

IASI Water Vapor Radiance Assimilation Experiments

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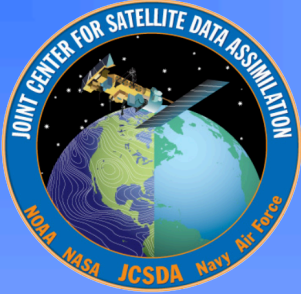
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National Aeronautics and Space Agency

John Derber

National Centers for Environmental Prediction

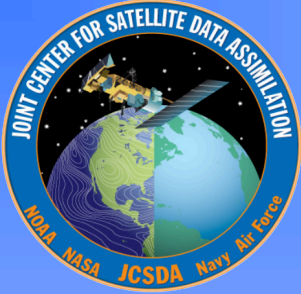




IASI Water Vapor Experiment

- December 2008 version of the GDAS/GFS at T382L64
- All operational data types planned to be used by operations
 - Including METOP's AMSUA, MHS, HIRS, and IASI longwave
- Two Seasons
 - 10 July – 31 August 2007
 - 1 Dec 2007 – 15 Jan 2008
- Last 30 days of each season are used
 - 00Z forecasts out to day 7

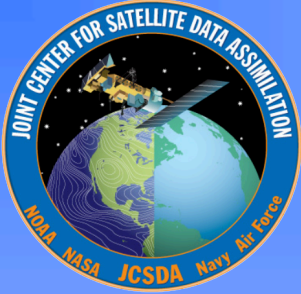




IASI Water Vapor Experiment

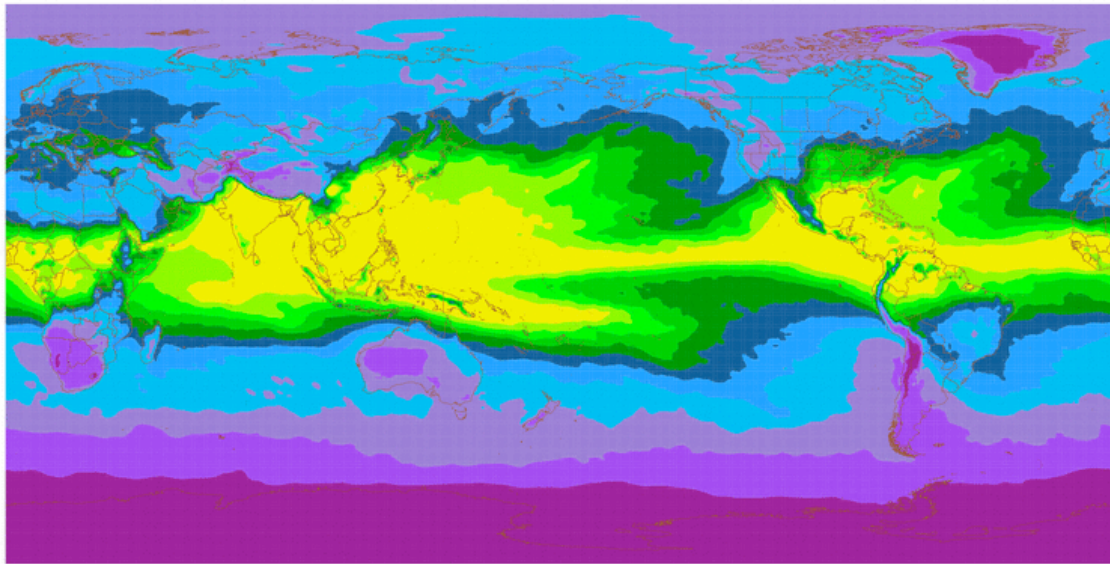
- IASI channel selection
 - 165 longwave channels
 - ◆ Also used in the control
 - 86 water vapor channels
 - ◆ Off-line water vapor channels only
- Thinned to 180 km
 - Clearest FOV based on AVHRR cloud fraction
- Radiance QC similar to AIRS
- One month used for bias correction spinup.





Results



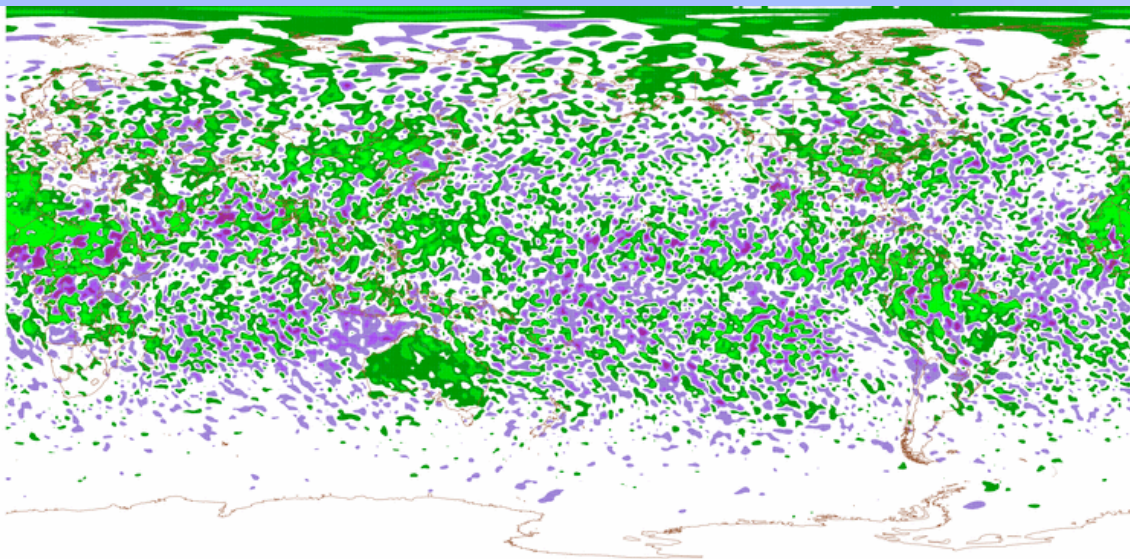


pwat monthly total ctrl: 200708Fpwat_00_c.gem IASI Aug 2007



Analysis precipitable
water

August 2007



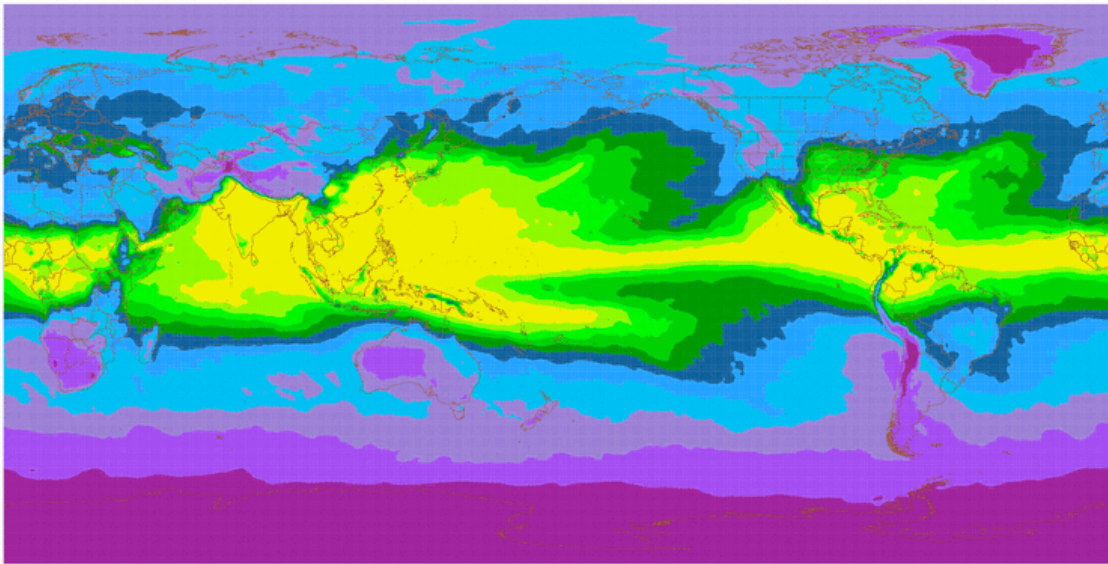
pwat monthly total diff experiment-control 200708pwat00.gem IASI Aug



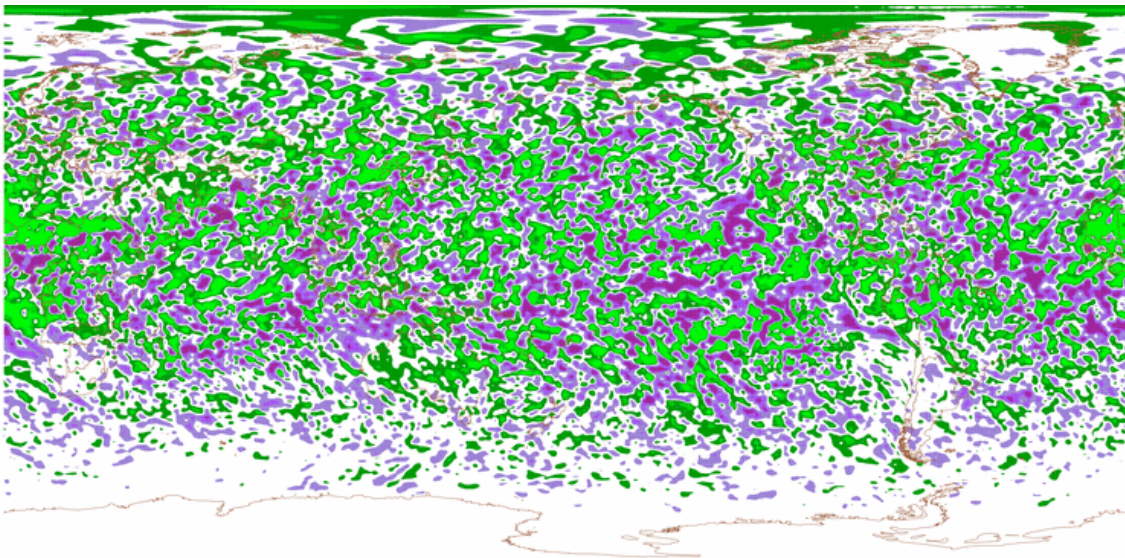
Analysis precipitable
water difference
(experiment – control).

August 2007





pwat monthly total ctrl 200708Fpwat_24_c.gem IASI Aug 2007



pwat monthly total diff experiment-control 200708pwat24.gem IASI Aug



24 hour forecast
precipitable water.

August 2007

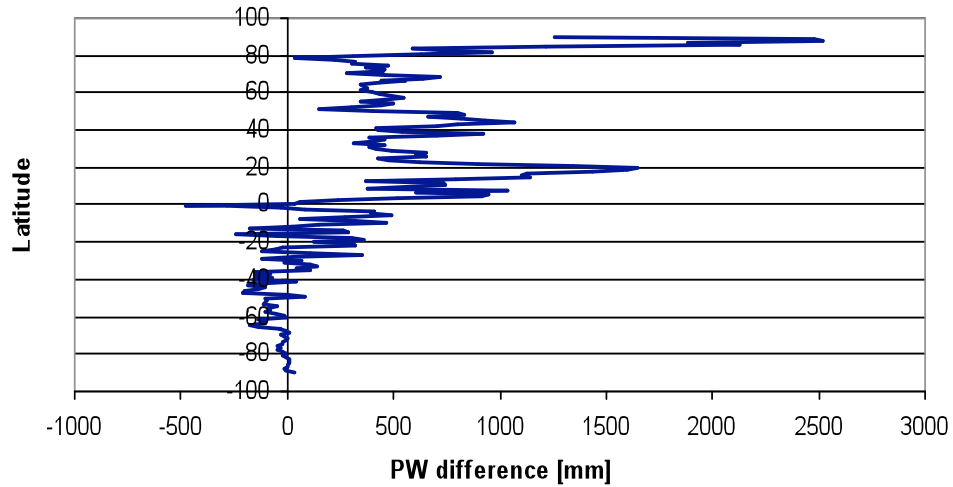
24 hour forecast
precipitable water
difference (experiment
– control).

August 2007





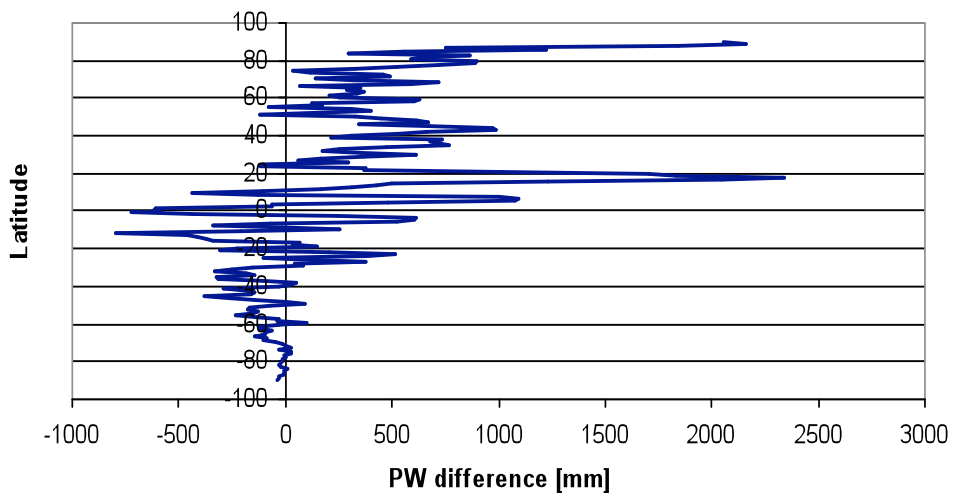
Precipitable Water Difference
Analysis
August 2007



The Northern Hemisphere
starts with more moisture

.....

Precipitable Water Difference
24 Hr Fcst.
August 2007



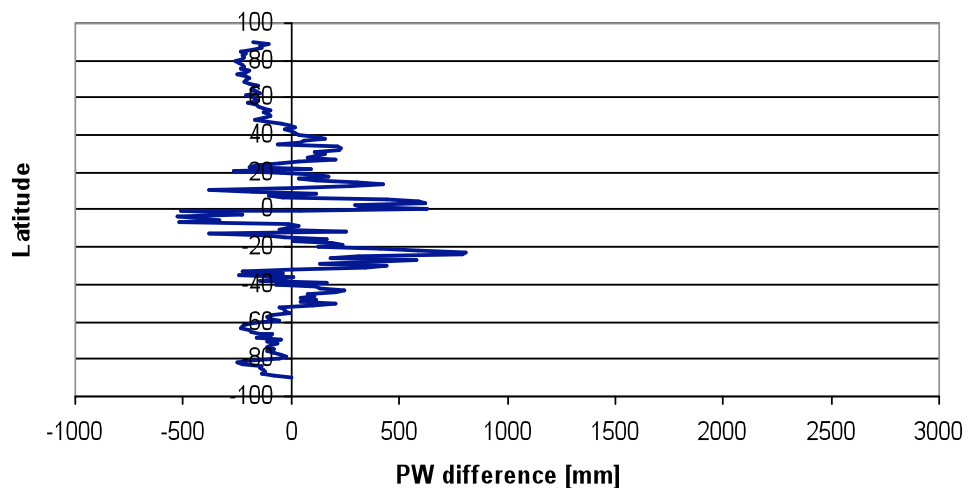
..... and keeps most of it
through 24 hours.

Southern Hemisphere is dryer.





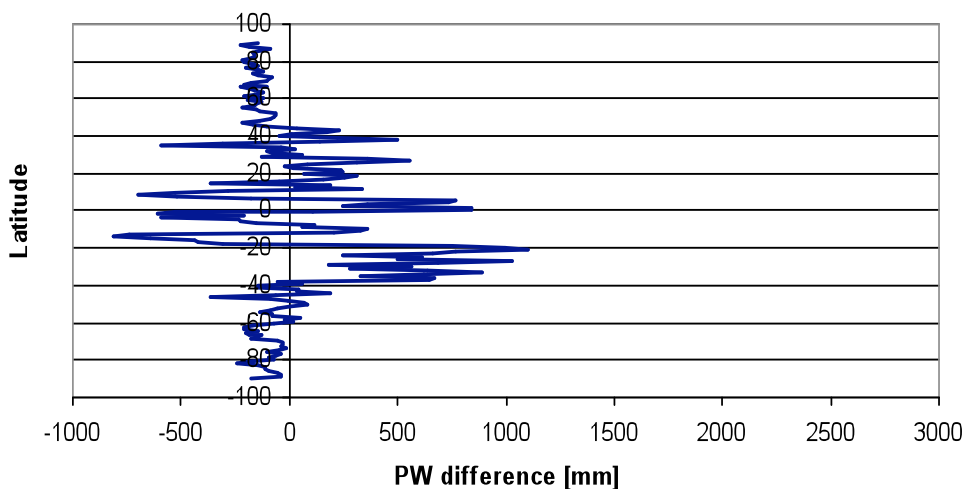
Precipitable Water Difference Analysis January 2008



The Mid-Latitudes starts
with less moisture

January 2008

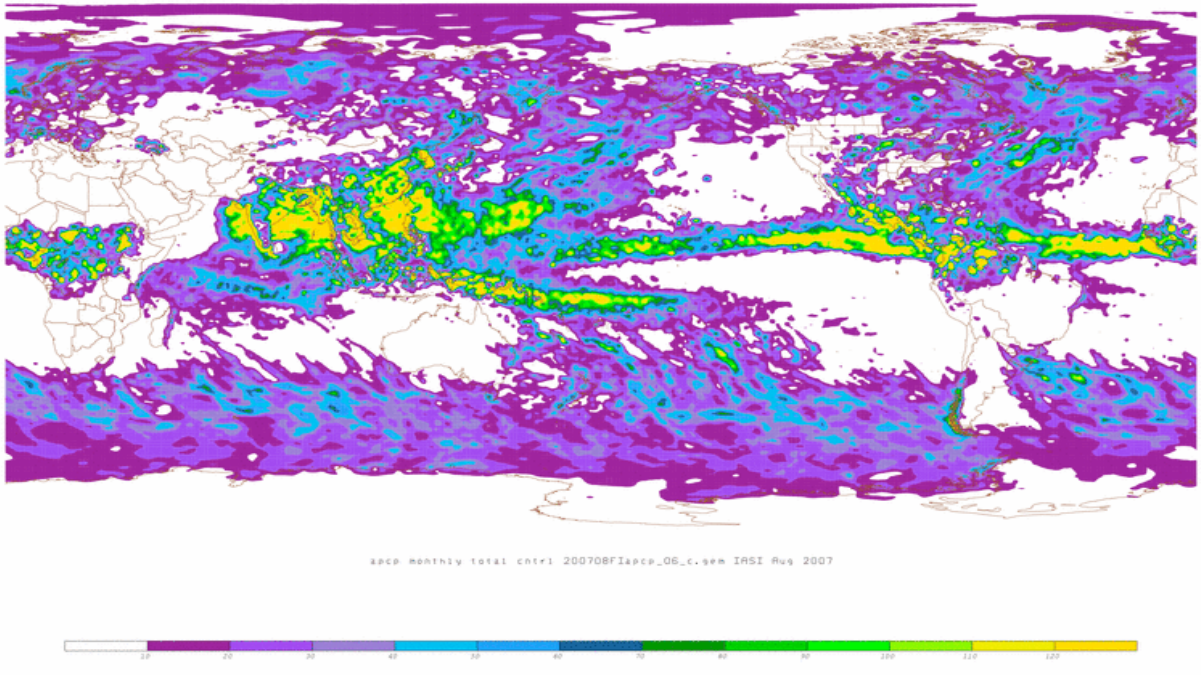
Precipitable Water Difference 24 Hr Fcst. January 2008



..... and remain dryer through
24 hours.

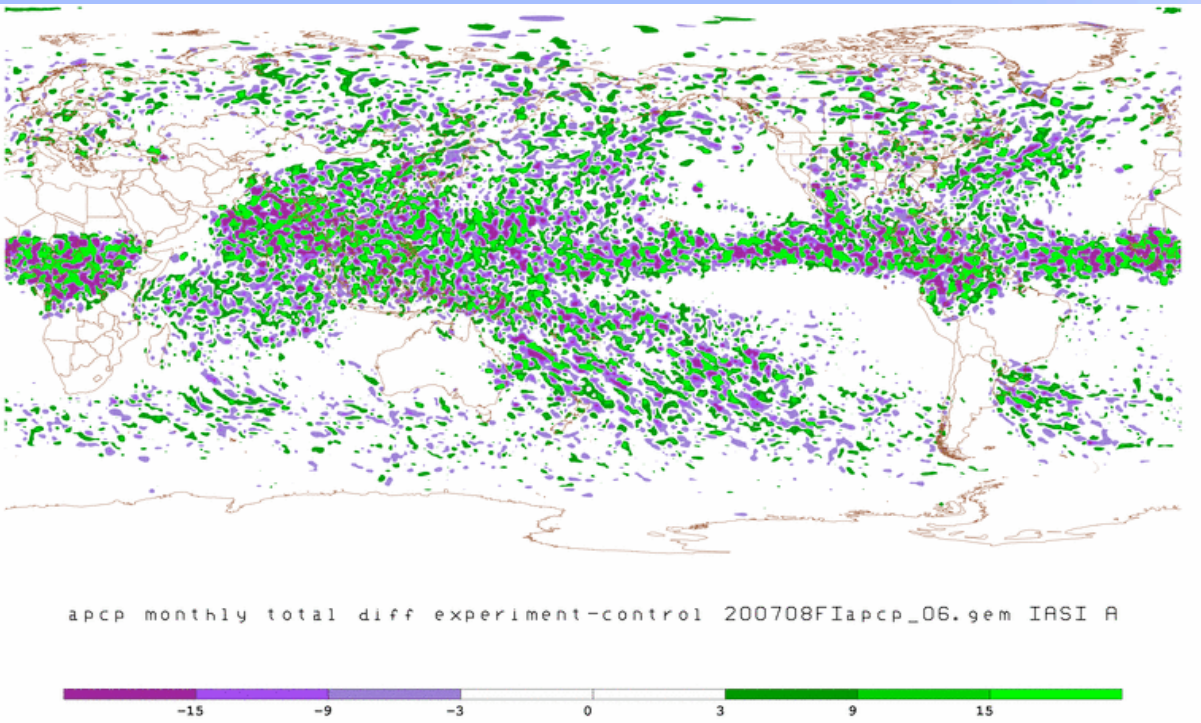
January 2008





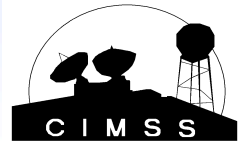
6 hour precipitation totals from the 0-6 hour forecast.

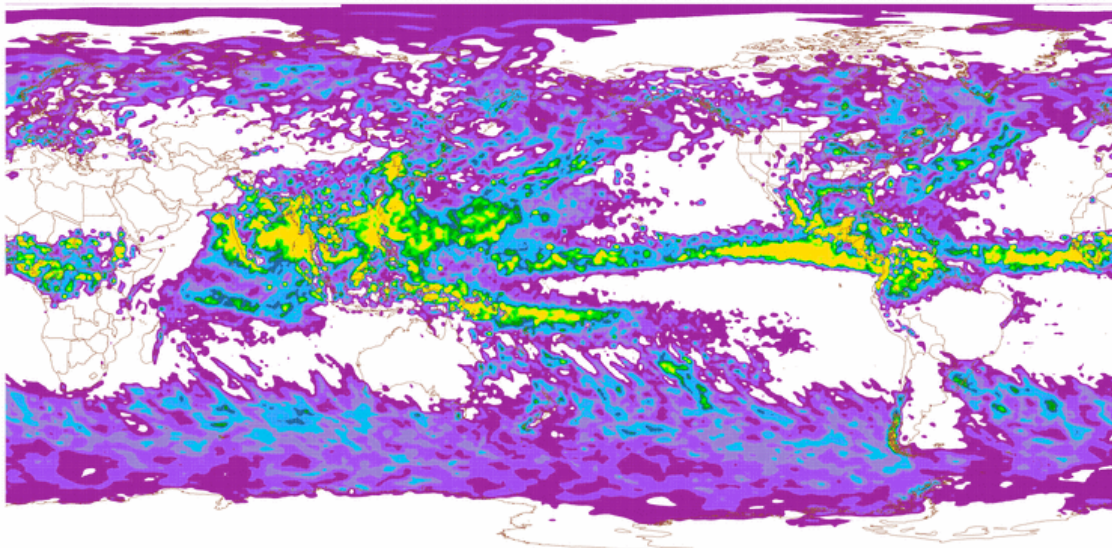
August 2007



Difference in 6 hour precipitation totals from the 0-6 hour forecast (experiment – control).

August 2007



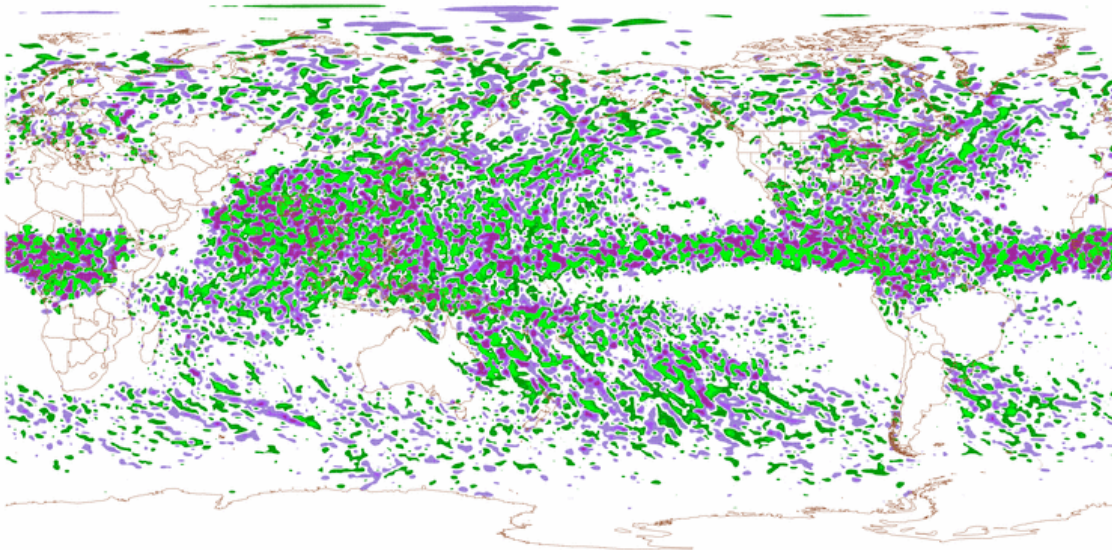


apcp monthly total cntri 200708FIapcp_24.gem IASI Aug 2007



6 hour precipitation totals from the 18-24 hour forecast.

August 2007



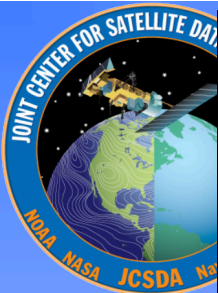
apcp monthly total diff experiment-control 200708FIapcp_24.gem IASI A



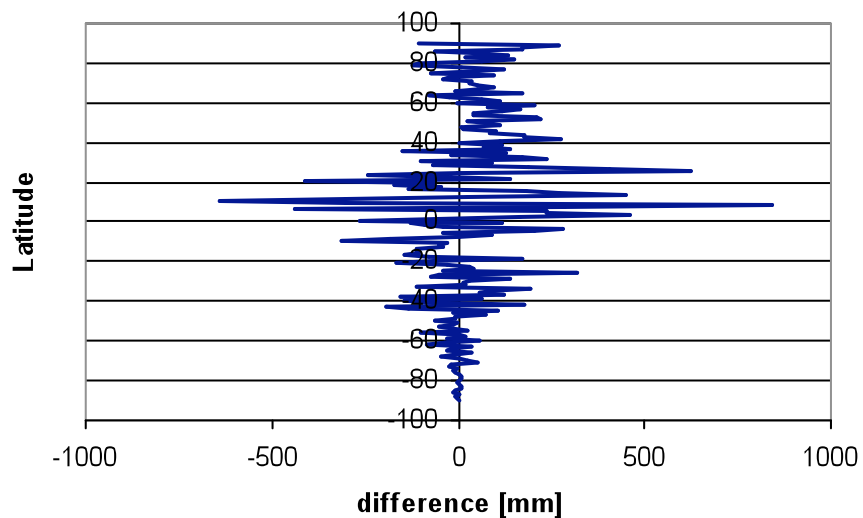
Difference in 6 hour precipitation totals from the 18-24 hour forecast.

August 2007





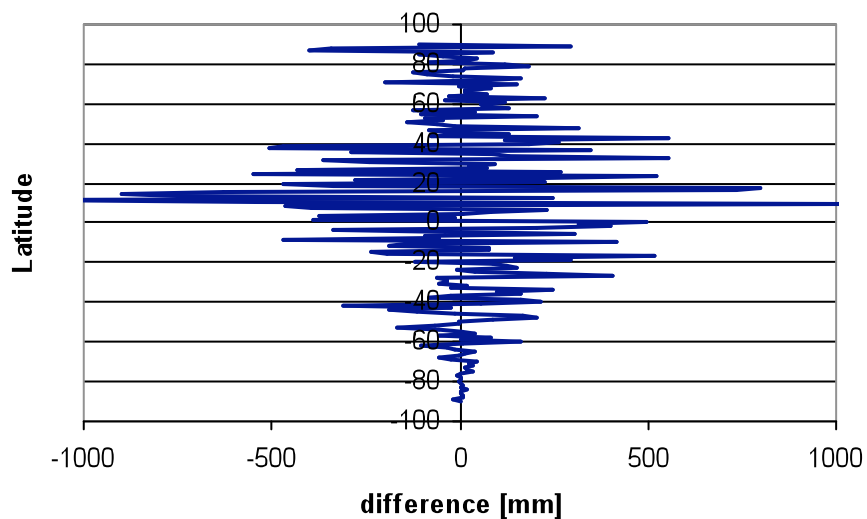
**0-6 hour precipitation differences
August 2007**



More rainfall in Northern Hemisphere after initialization.

August 2007

**18-24 hour precipitation differences
August 2007**



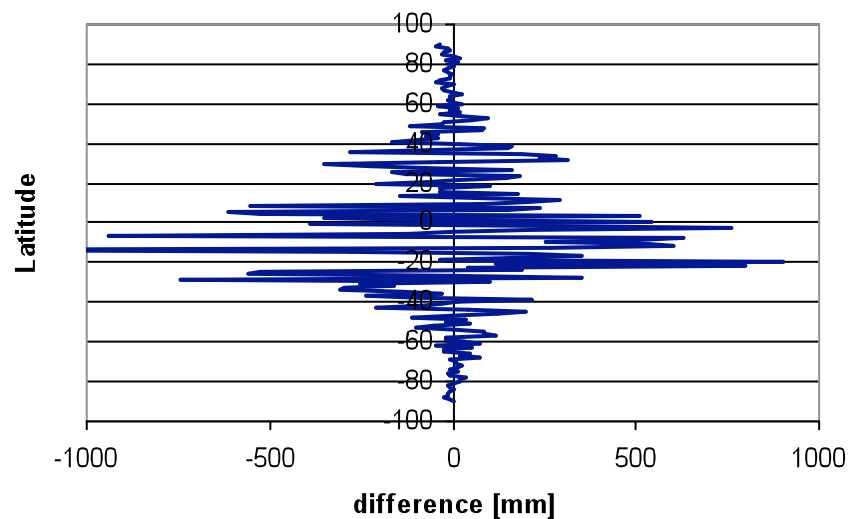
Less rainfall in Tropics at 24 hours.

August 2007





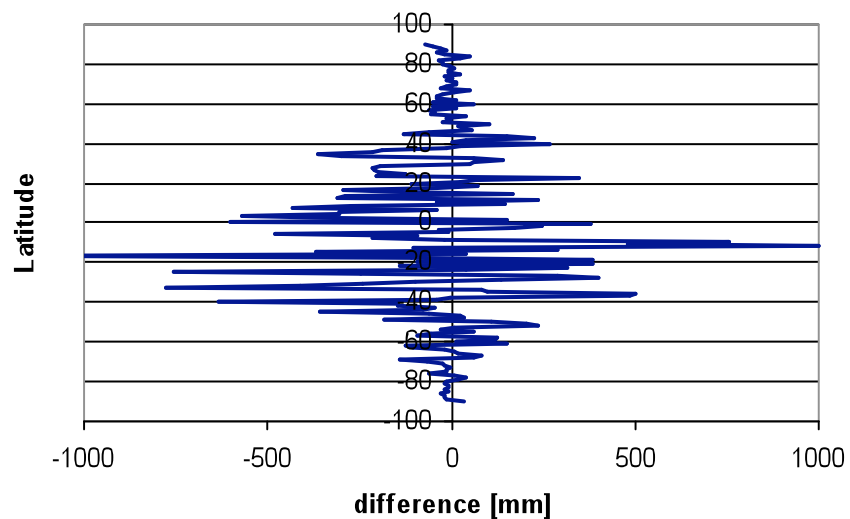
**0-6 hour precipitation differences
January 2008**



More variability by latitude than in August 2007.

January 2008

**18-24 hour precipitation differences
January 2008**

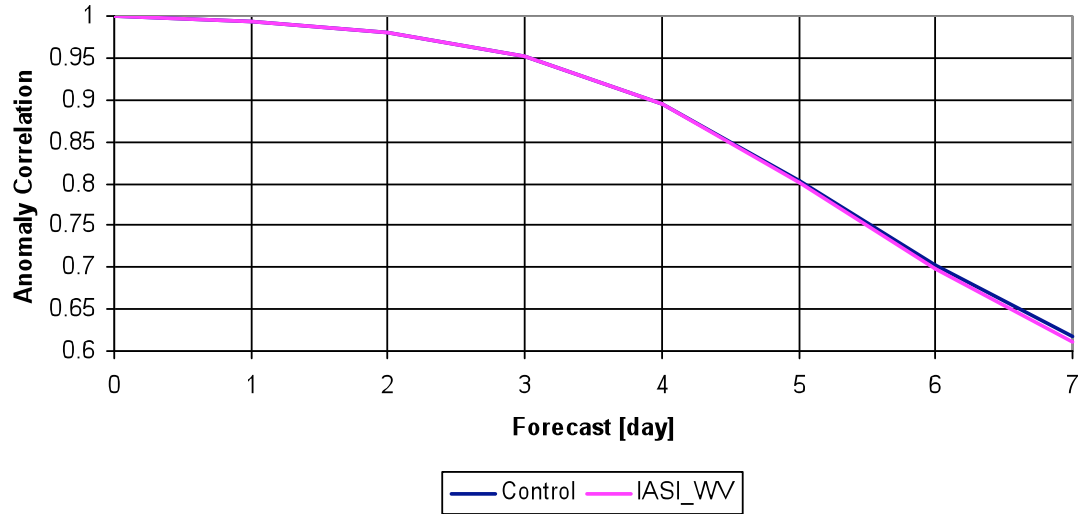


No major trend with forecast time.

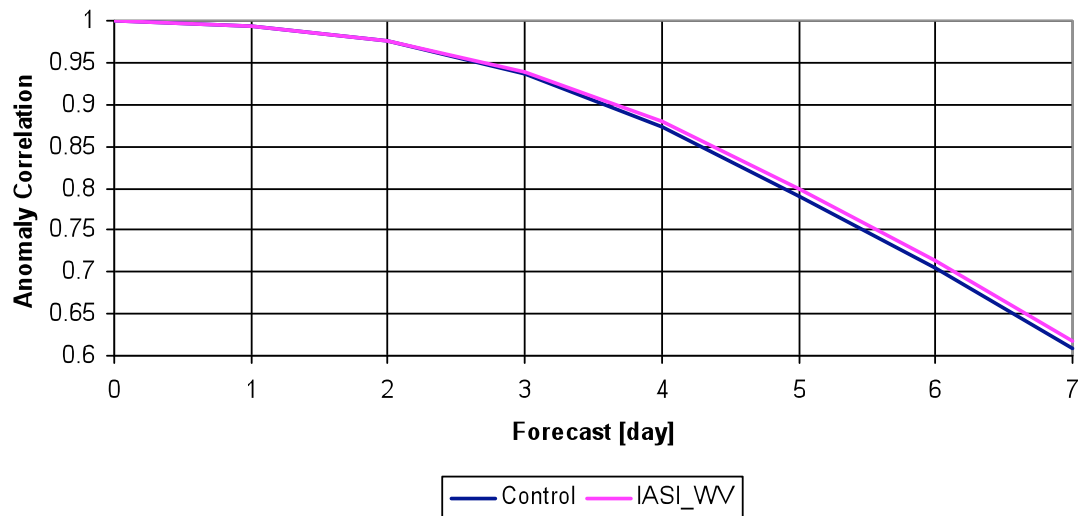
January 2008



N. Hemisphere 500 hPa AC Z
20N - 80N Waves 1-20
1 Aug - 31 Aug 2007

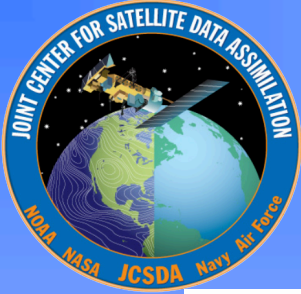


S. Hemisphere 500 hPa AC Z
20S - 80S Waves 1-20
1 Aug - 31 Aug 2007



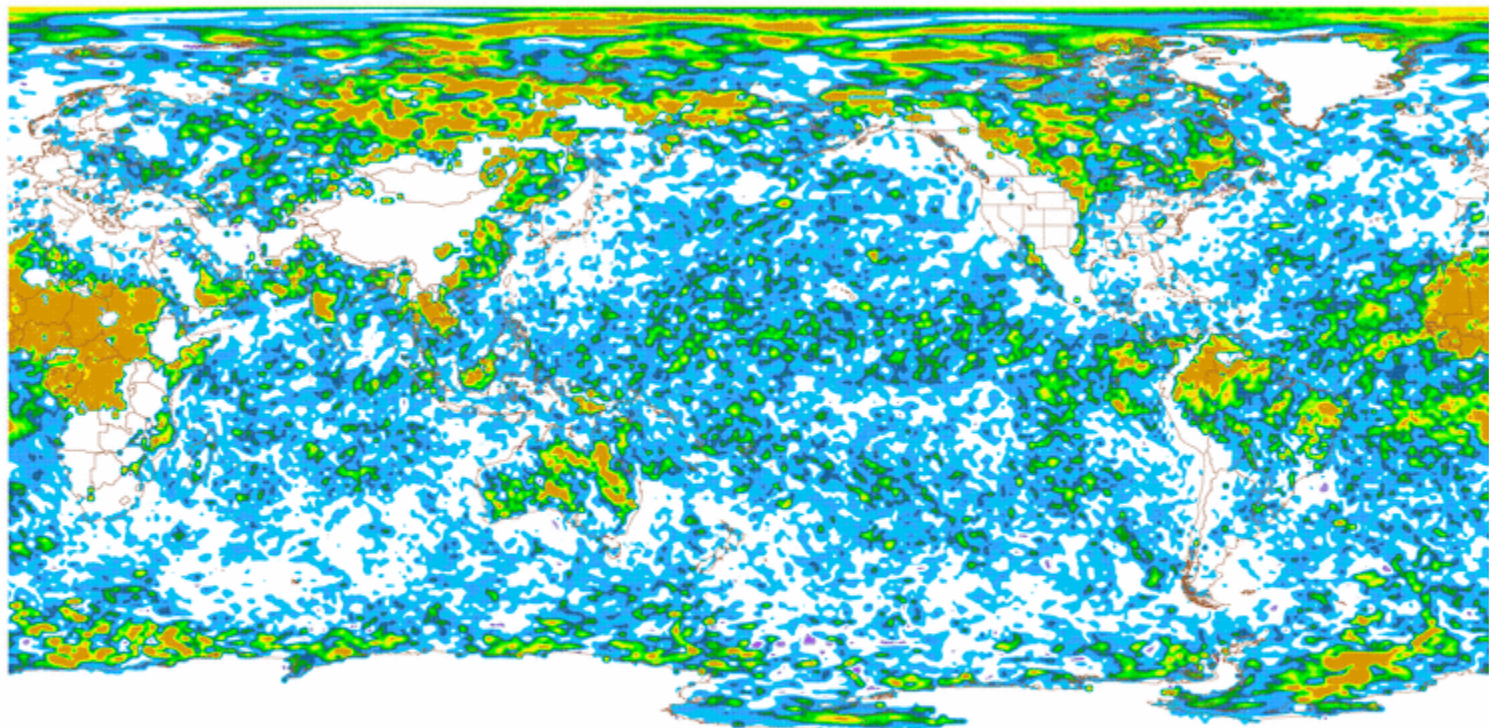
Anomaly correlations are mostly neutral





Forecast Impact of 925 hPa Relative Humidity

6 hour forecast

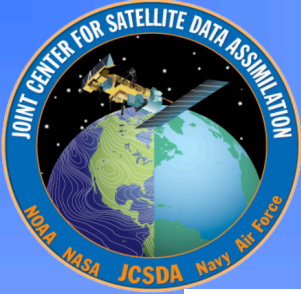


RH 925hPa FCST IMPACT 6HR IASI Aug 2007



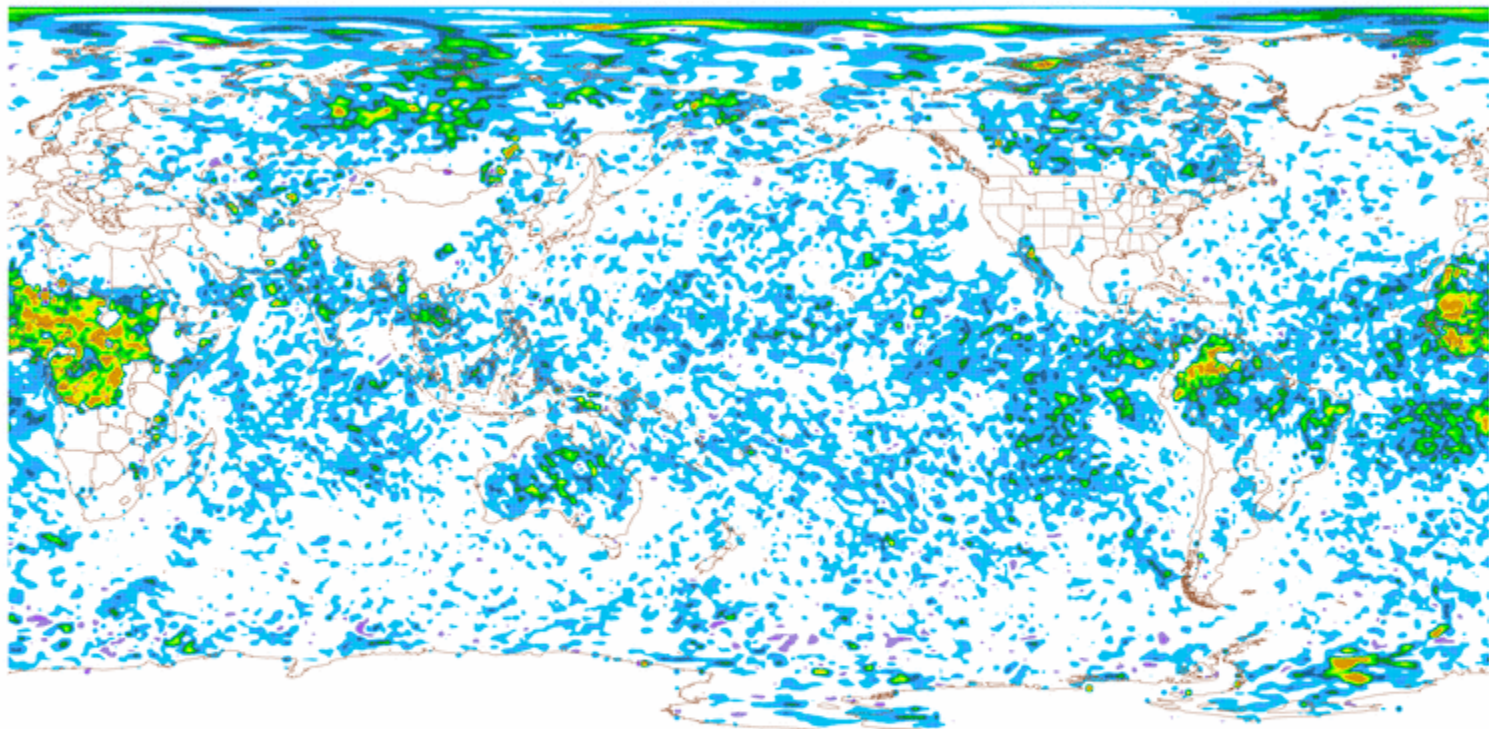
Values near zero or underground are white





Forecast Impact of 925 hPa Relative Humidity

12 hour forecast

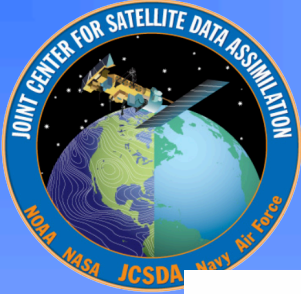


RH 925hPa FCST IMPACT 12HR IASI Au9 2007



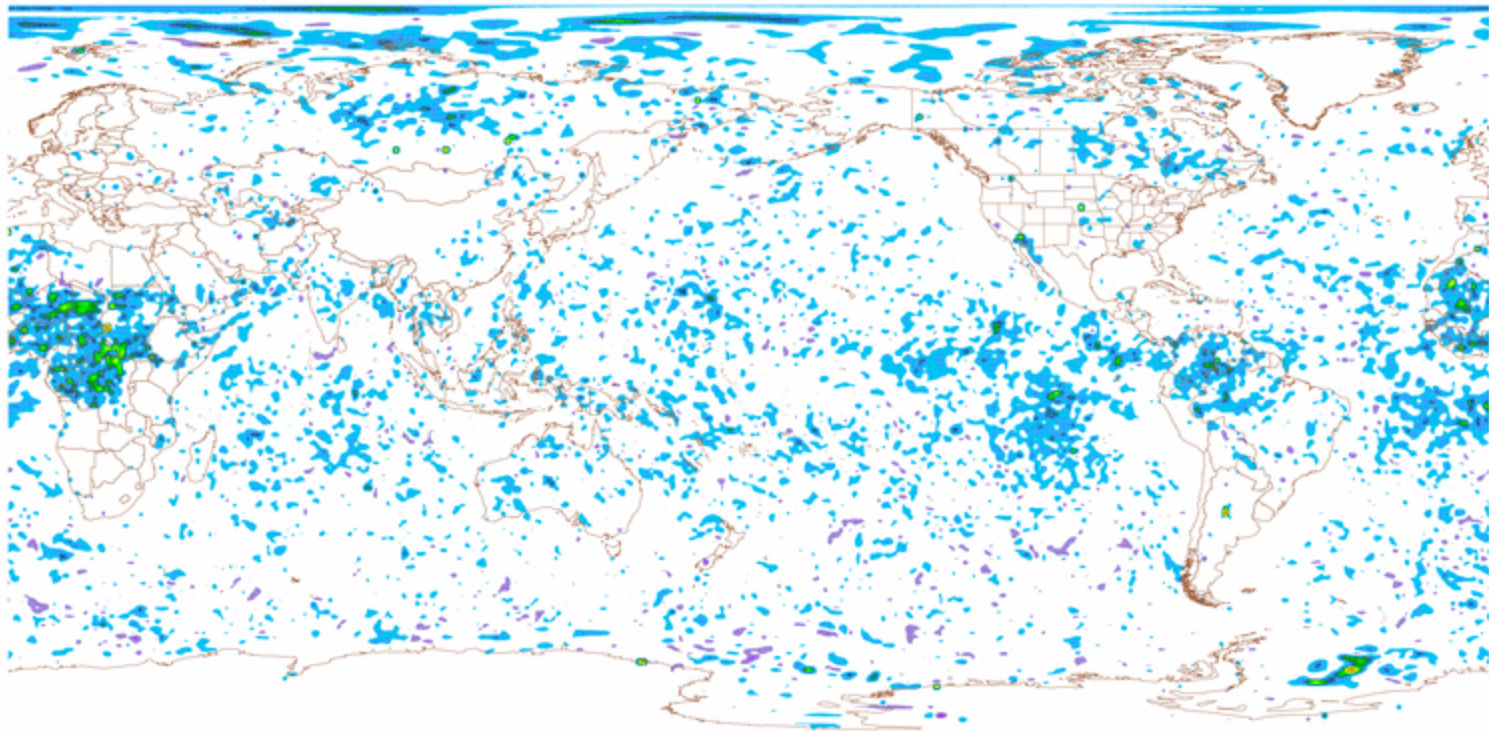
Values near zero or underground are white





Forecast Impact of 925 hPa Relative Humidity

24 hour forecast

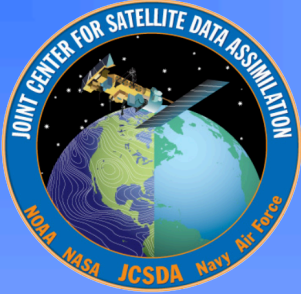


RH 925hPa FCST IMPACT 24HR IASI Au9 2007



Values near zero or underground are white

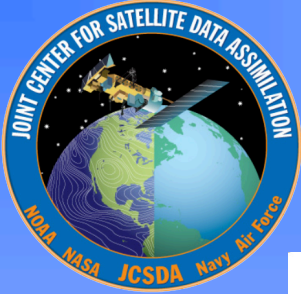




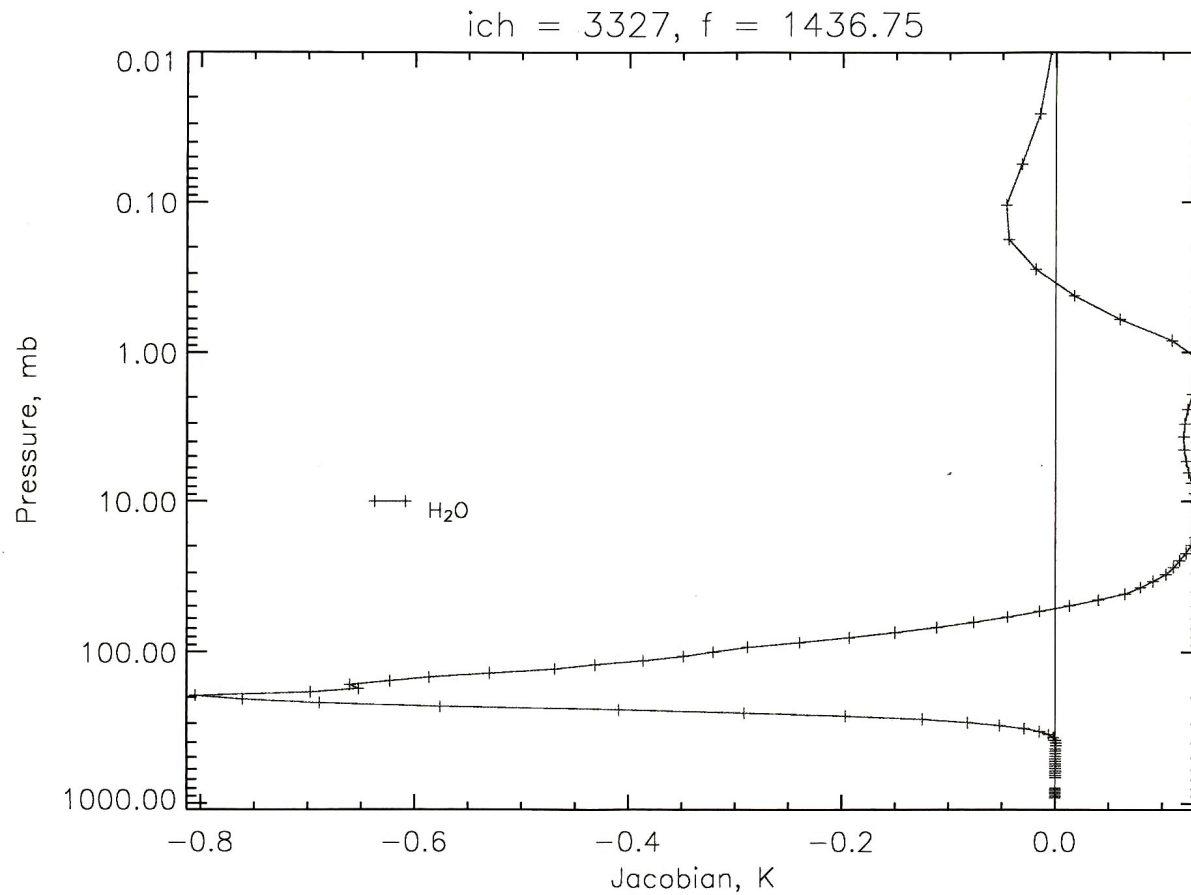
Water Vapor Channel Issues to be resolved

- Assimilation
 - Convergence
 - Stratosphere moisture Jacobians
 - Constraining supersaturation
 - Constraining negative moisture
- Model moisture
 - Precipitable water/ relative humidity
 - Precipitation



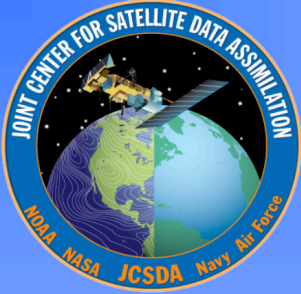


IASI Water Vapor Jacobian



From Chris Barnet

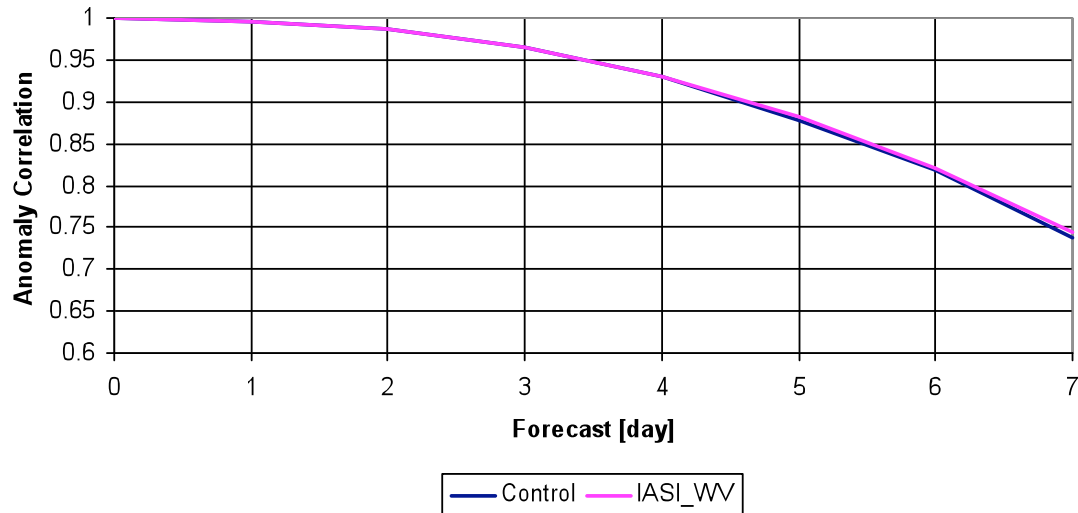




End



N. Hemisphere 500 hPa AC Z
20N - 80N Waves 1-20
15 Dec 2007 - 15 Jan 2008



S. Hemisphere 500 hPa AC Z
20S - 80S Waves 1-20
15 Dec 2007 - 15 Jan 2008

