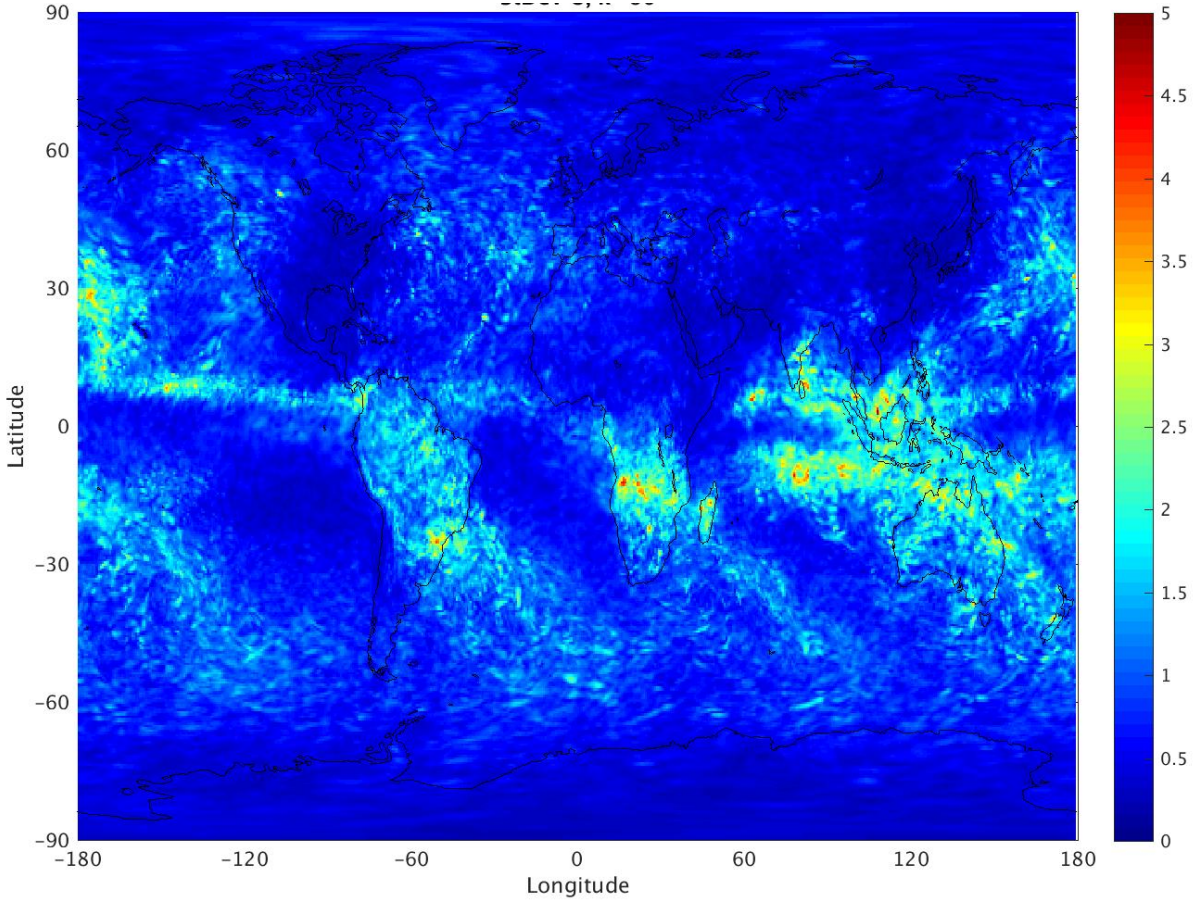


Standard deviation of difference for 0Z 1-28 December 2010

T at η=780

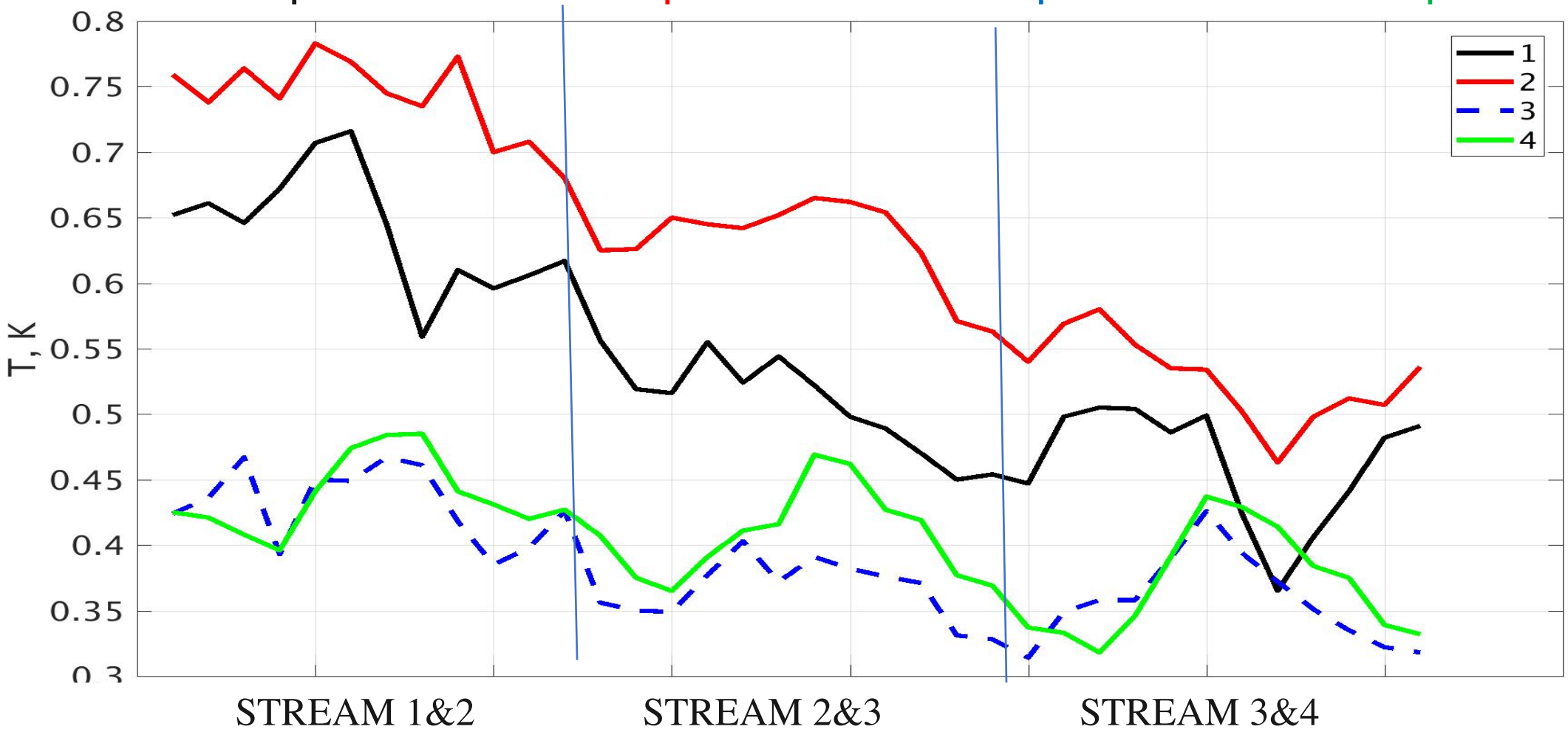


u at η=780



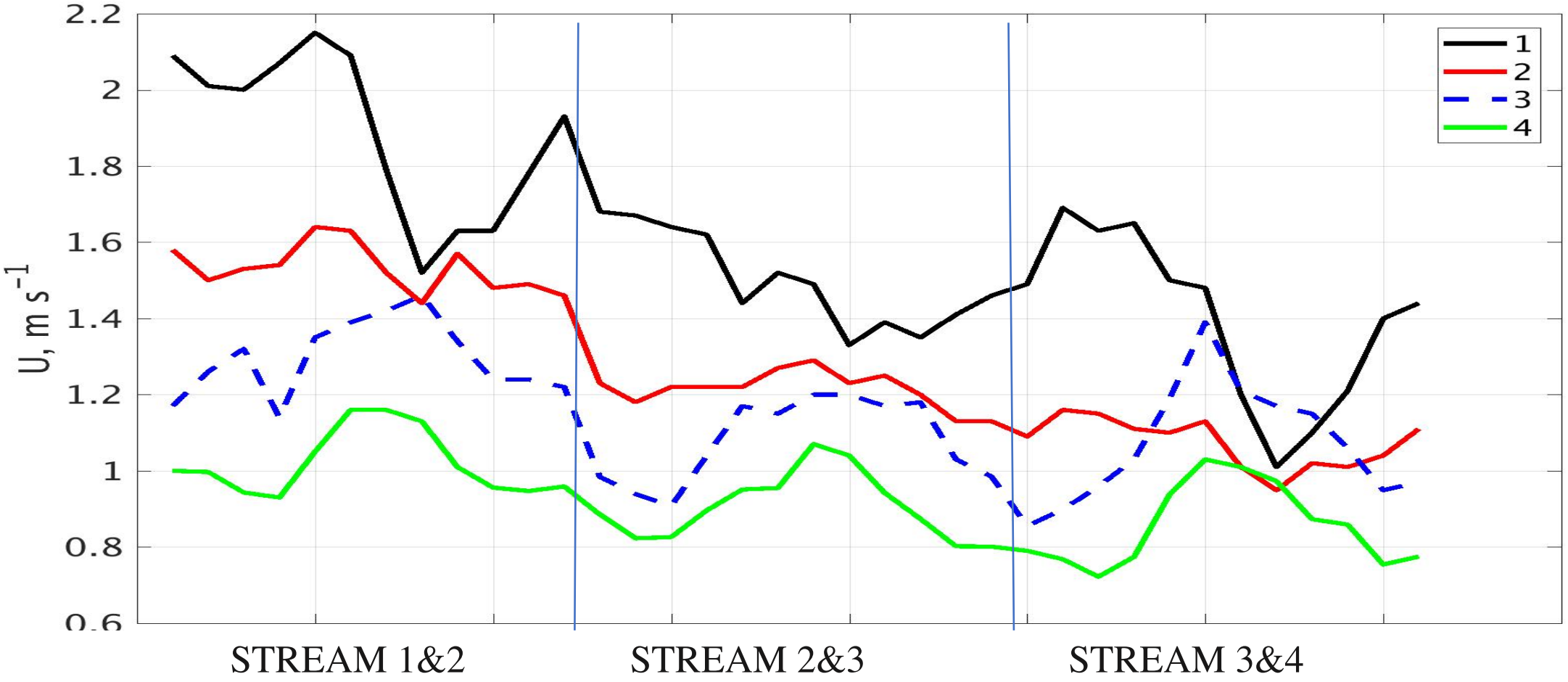
Time series of monthly standard deviations of T differences for the 3 x 12 overlap months

30S-60S η=200 30S-60S η=700 30N-60N η=200 30N-60N η=700



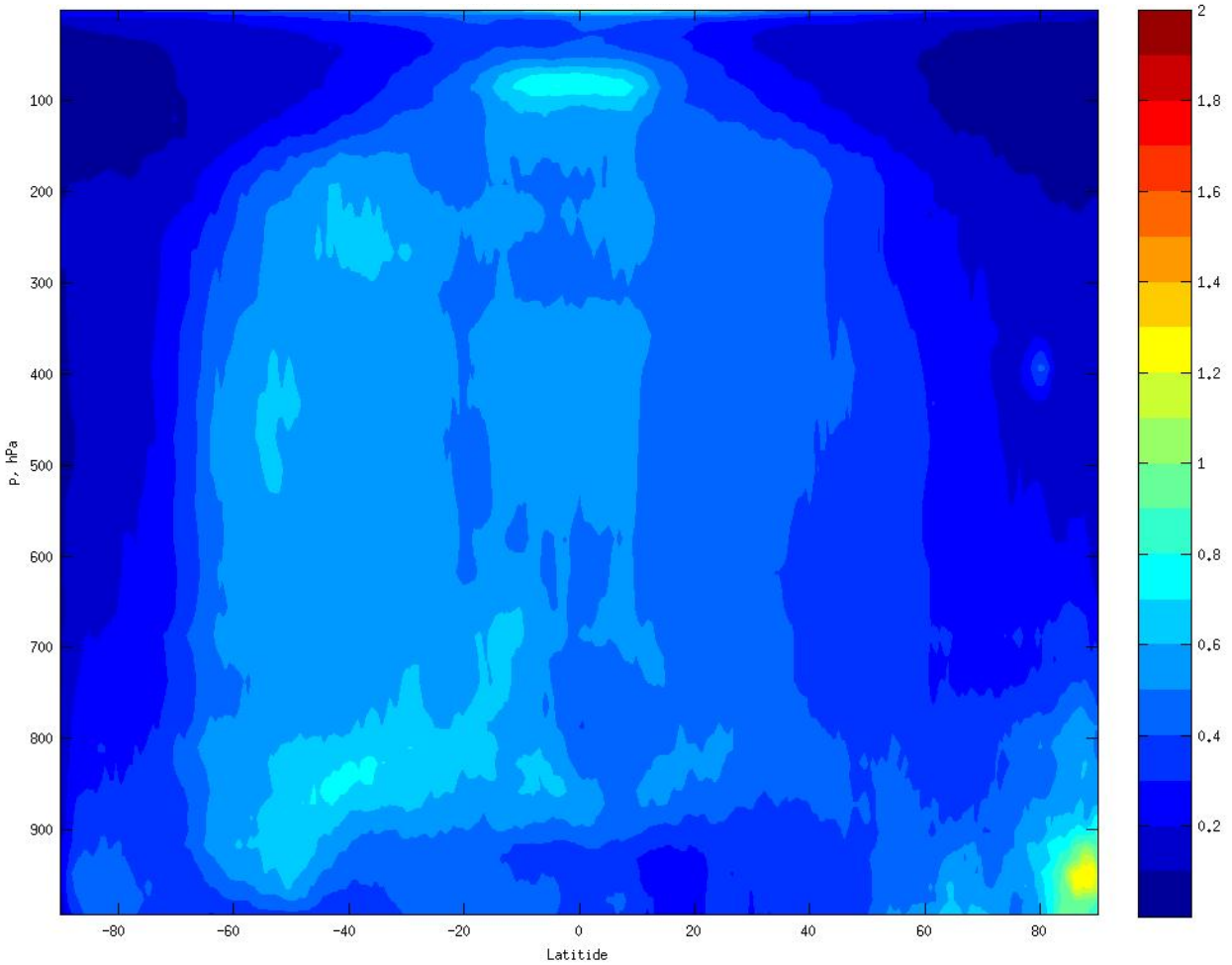
Time series of monthly standard deviations of u differences for the 3 x 12 overlap months

30S-60S η=200 30S-60S η=700 30N-60N η=200 30N-60N η=700

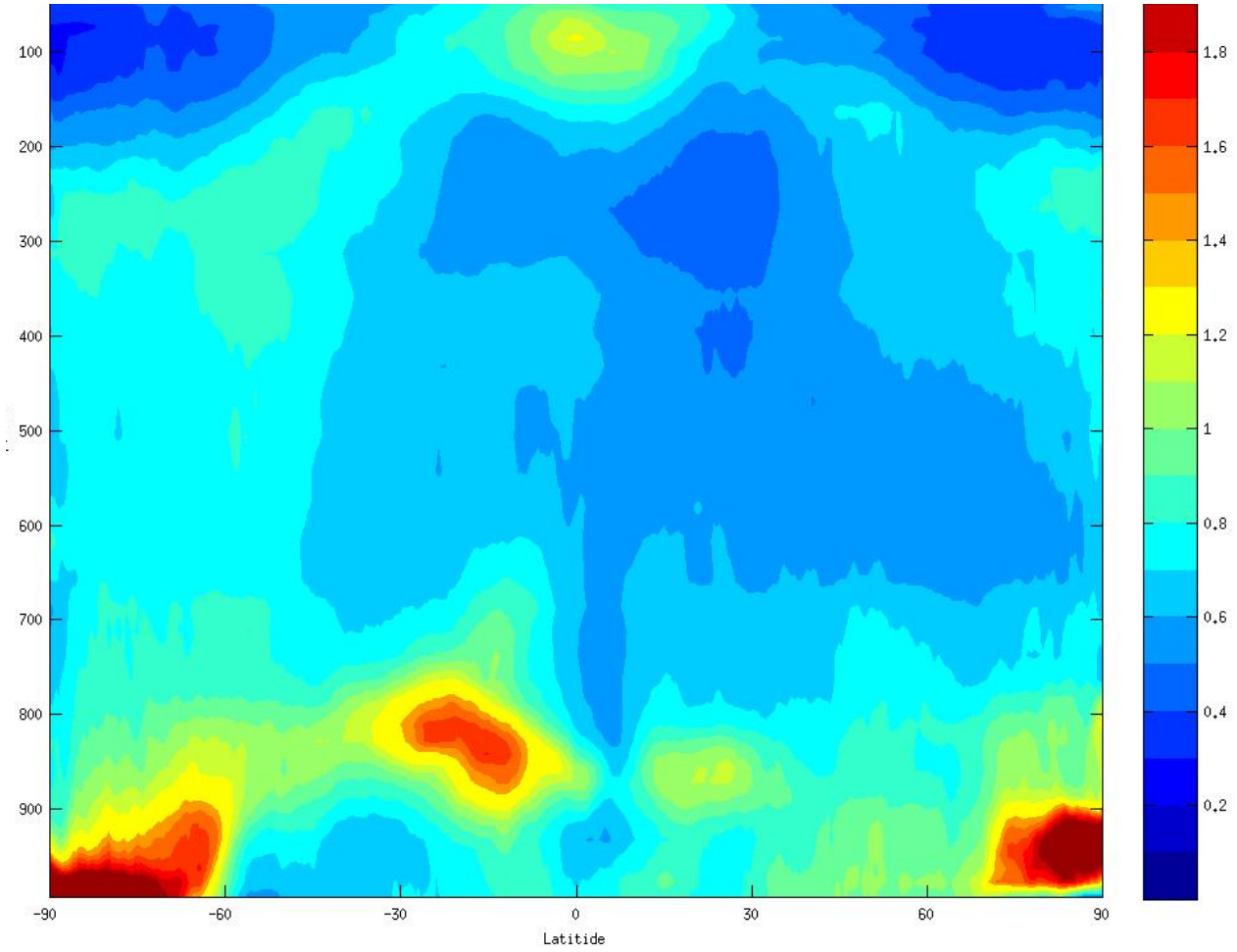


Zonal and temporal standard deviations of T differences or errors

T difference between streams December 2010

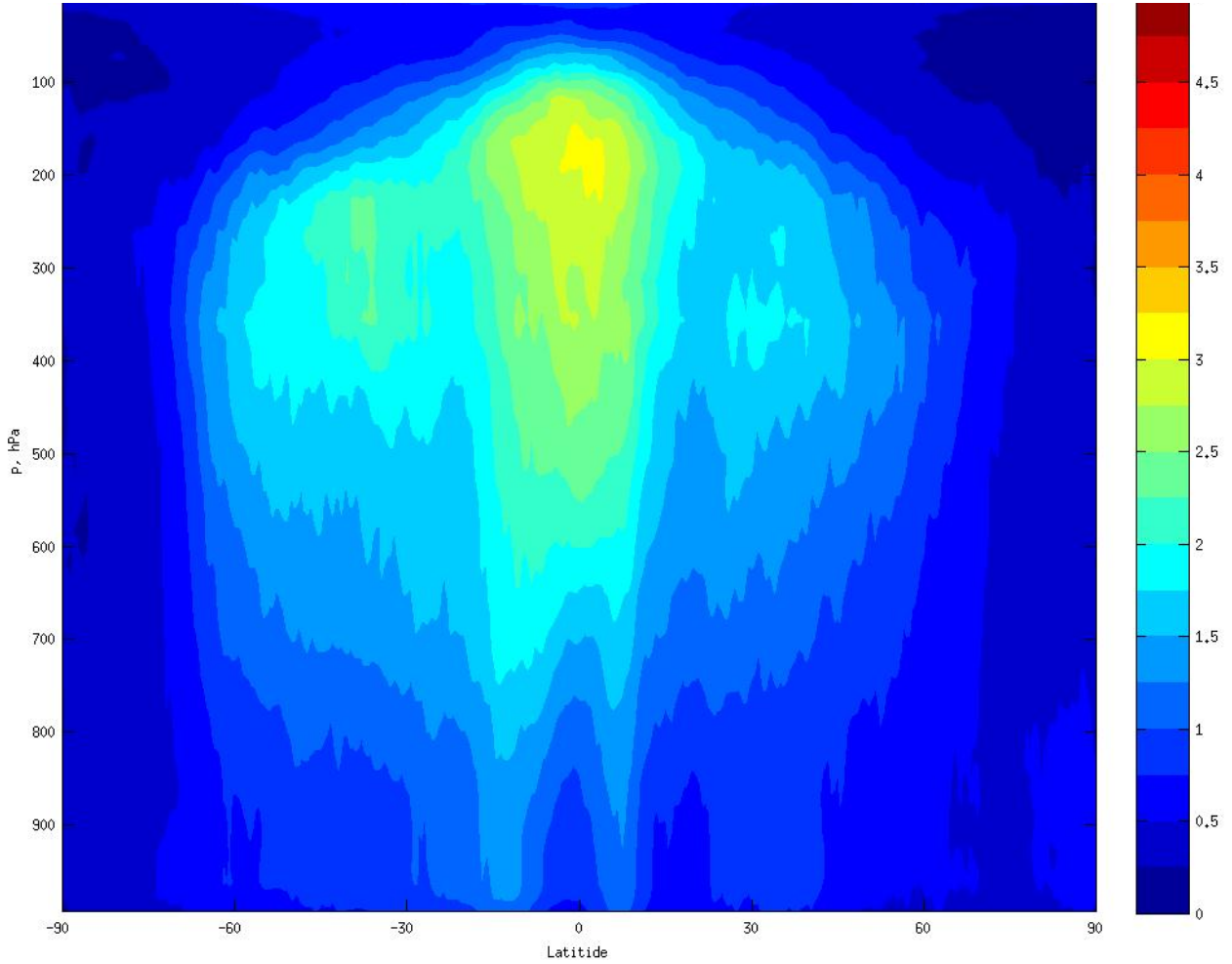


OSSE-estimated T analysis error for July



Zonal and temporal standard deviations of u differences or errors

u difference between streams December 2010



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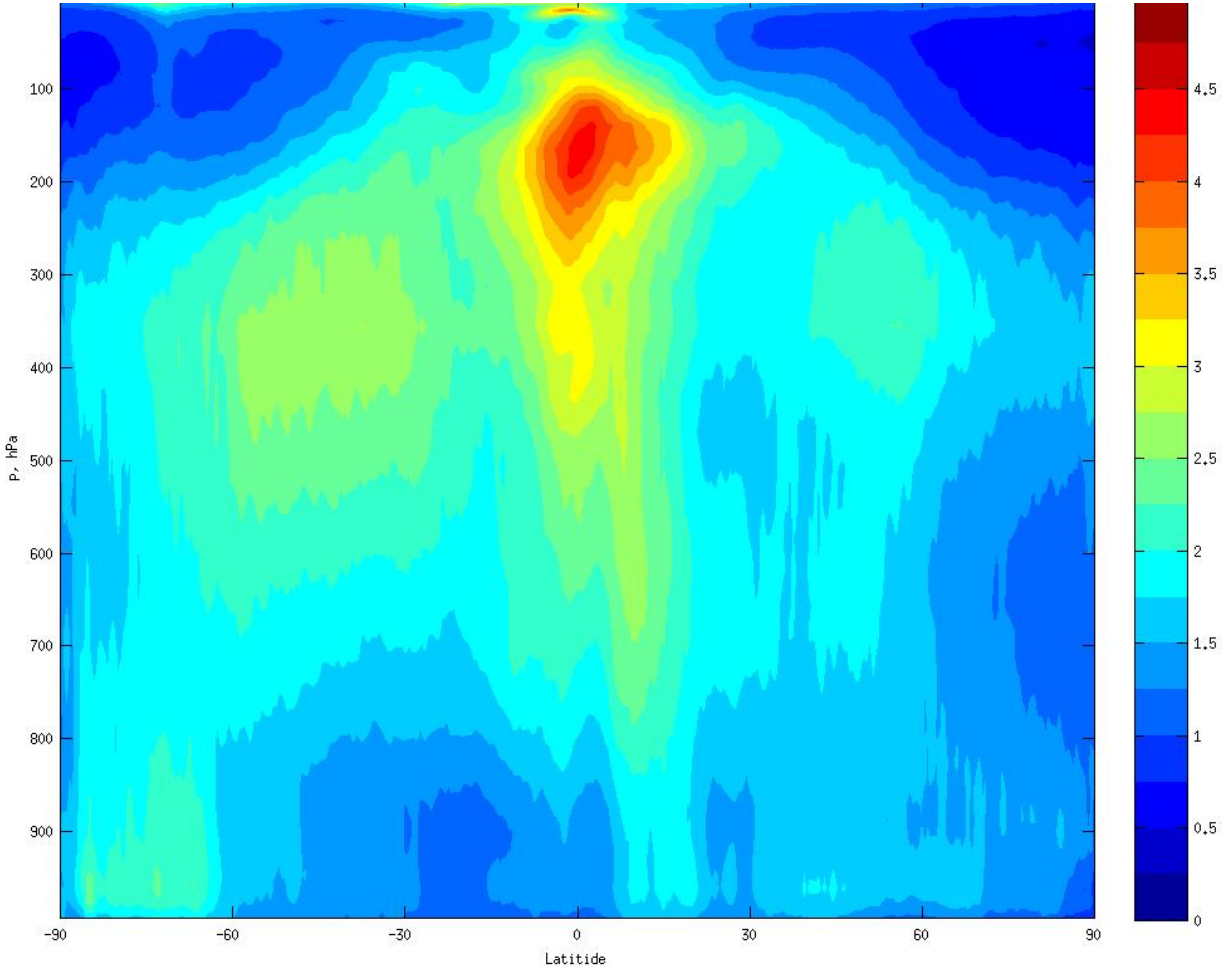

Surprising Result

Even after 12 months of 4 times daily assimilation with

same observations, same model, and same data assimilation algorithm,

the standard deviations of differences between streams in the extra-tropics

are ~0.4 K for T and ~1.5 m/s for vector wind;

i.e., approx. 60% of corresponding estimated analysis errors.