

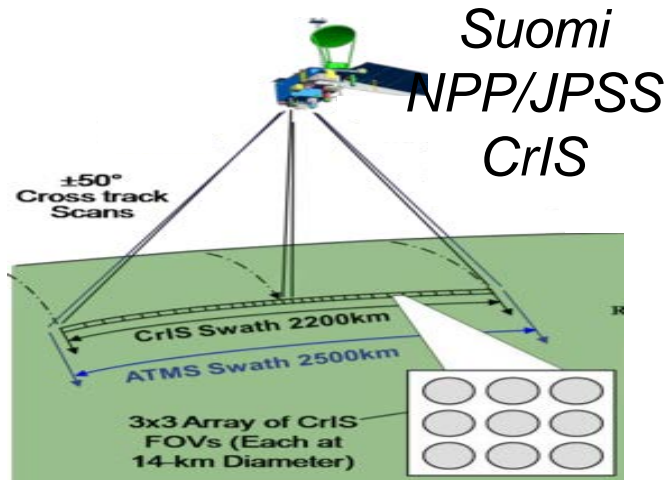
Observations of Atmospheric Dynamics From Consecutive CrIS and AIRS Measurements

W. L. Smith Sr.^{1,2,3}, E. Weisz², Tobin², Revercomb², Larar³

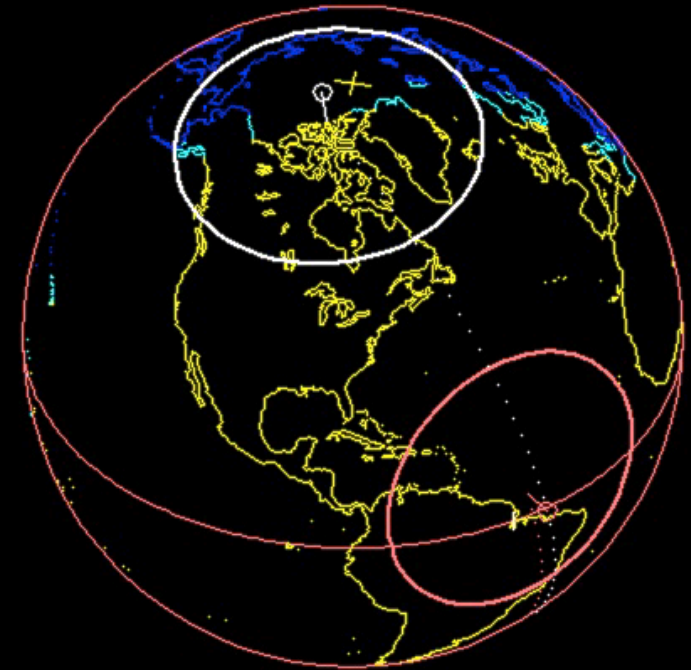
¹ Hampton University, ² University of Wisconsin-Madison, NASA/LaRC

18th International TOVS Study Conference

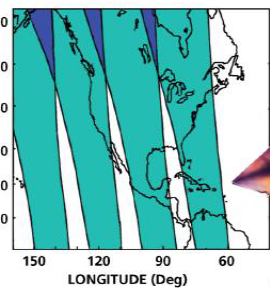
21 - 27 March 2012, Toulouse, France



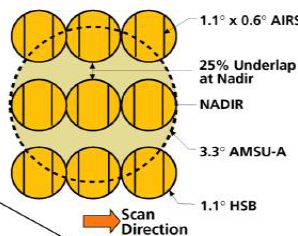
NPP	12062.8791	7202.18	98.71	101.44	824.18
AQUA	12061.3531	7077.72	98.22	98.83	699.72
METOPA	12060.6586	7195.64	98.71	101.30	817.64



TYPICAL ONE-DAY SCAN PATTERN



AIRS/AMSU IFOV



AIRS SCAN GEOMETRY

- Altitude: 705 km
- Scan Period: 2.667 s
- Ground Footprints: 90/Scan

Comparison of CrIS and AIRS

CrIS

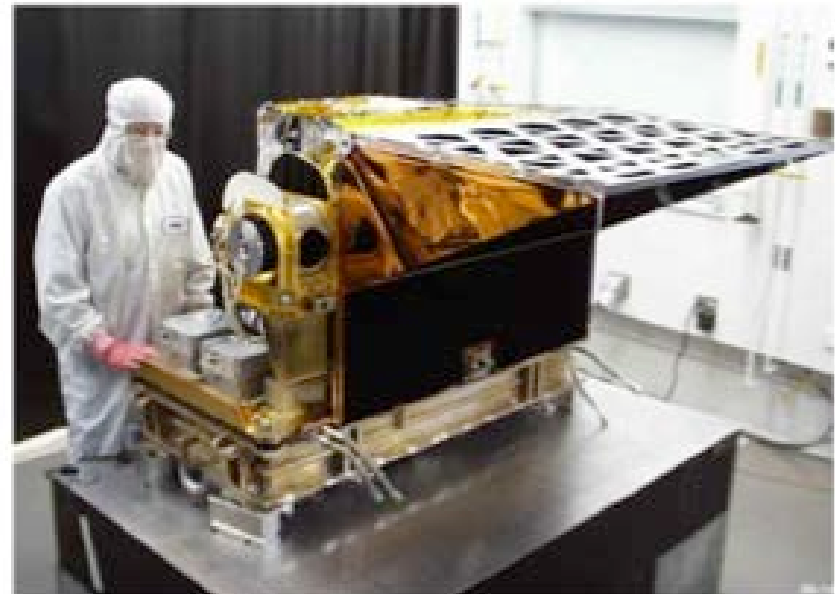
Cross-track Infrared Sounder
Michelson interferometer
146 kg, 110 W
3x3 14 km FOVs at nadir, contiguous
Launched on Suomi NPP in 2011



80 x 47 x 56 cm

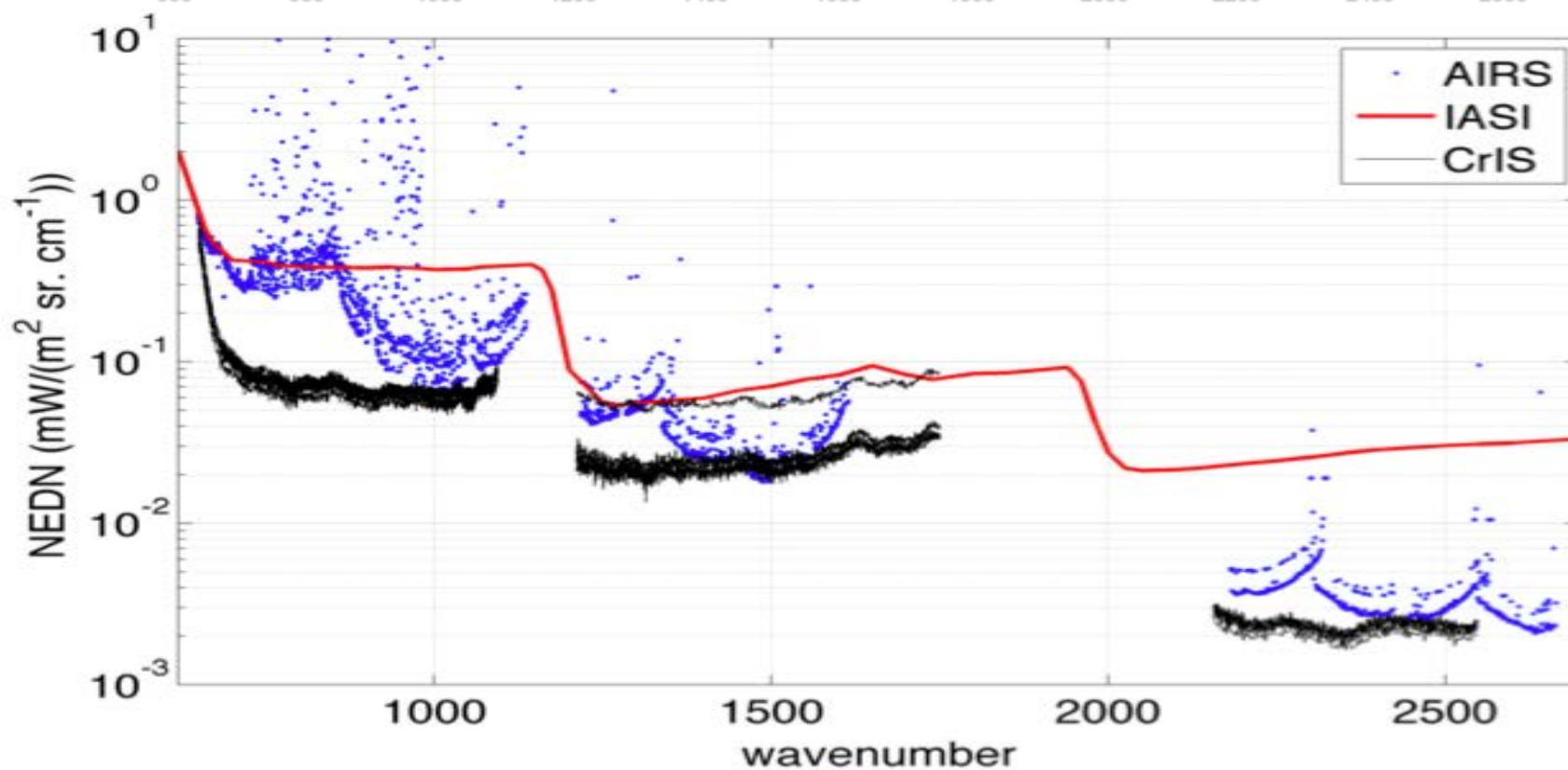
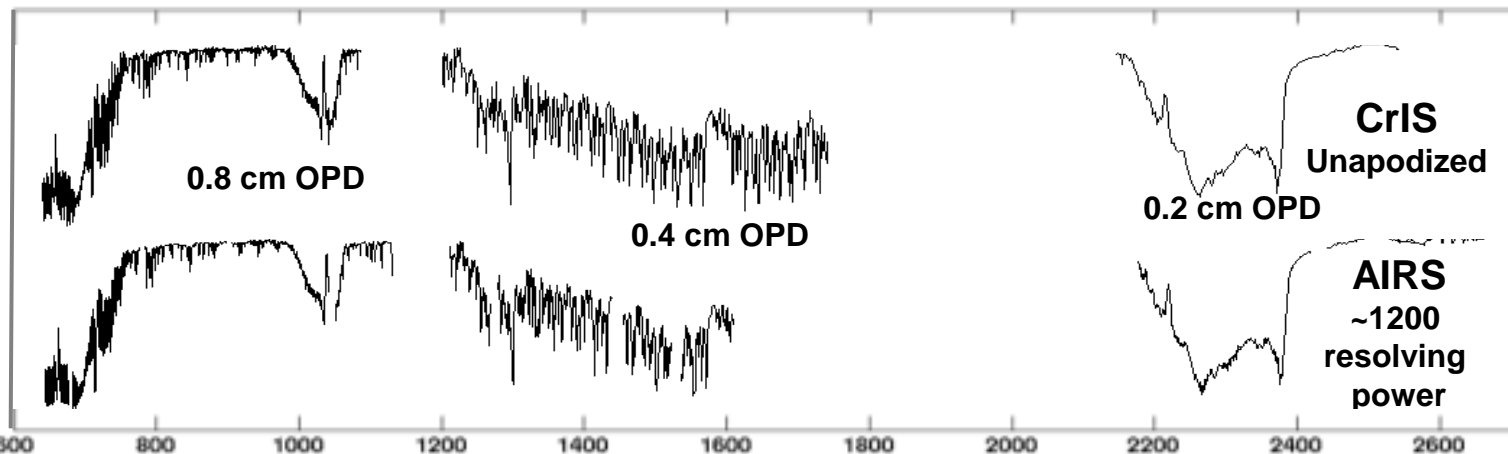
AIRS

Atmospheric InfraRed Sounder
Grating spectrometer
166 kg, 256 W
13.5 km FOV at nadir, contiguous
Launched on Aqua in 2002

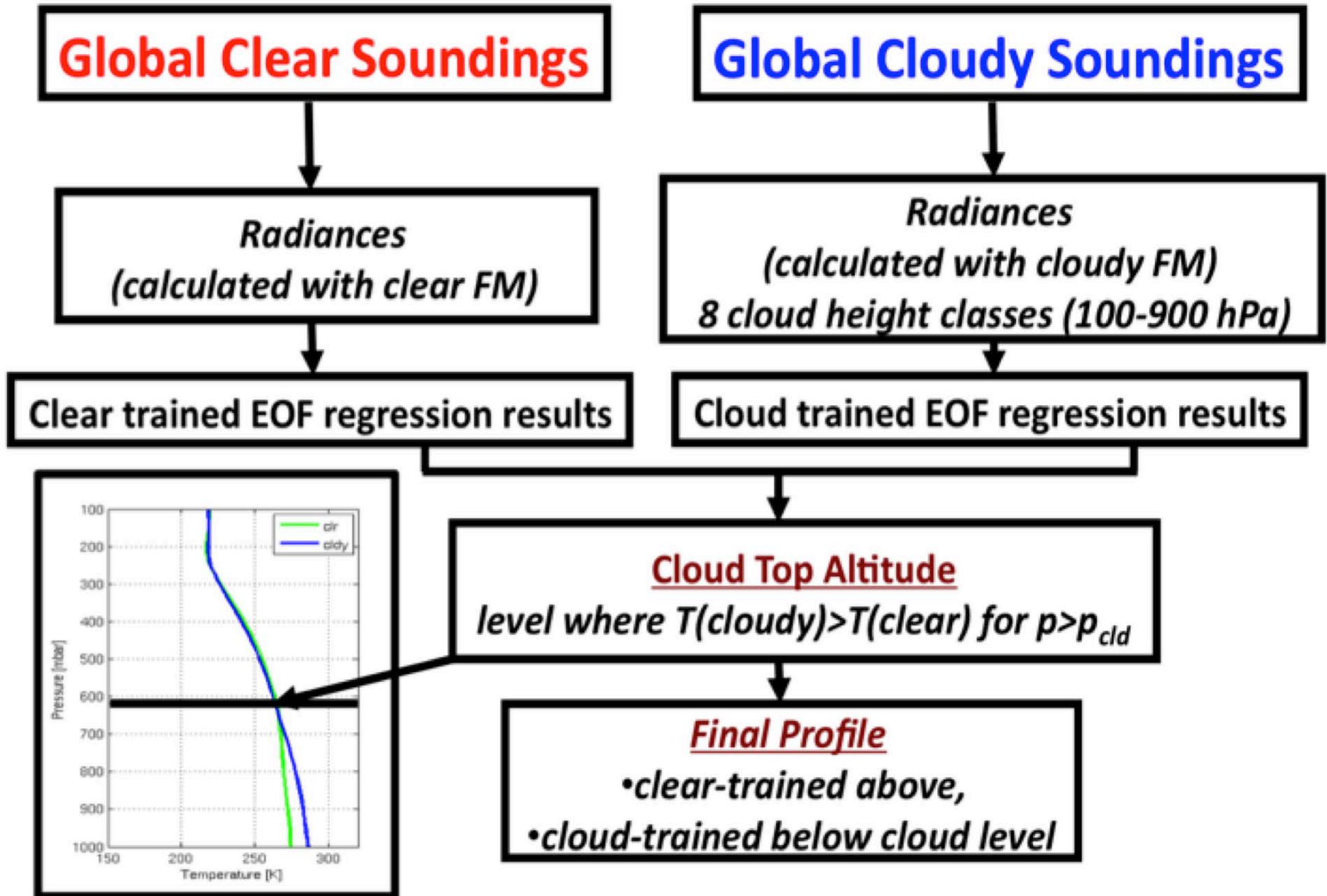


139.7 x 151.2 x 76.2 cm

Spectral Coverage, Resolution, and Noise

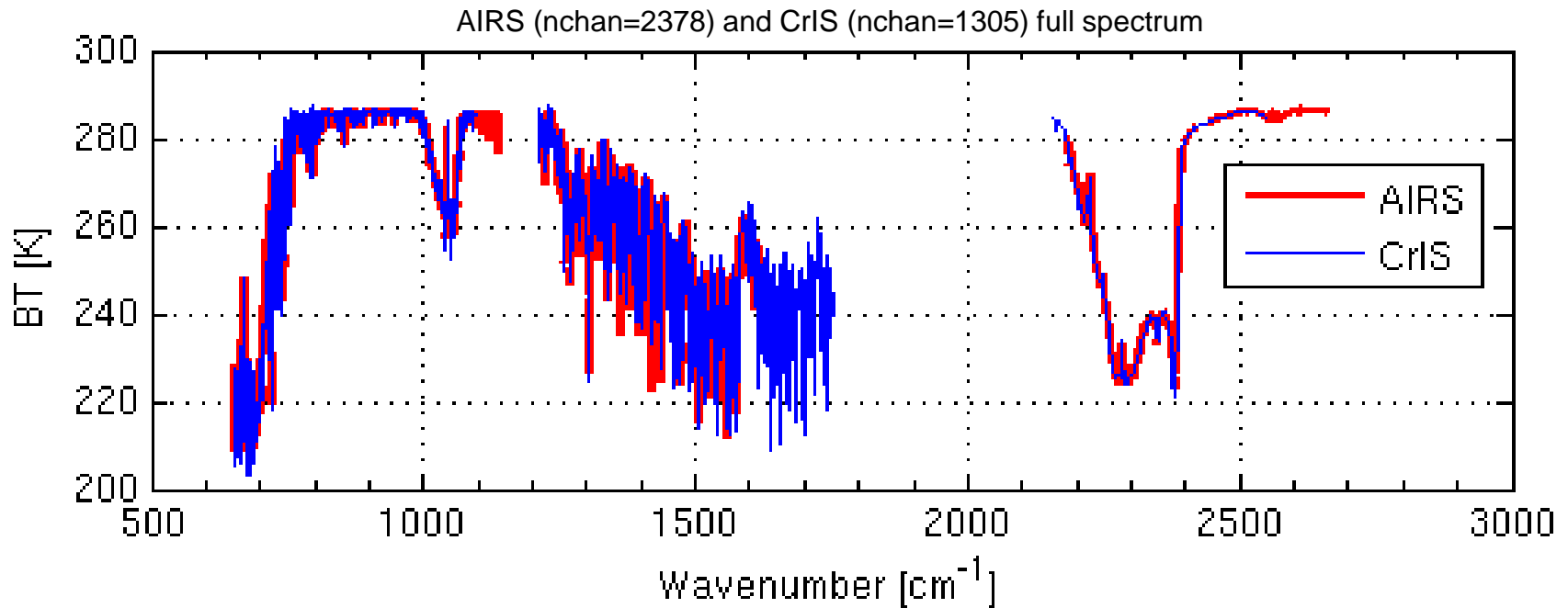


Dual-Regression Retrieval Method



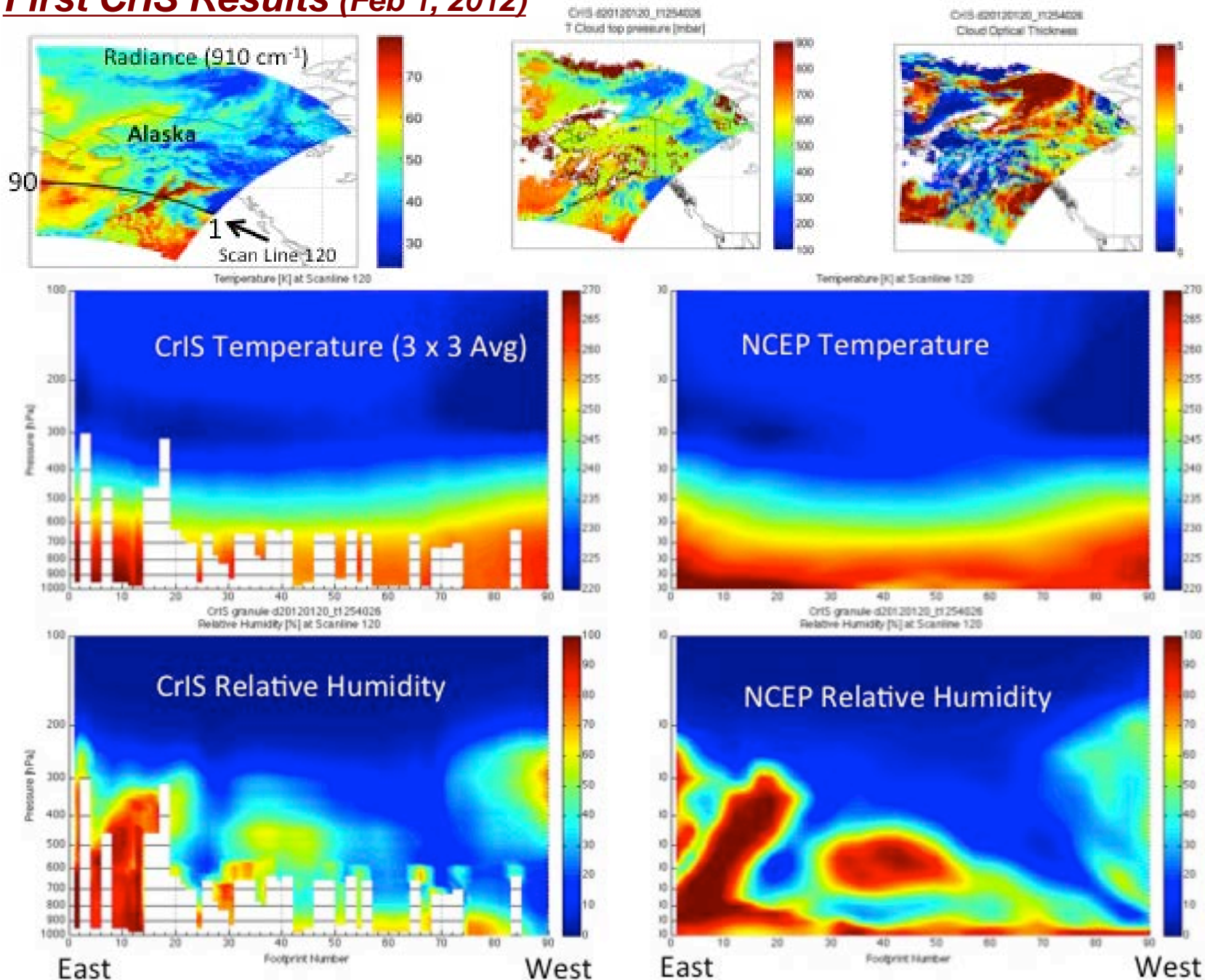
* **Cirrus cloud-top:** Level above 300-hPa and T-cloud top where $RH > 99\%$

AIRS and CrIS spectrum



- In the retrieval channels up to 2400 cm^{-1} are used.
 - AIRS = 1449
 - CrIS = 1245

First CrIS Results (Feb 1, 2012)



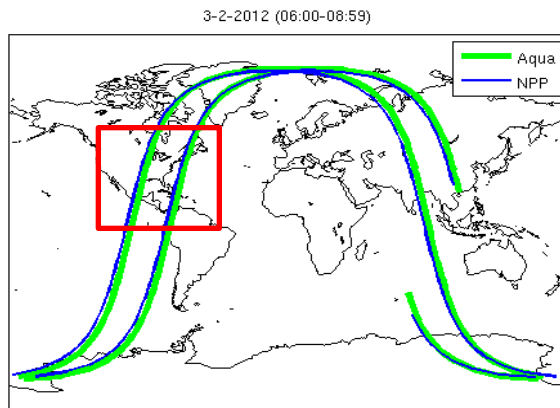


movie

Aqua and NPP orbits over North America on March 2, 2012

AIRS granules

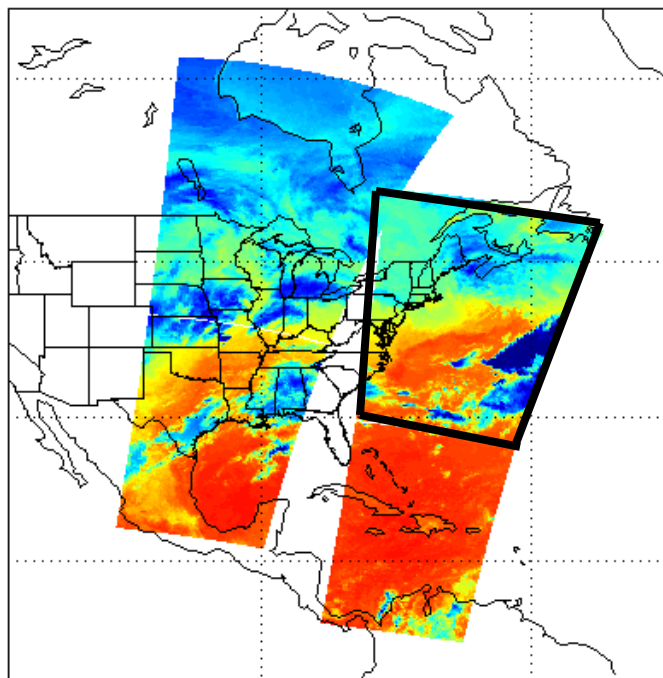
Start times: 06:29, 06:35,
08:05, 08:11 UTC
AIRS granule size: 90x135
(12150 FOVs)
4 granules in total



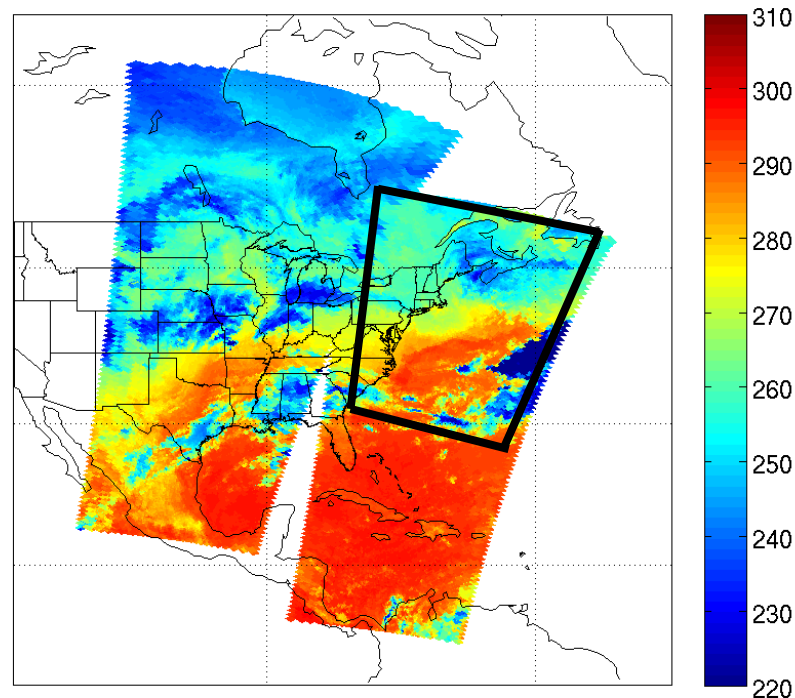
CrIS granules

eastern/western orbit start
times: 06:25/08:07 UTC
CrIS granule size: 90x12
(1080 FOVs)
46 granules in total

AIRS 2012.03.02 descending
Brightness Temperature [K] at 912.0 cm^{-1}

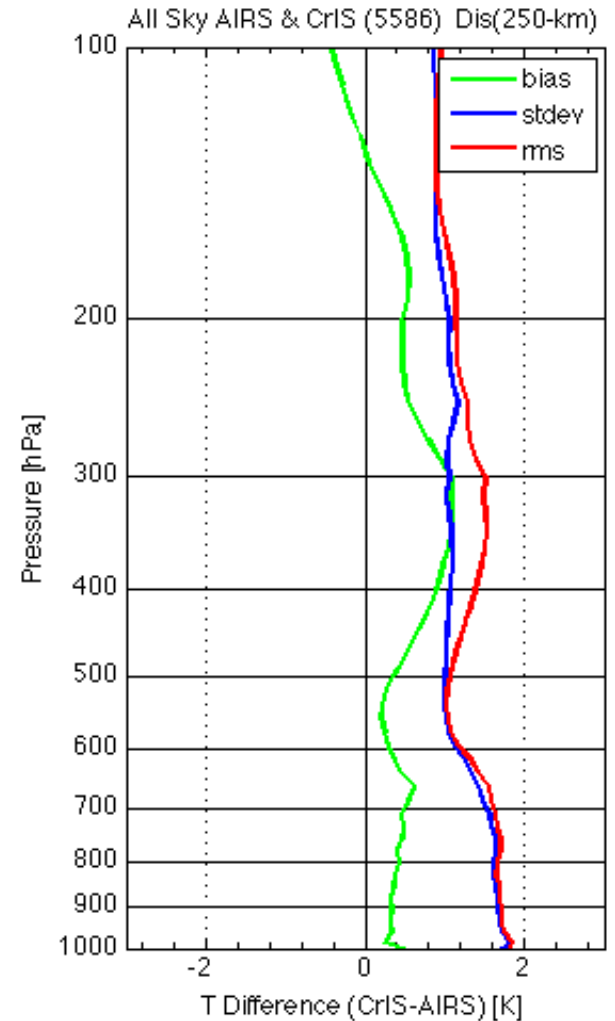
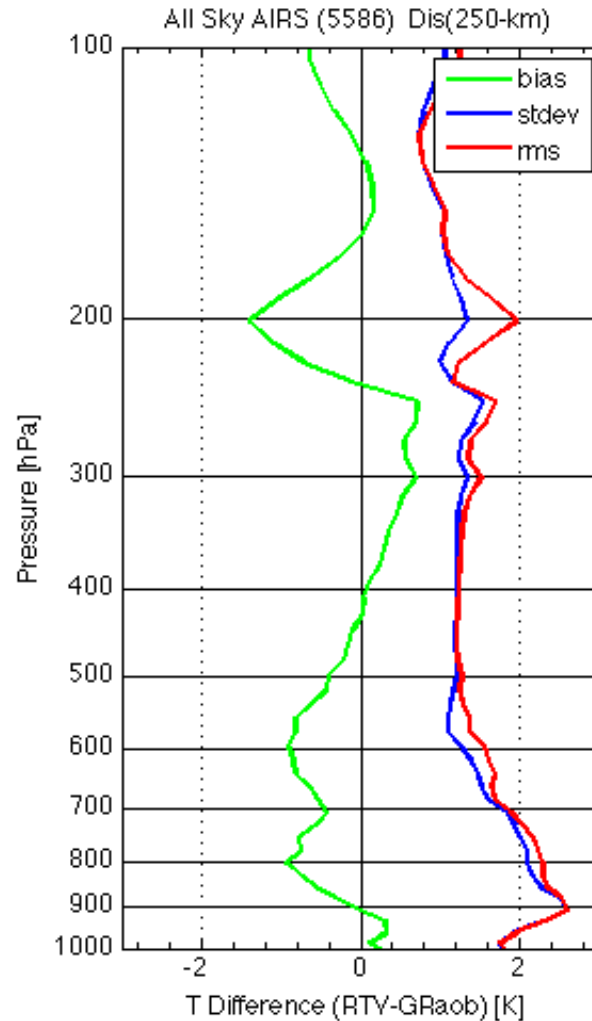
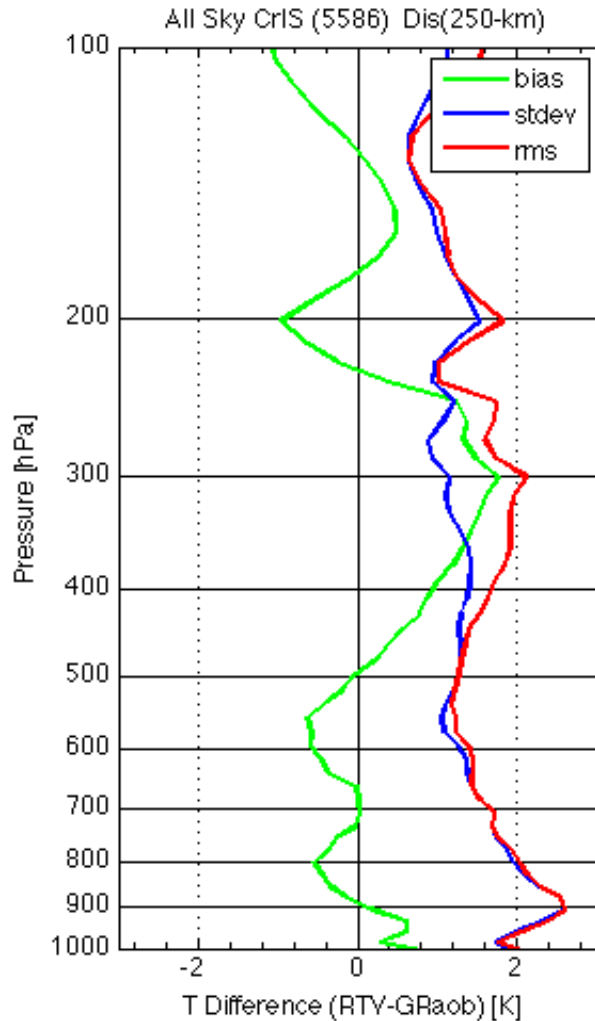


CrIS 20120302
Brightness Temperature [K] at 910.0 cm^{-1}



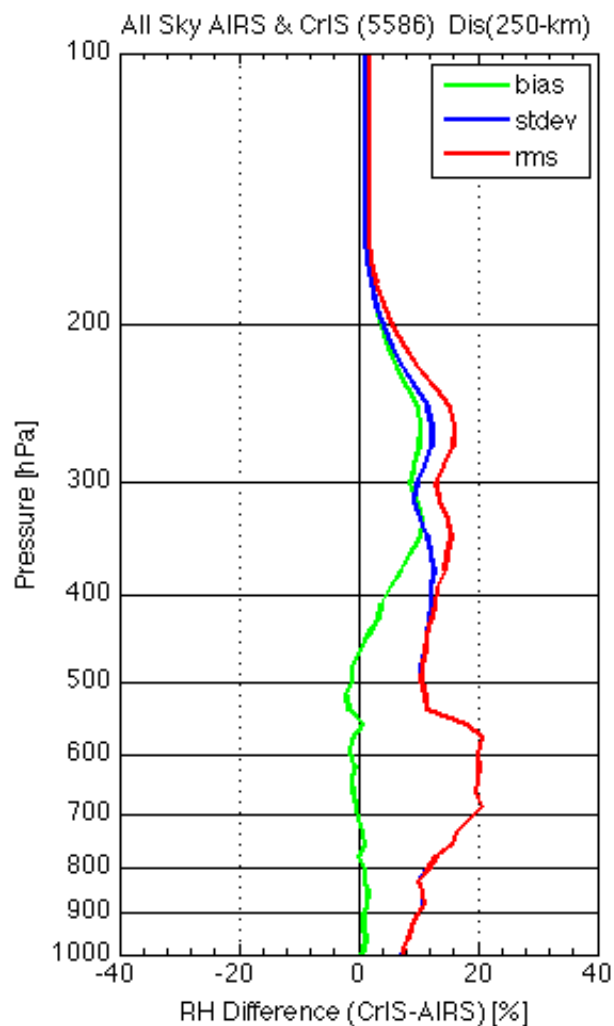
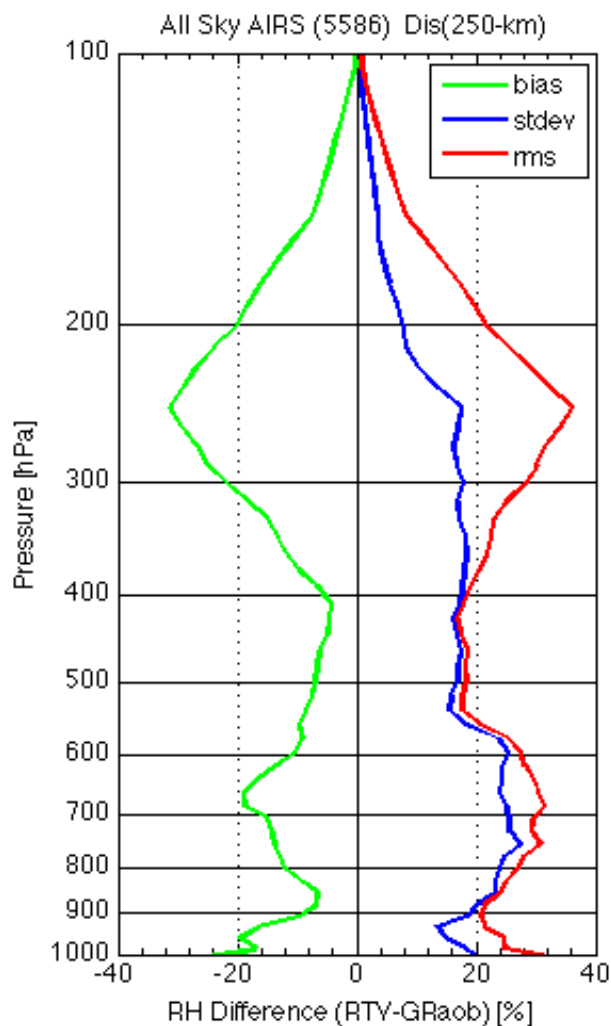
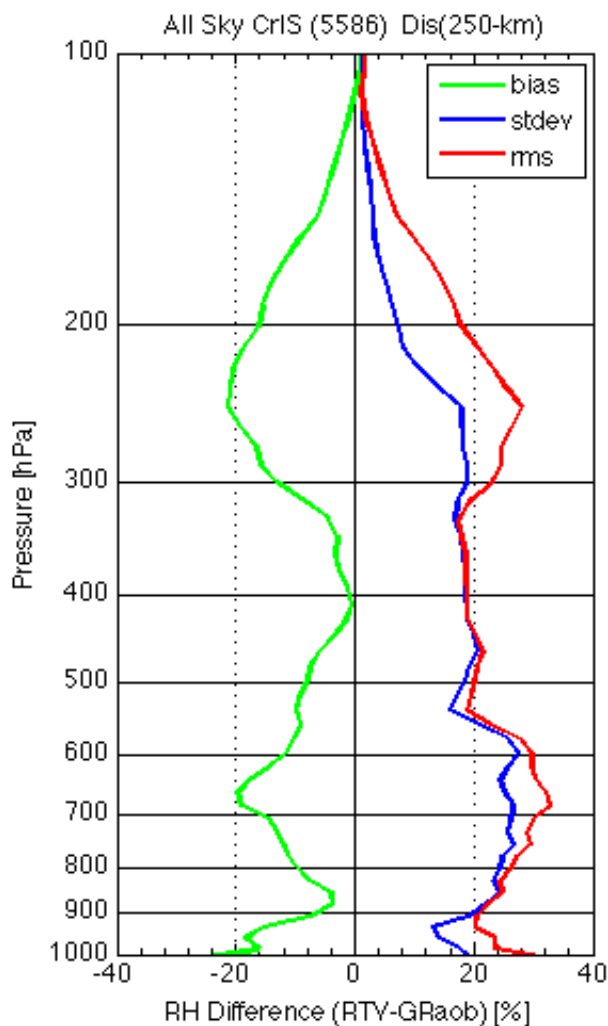
CrIS vs AIRS vs Raob Analyses

Temperature



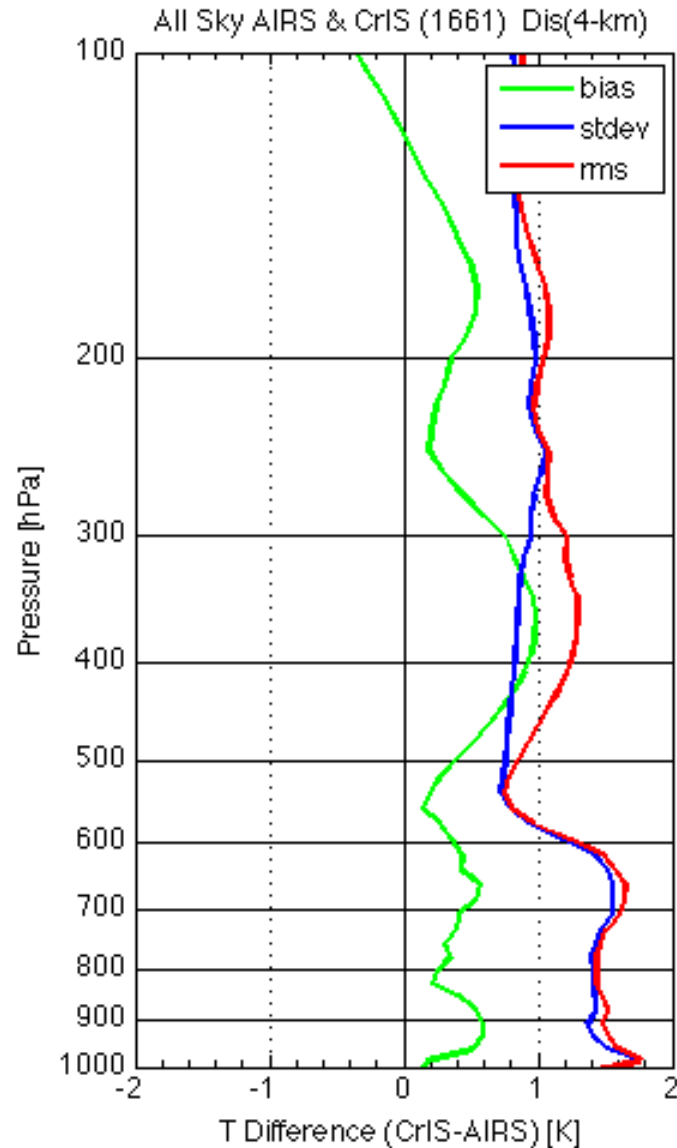
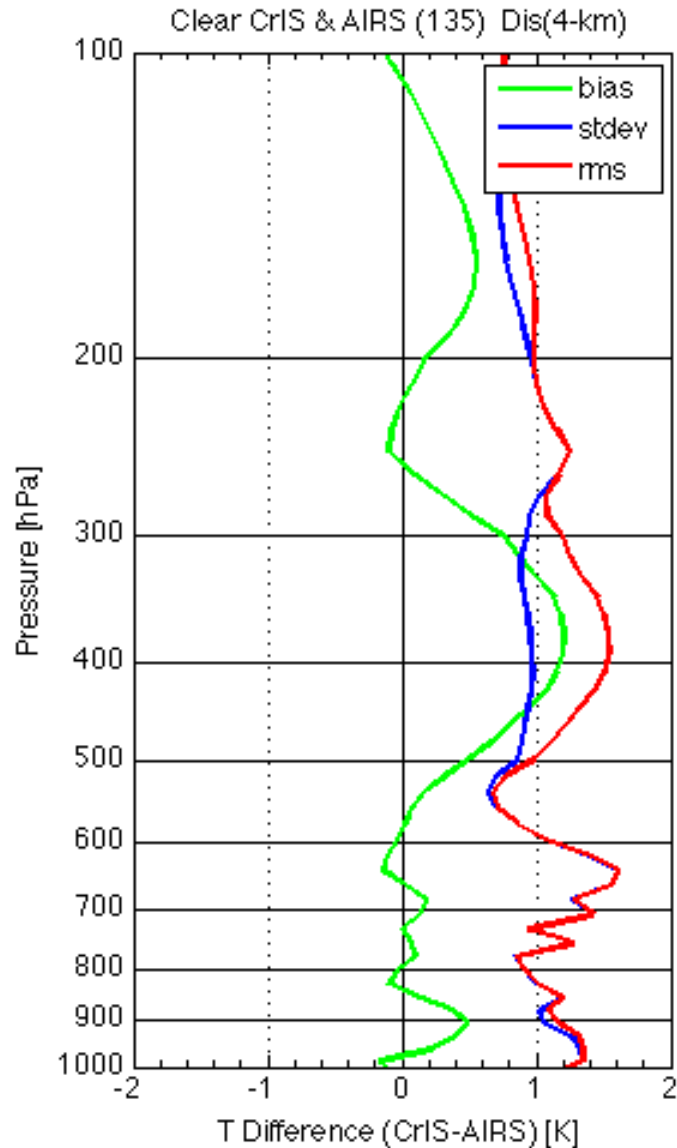
CrIS vs AIRS vs Raob Analyses

Relative Humidity



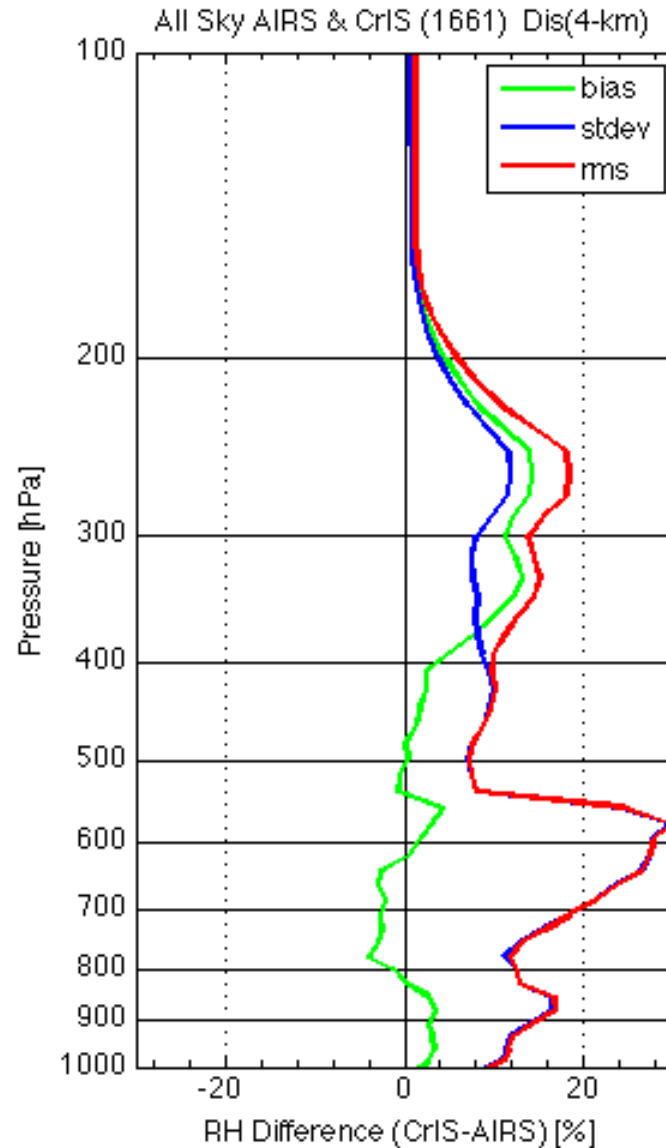
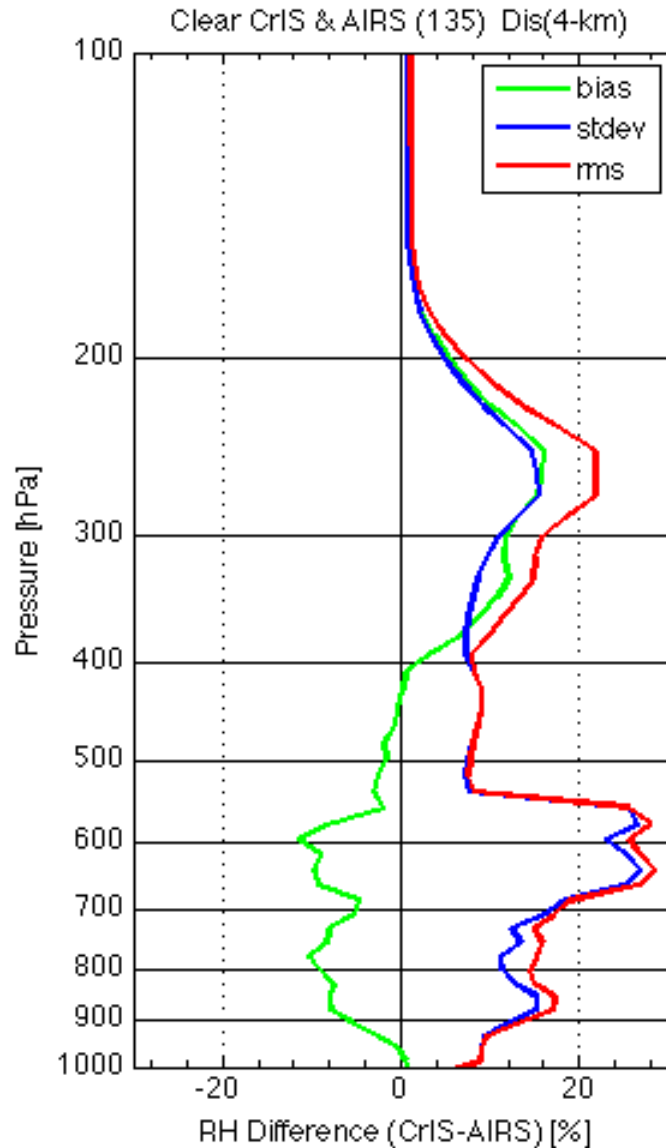
CrIS – AIRS Statistics

Temperature



CrIS – AIRS Statistics

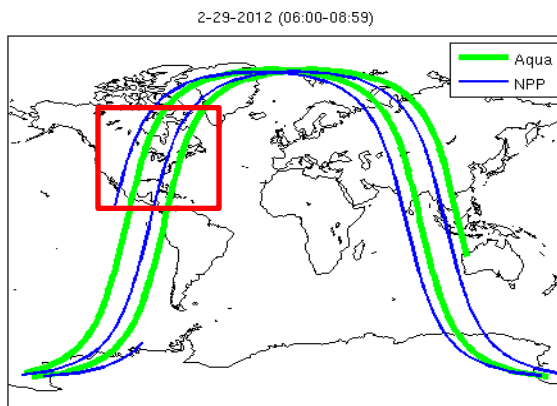
Relative Humidity



Aqua and NPP orbits over North America on Feb. 29, 2012

AIRS granules

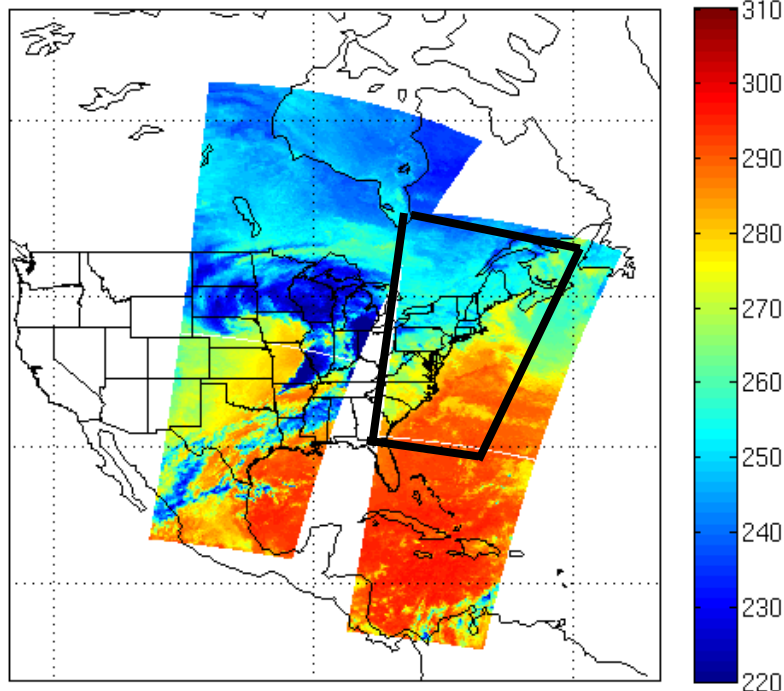
Start times: 06:41, 06:47,
08:17, 08:23 UTC
AIRS granule size: 90x135
(12150 FOVs)
4 granules in total



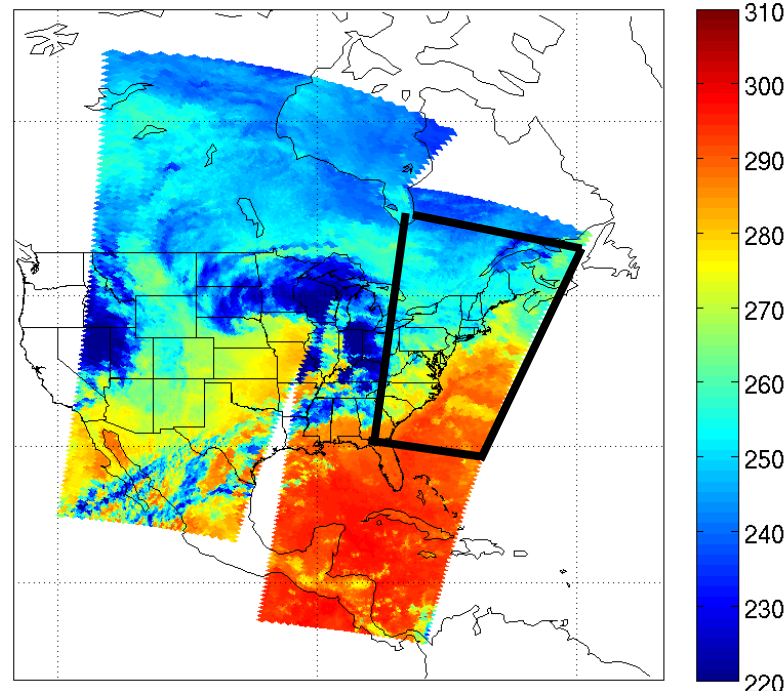
CrIS granules

eastern/western orbit start
times: 07:05/08:44 UTC
CrIS granule size: 90x12
(1080 FOVs)
47 granules in total

AIRS 2012.02.29 descending
Brightness Temperature [K] at 912.0 cm^{-1}

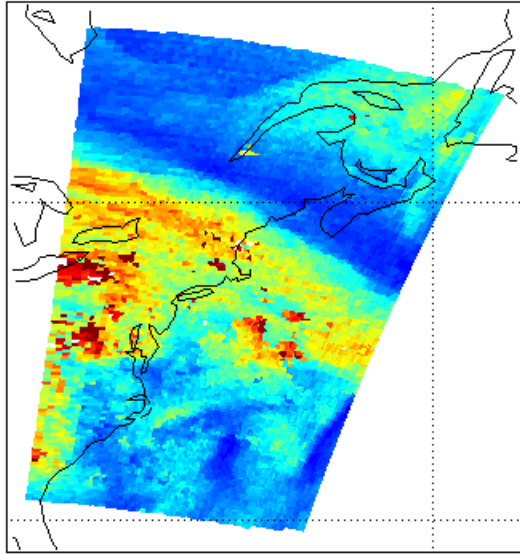


CrIS 20120229
Brightness Temperature [K] at 910.0 cm^{-1}

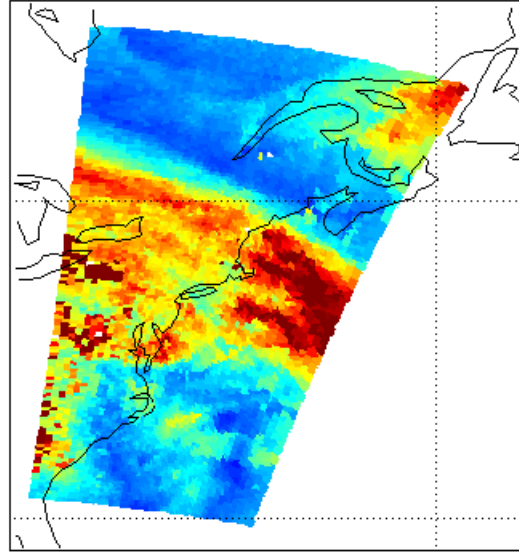


300 hPa RH 500 hPa T (February 29)

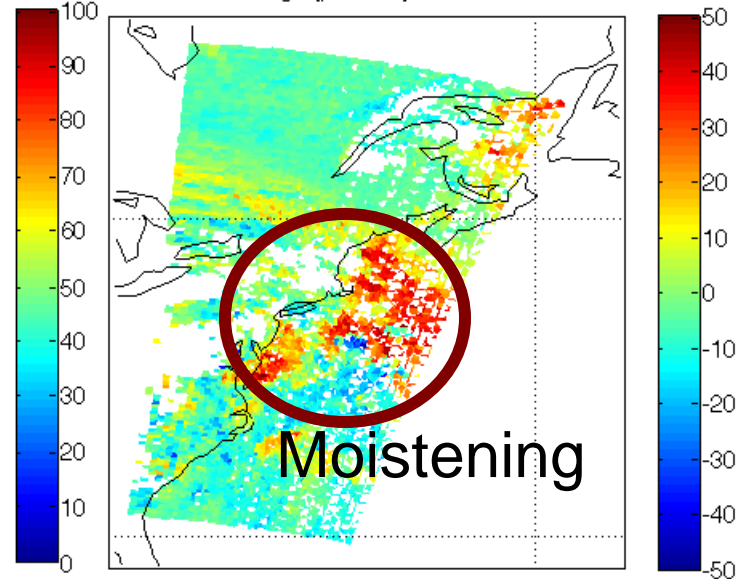
AIRS granule .06 (2012.02.29)
Relative Humidity [percent] at 300 mbar



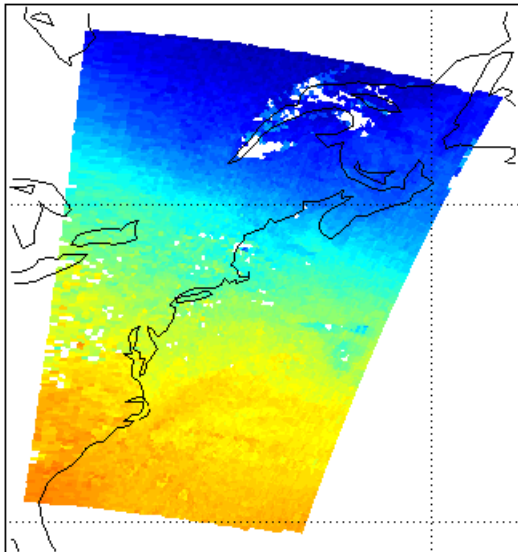
CrIS granule .06 (2012.02.29)
Relative Humidity [percent] at 300 mbar



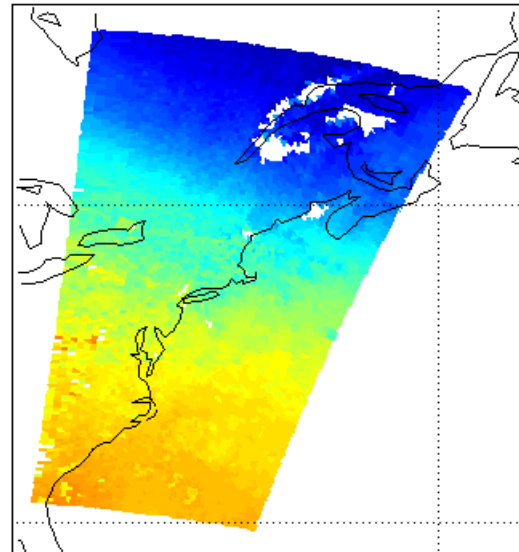
AIRS/CrIS granule .06 (2012.02.29)
RH Change [percent] at 300 mbar



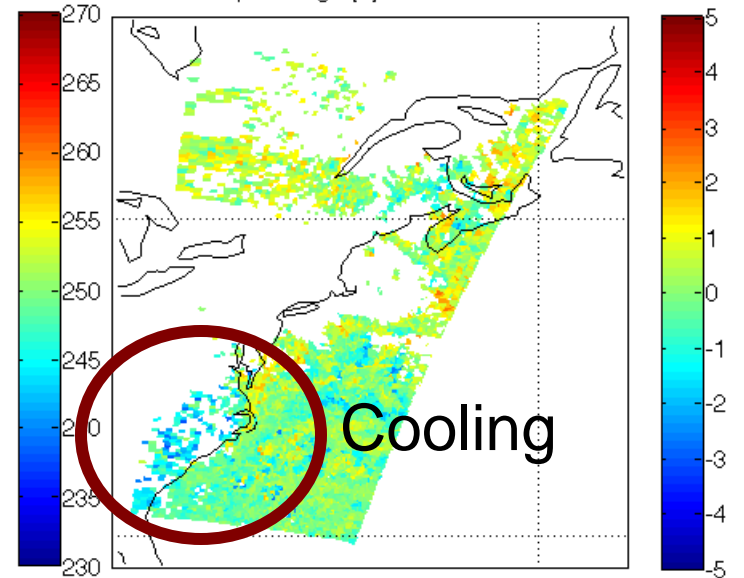
AIRS granule .06 (2012.02.29)
Temperature [K] at 496.63 mbar



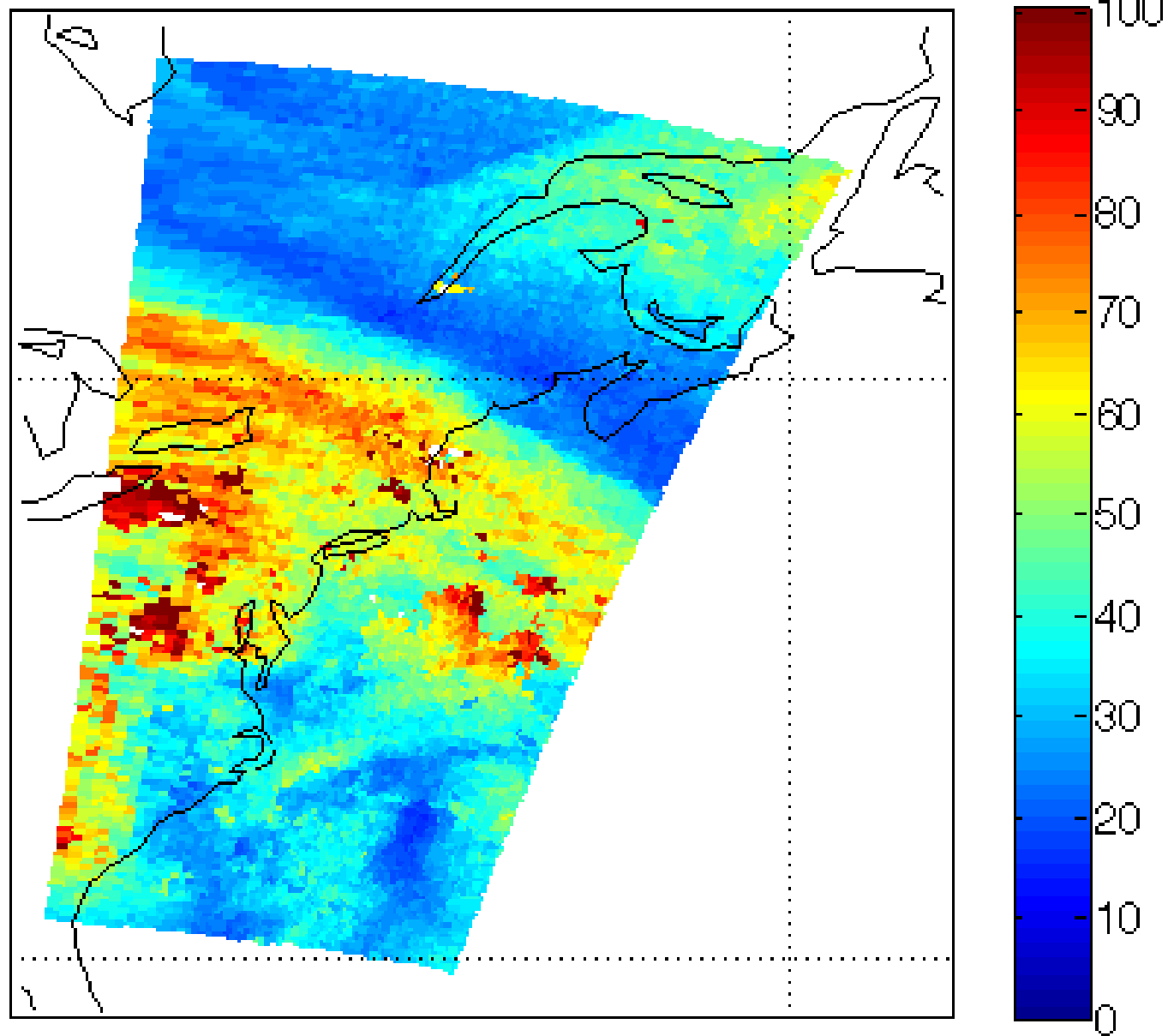
CrIS granule .06 (2012.02.29)
Temperature [K] at 496.63 mbar



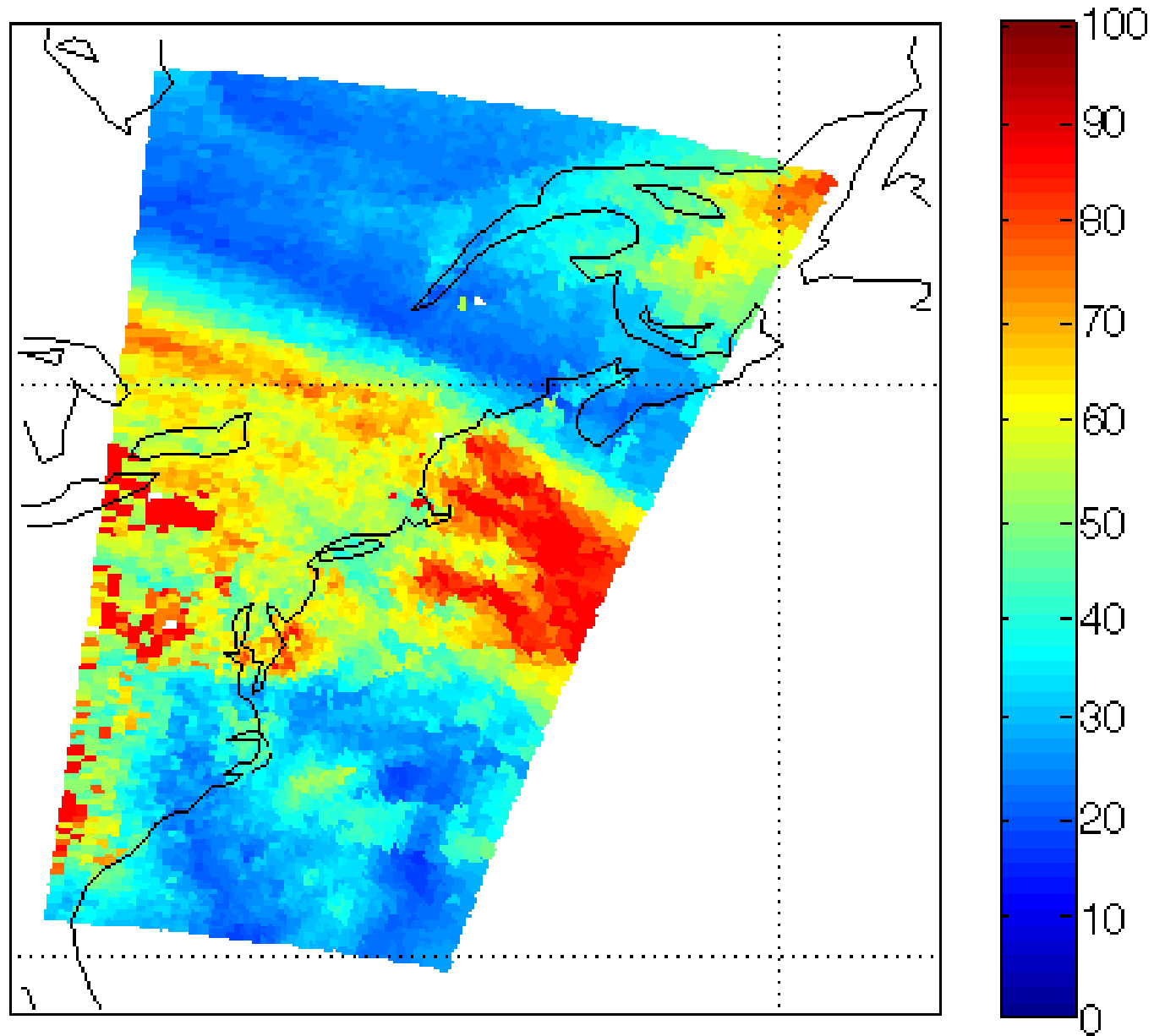
AIRS/CrIS granule .06 (2012.02.29)
Temp Change [K] at 496.63 mbar



AIRS granule .06 (2012.02.29)
Relative Humidity [percent] at 300 mbar



OrIS granule .06 (2012.02.29)
Relative Humidity [percent] at 300 mbar



Conclusions (Very Preliminary)

- AIRS & CrIS RMS differences with radiosonde profiles are comparable (1-2 K, 10-30%)
- **However** : RMS differences between AIRS and CrIS are significant t (1-1.5K, 5-20%)
- Time differences between AIRS and CrIS to estimate atmospheric tendencies appears feasible but synoptic scale error differences must be minimized.
- After Metop-B is in orbit and enabling 48 minute interval IASI data we will have, along with CrIS and AIRS data, time tendencies 4x per day globally. (This is not a substitute for the geo-hyperspectral sounder).

Thank you for your attention.