

Validation and Comparison of S-HIS and NAST-I Retrievals for THORPEX 2003

CIMSS/SSEC, UW-Madison
NASA Langley Research Center

Presented by

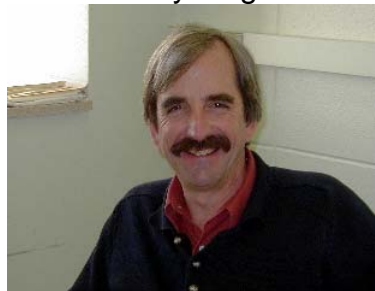
Paolo Antonelli

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Who's Doing What ?

Not shown: Robert Holz (UW), Allen Larar (LaRC)

Everything



Miscellaneous



Data Processing



Land surface



Cloud properties



Everything



Data Processing



Data Processing



Clouds



Retrievals



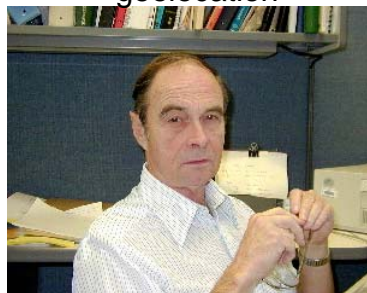
Retrievals



MODIS/MAS comparisons



geolocation



DB/IMAPP



PNF/Retrieval



Miscellaneous



Everything



Miscellaneous



Retrievals



and of course ...



2003 Pacific THORPEX Observing System Test



- The 2003 Pacific THORPEX Observing System Test is the first in a series of **Pacific and Atlantic** observation campaigns in support of the THORPEX Program.
- THORPEX - a Global Atmospheric Research Program, is a **10 year international research program** under the auspices of the World Meteorological Organization/World Weather Research Program (WMO/WWRP) to accelerate improvements in weather predictions and the societal value of advanced forecast products.
- THORPEX will examine **predictability** and **observing system** issues, and establish the potential to produce significant statistically-verifiable **improvements in forecasts** of high impact weather.

<http://www-angler.larc.nasa.gov/thorpe/>

Questions we are trying to answer

- What are we able to retrieve, in terms of vertical and horizontal resolution, from S-HIS observations?
- How do the S-HIS observing capabilities compare to those of the other instruments involved in the experiments?
- How do we make the FTS data available for NWP model assimilation?
- Which impact do the FTS data have on model analysis and forecast?



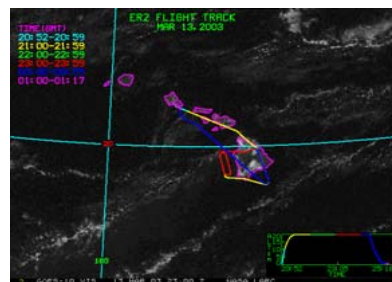
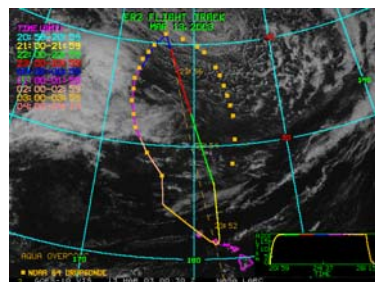
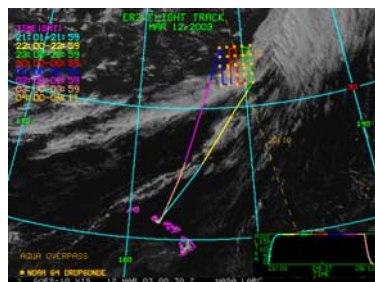
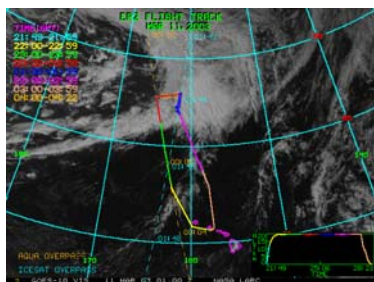
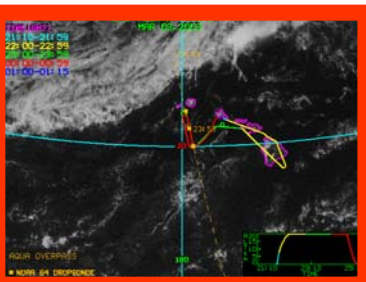
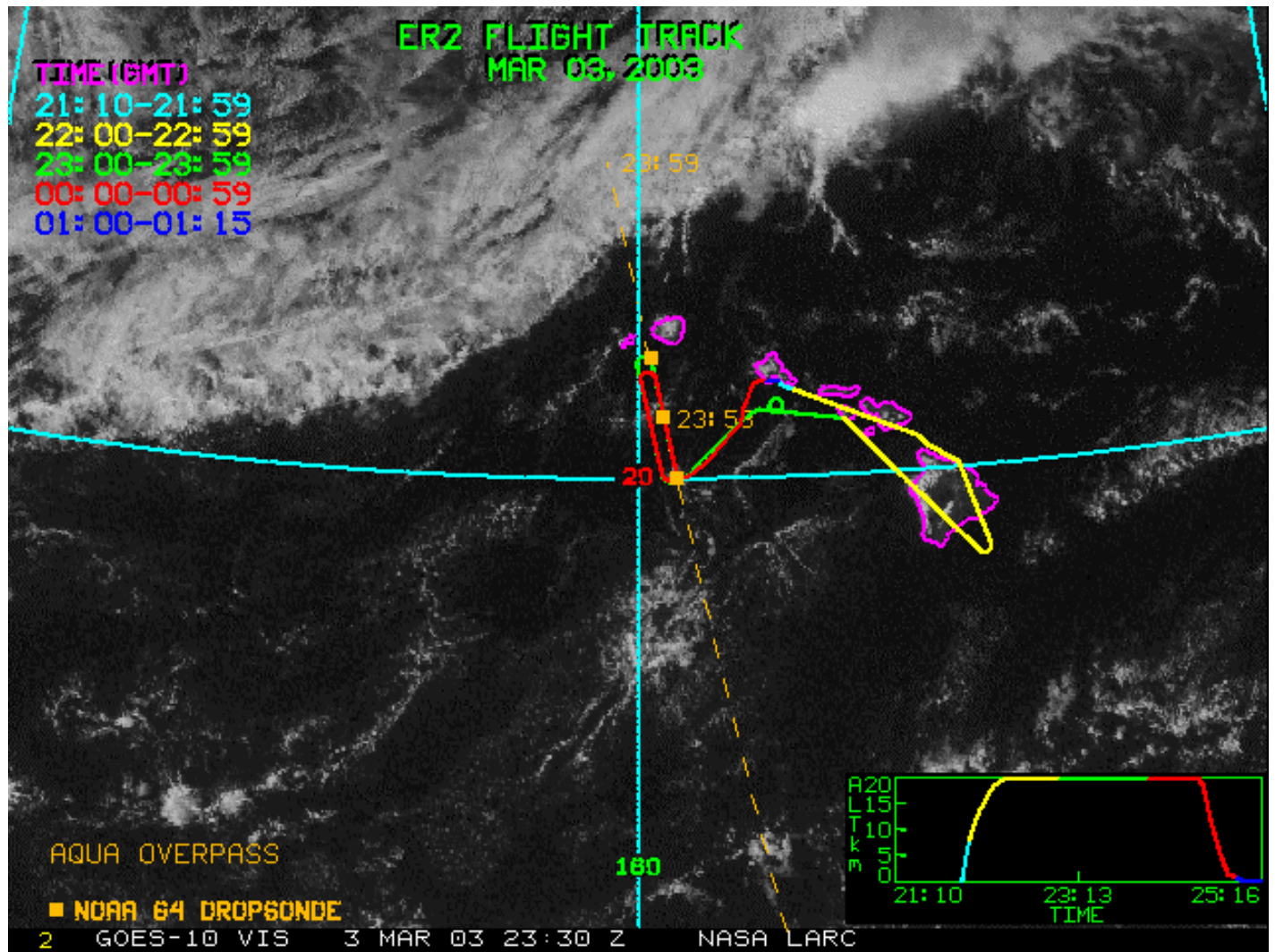
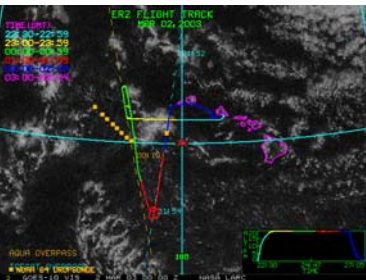
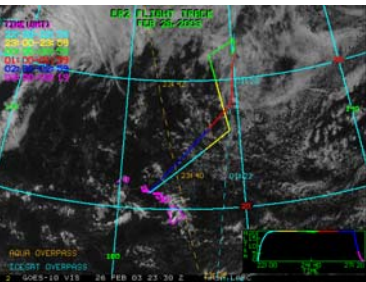
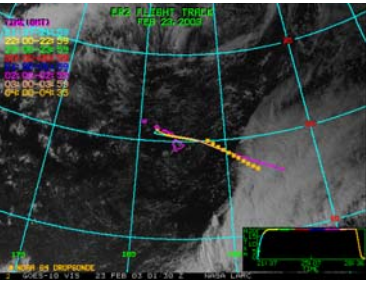
Platforms & Instruments



- ER-2 (cruise altitude: 20 km), its instruments are above 94% of the earth's atmosphere
 - NAST-I (FTS, 3.7-16 microns @ $.25 \text{ cm}^{-1}$)
 - S-HIS (FTS, 3.3-18 microns @ $.5 \text{ cm}^{-1}$)
 - CPL (Lidar, 1064 nm, 532 nm, and 355 nm)
 - MAS (Vis and IR @ 50 m res)
- G4 (cruise altitude: 13 km)
 - Dropsondes

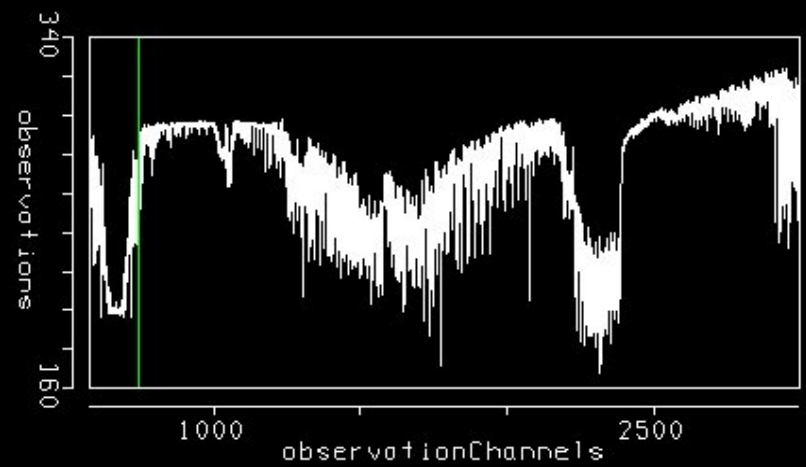
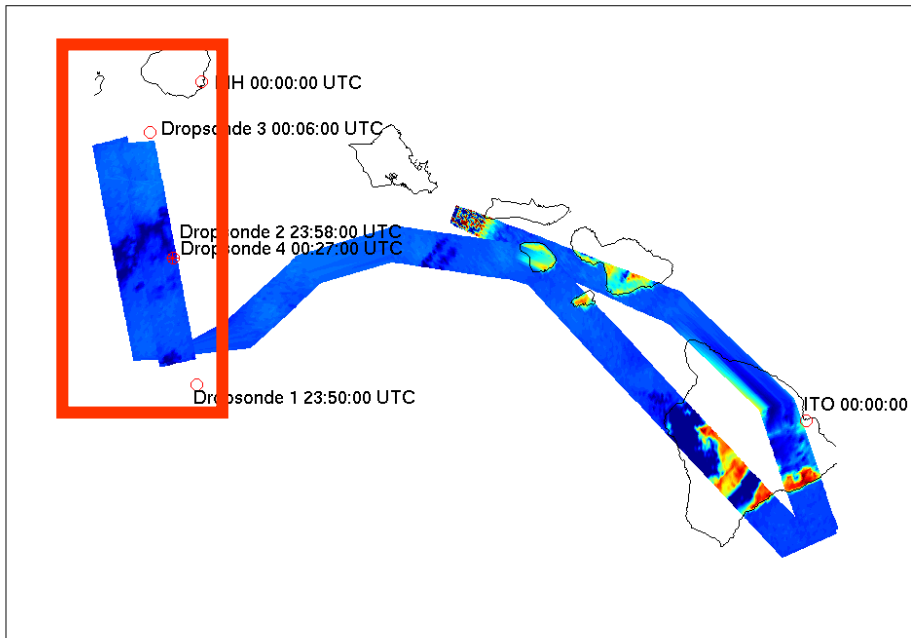


Flights

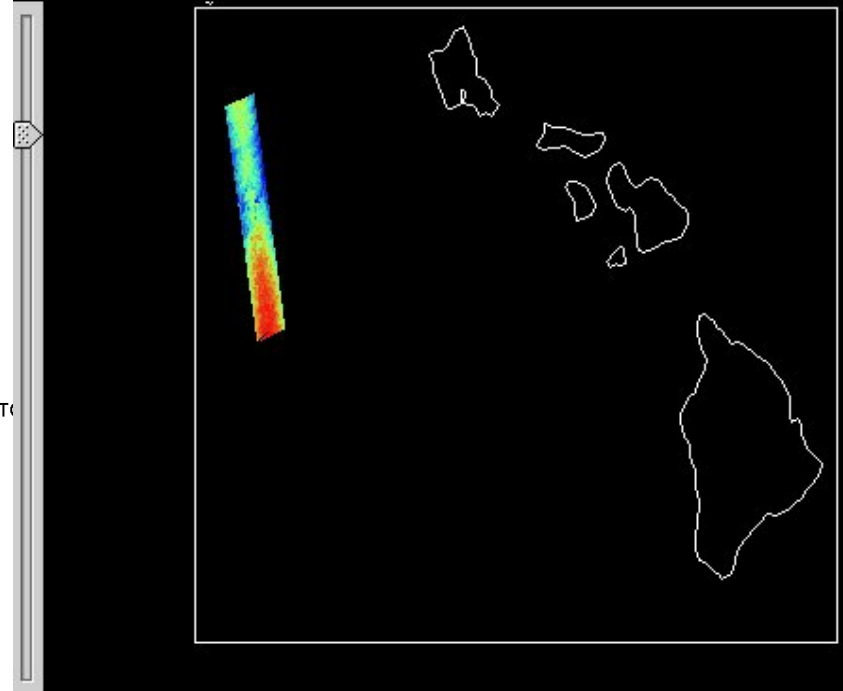


Case Study

03 March 2003



Channel: 744.50 [cm^A-1]

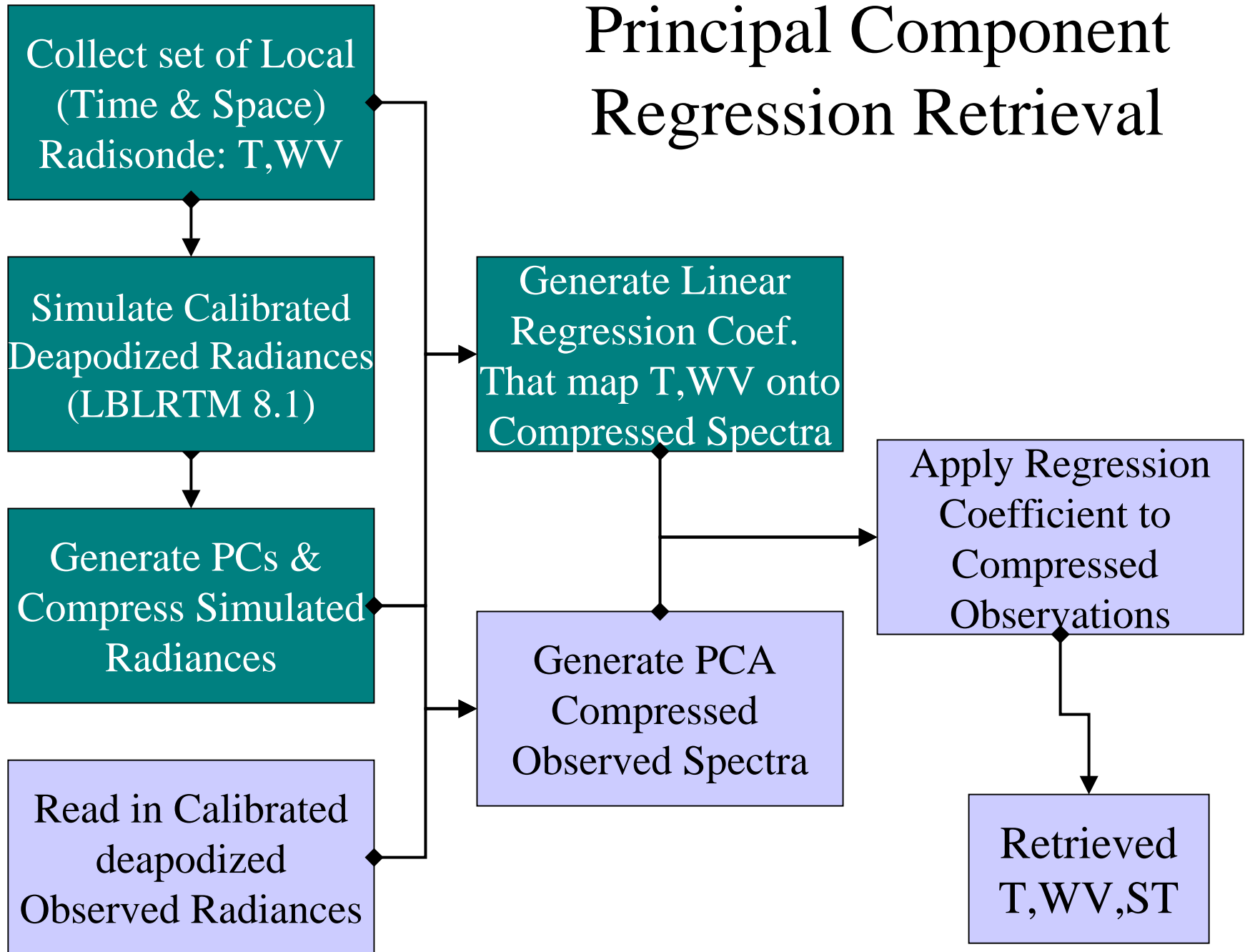


Set Color Range

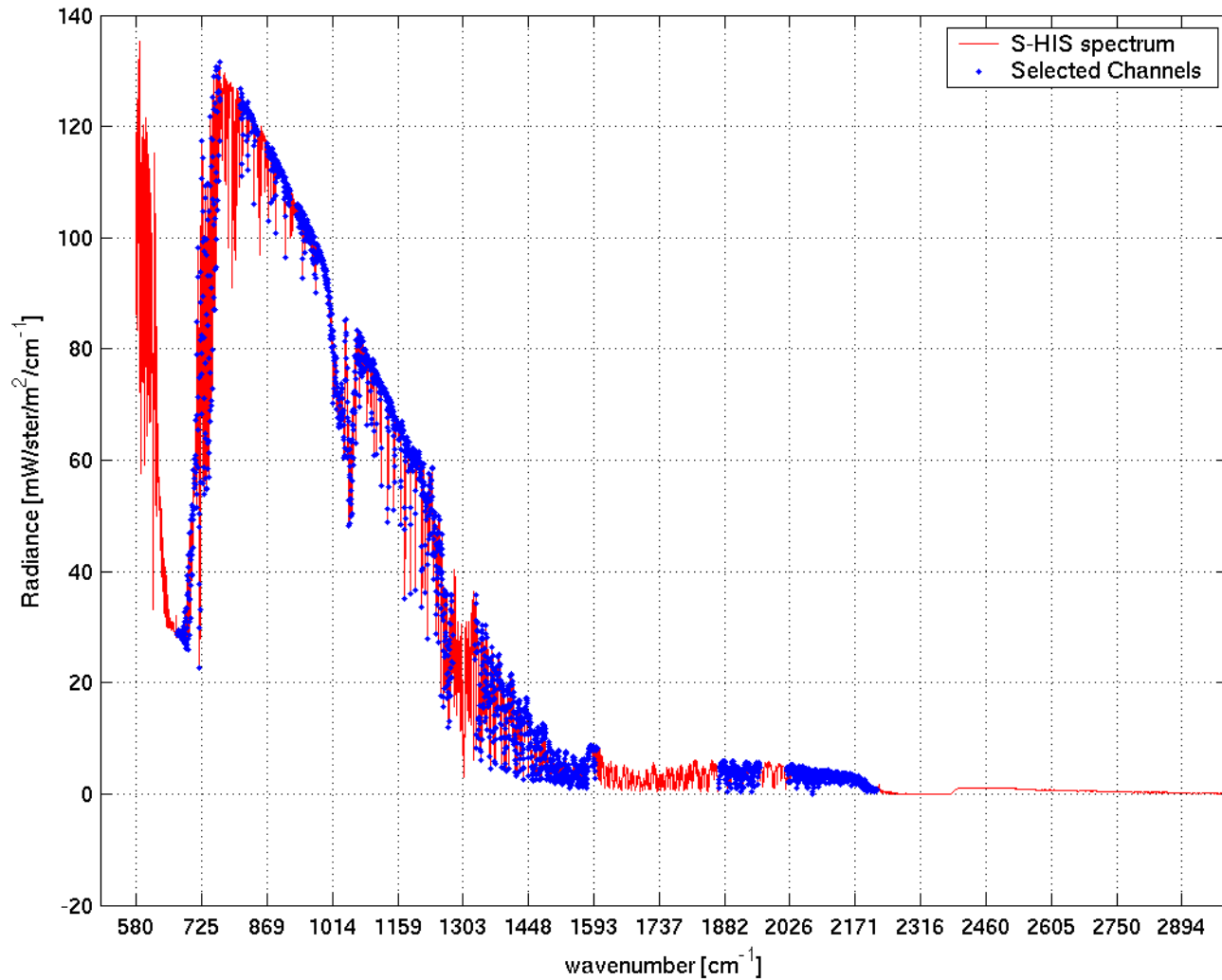
Get linear combinations

Instrument:
Lat = 21.18 Lon = -157.51
Time = 725.00 [offset (s)]
FOV angle = -30.42 [degrees]

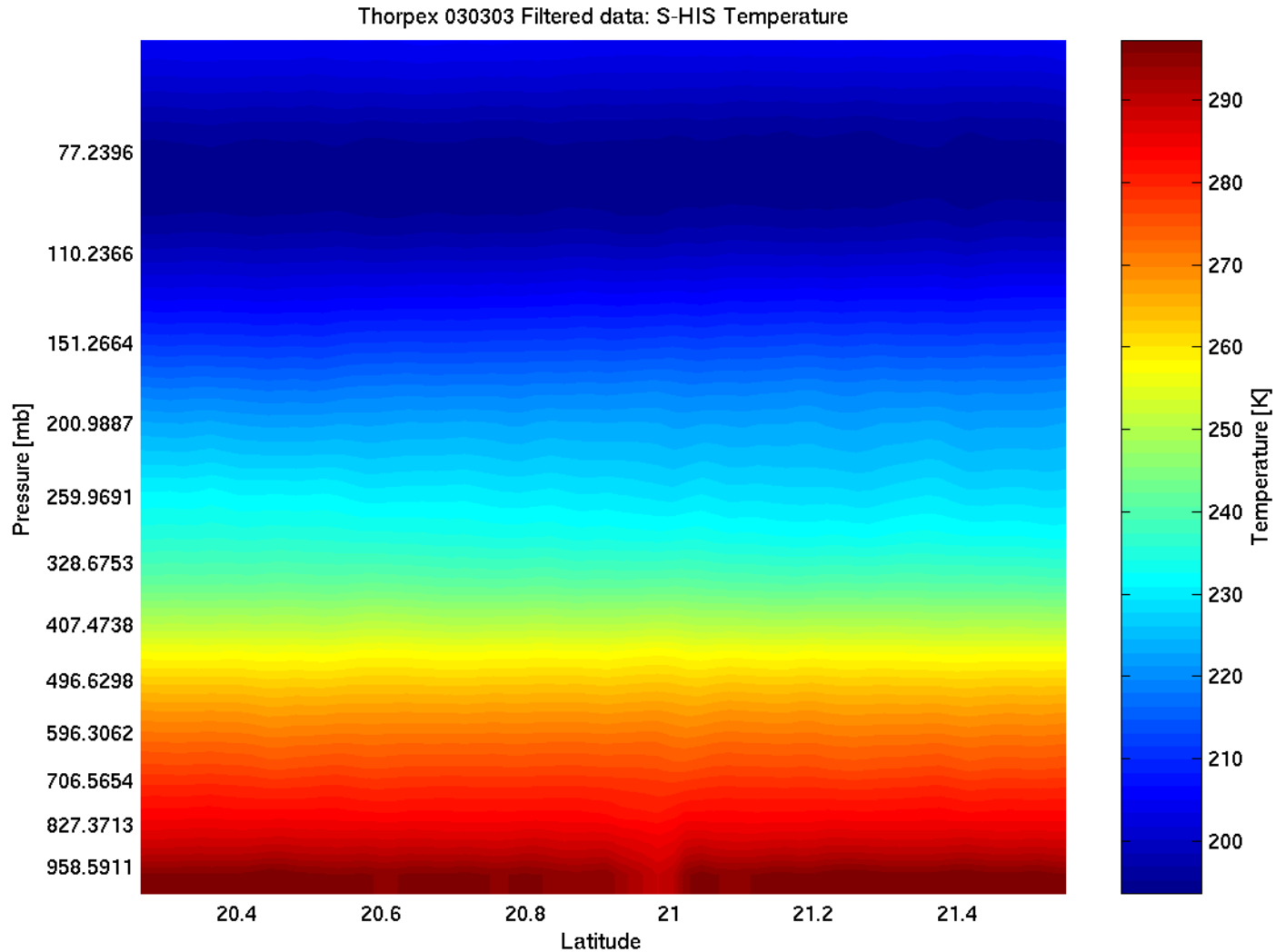
Principal Component Regression Retrieval



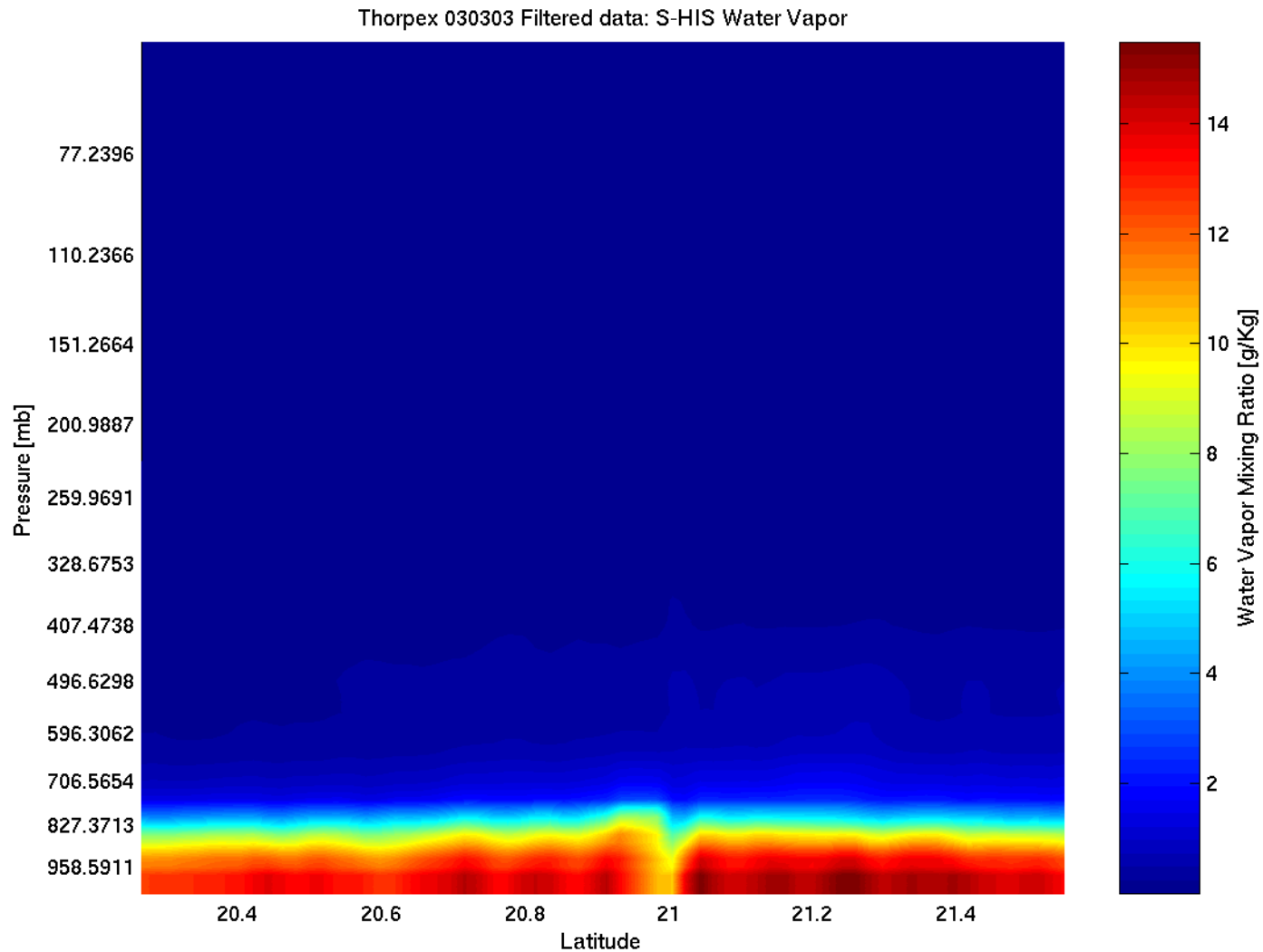
Selected Channels



S-HIS Temperature Cross-Section

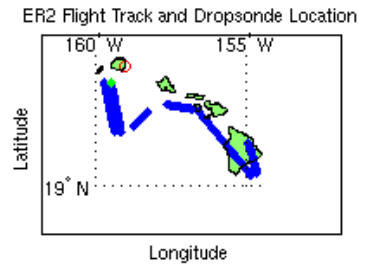
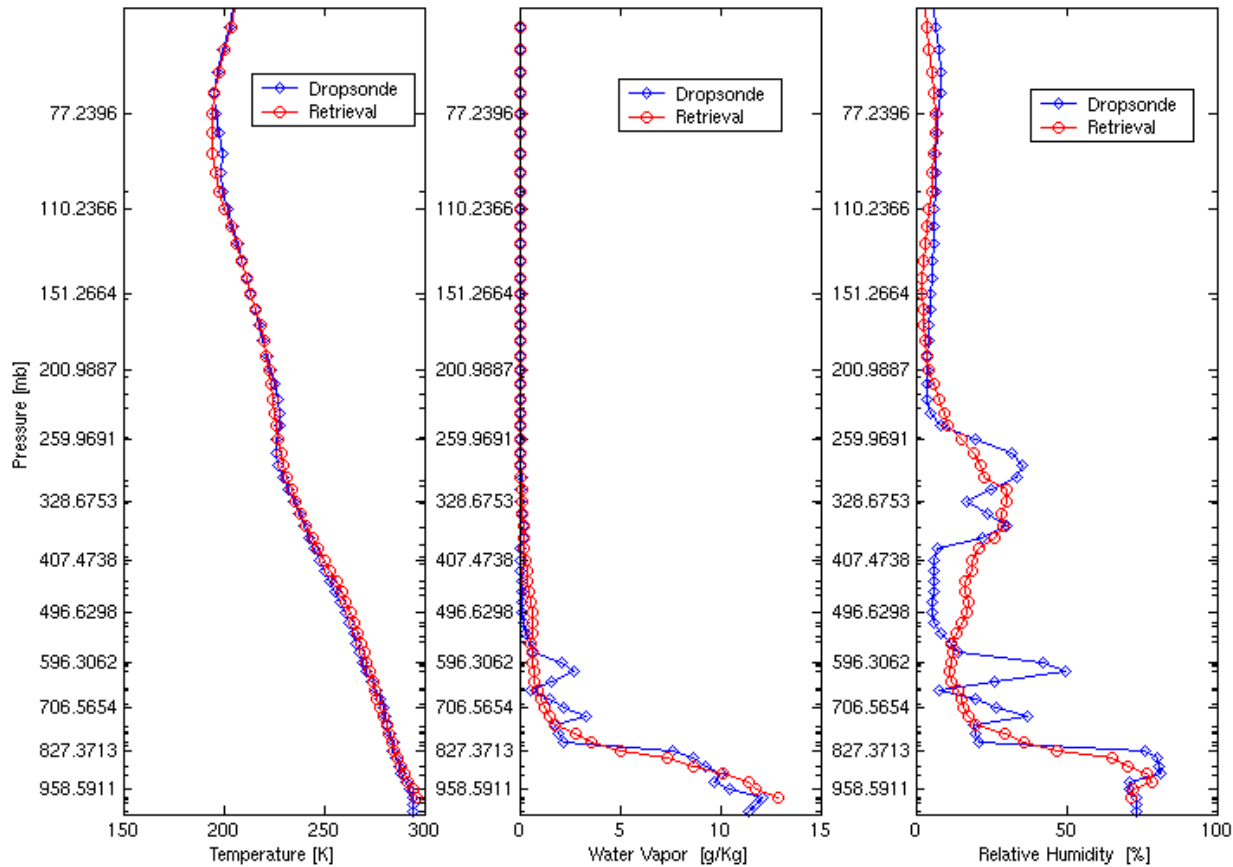


S-HIS Water Vapor (MR) Cross-Section

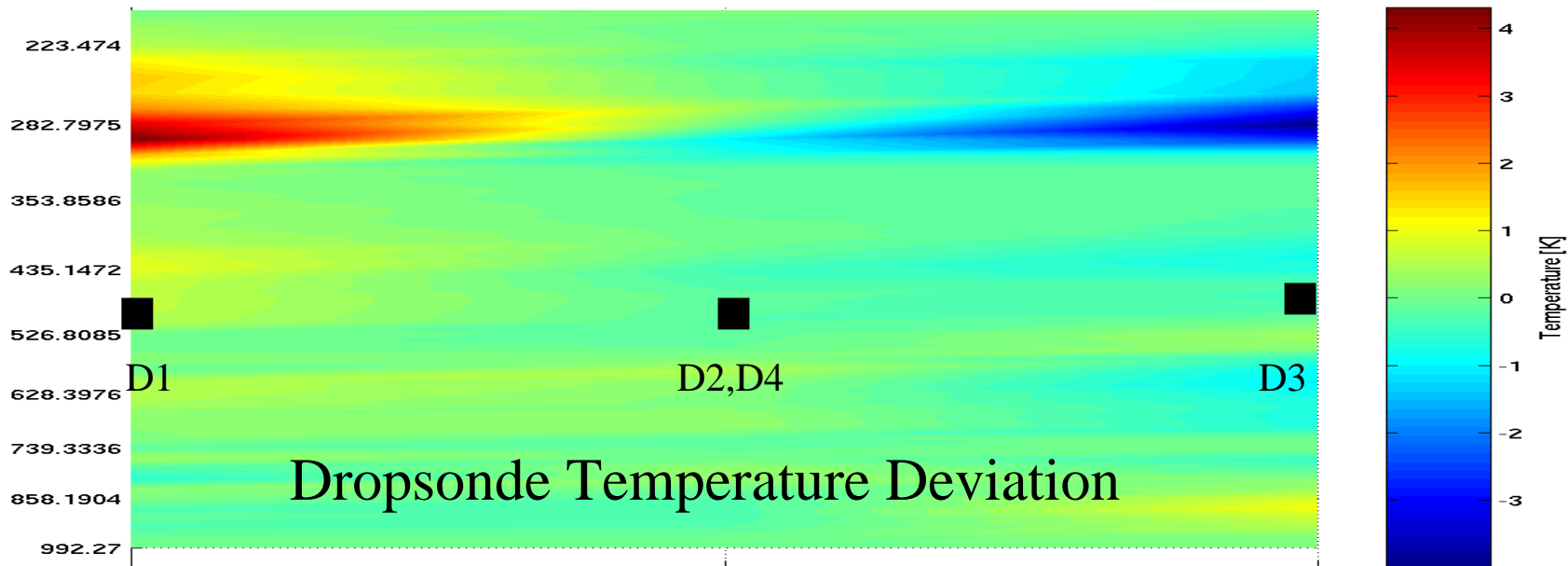


S-HIS Radiosonde Validation

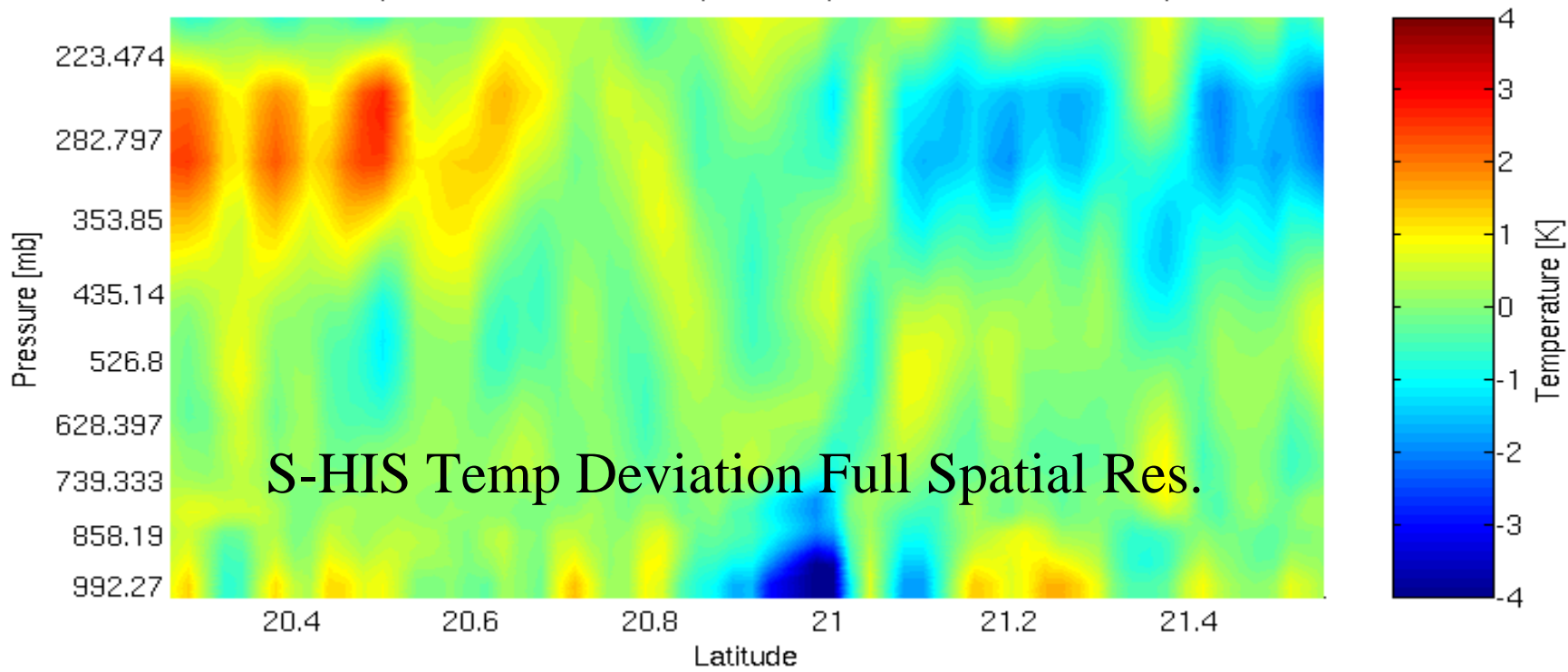
S-HIS Retrieval Validation. TS: LBLRTM 8.1; Unfiltered Data, #pcs: 030; Dropsonde: 2003, 03, 04 @ LIH 00:00:00 UTC



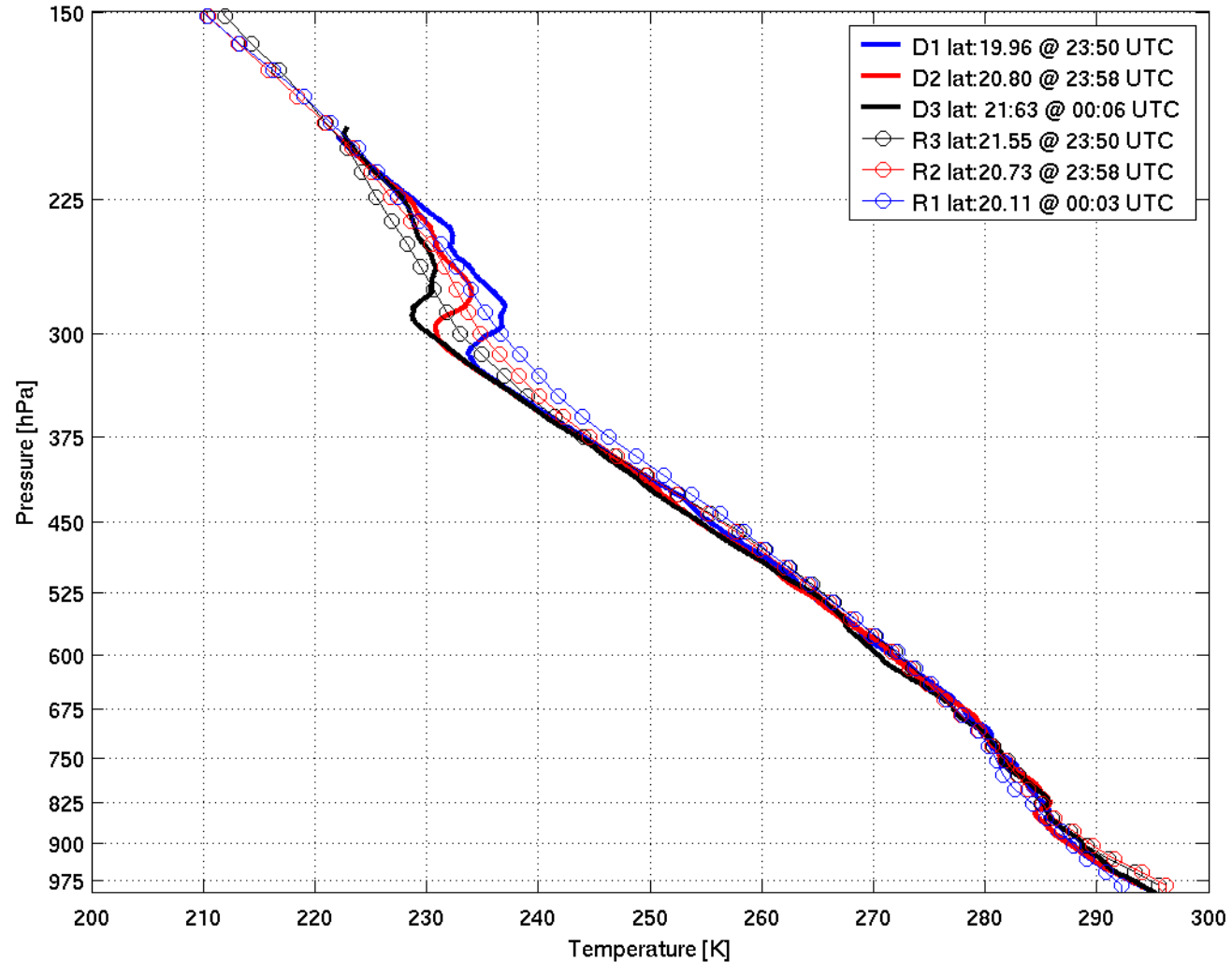
ThorpeX 030303: Dropsonde Temperature (Deviation from the Mean)

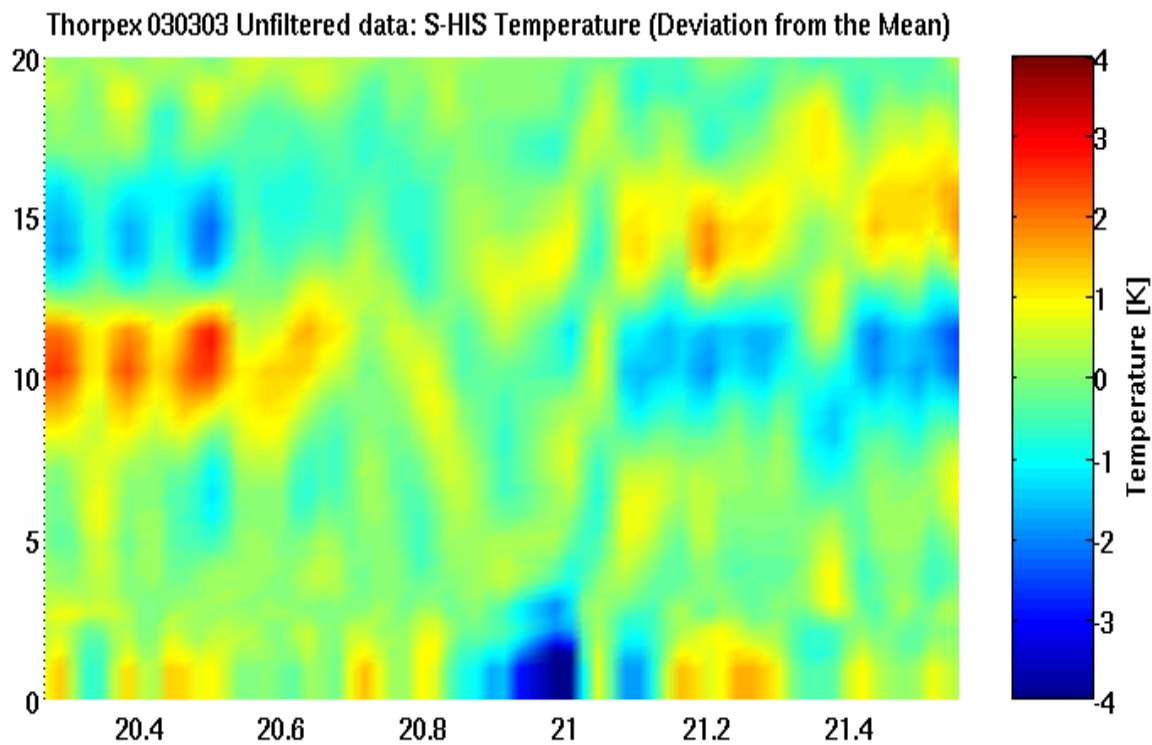
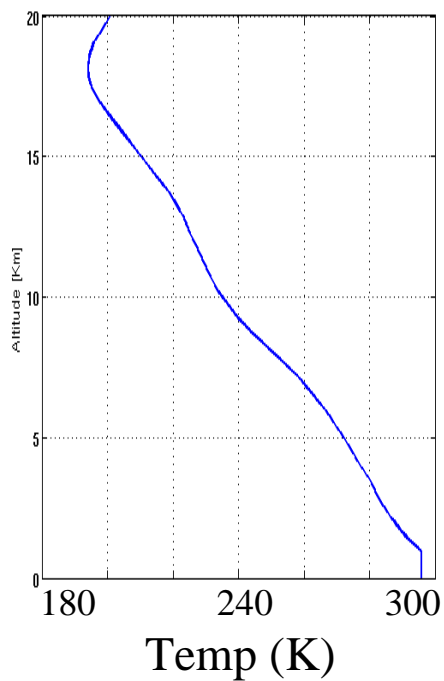
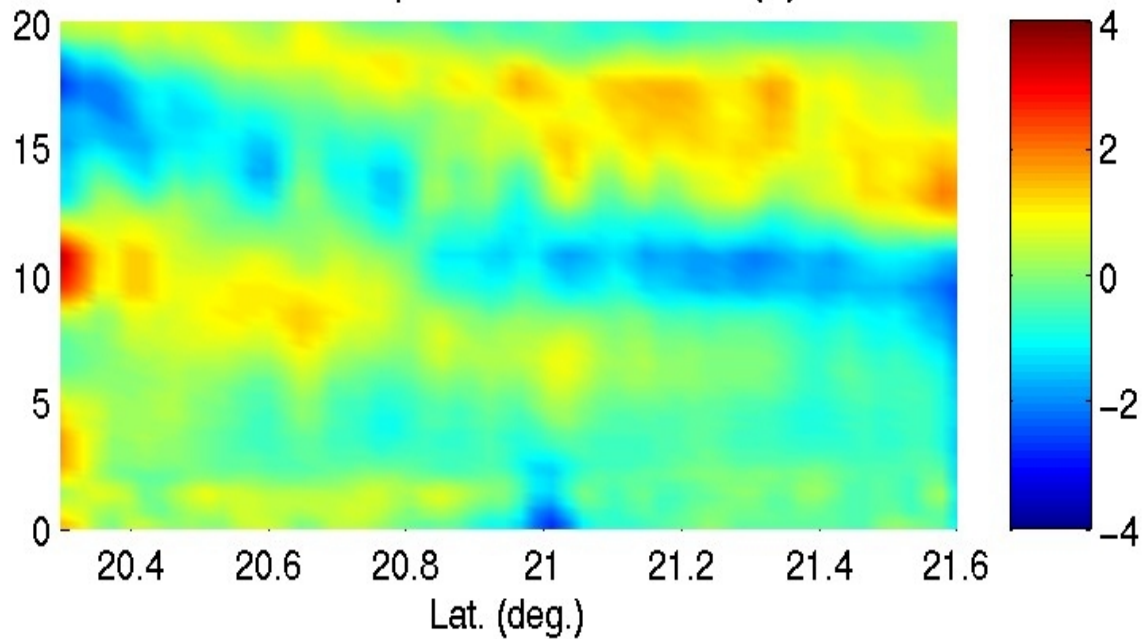
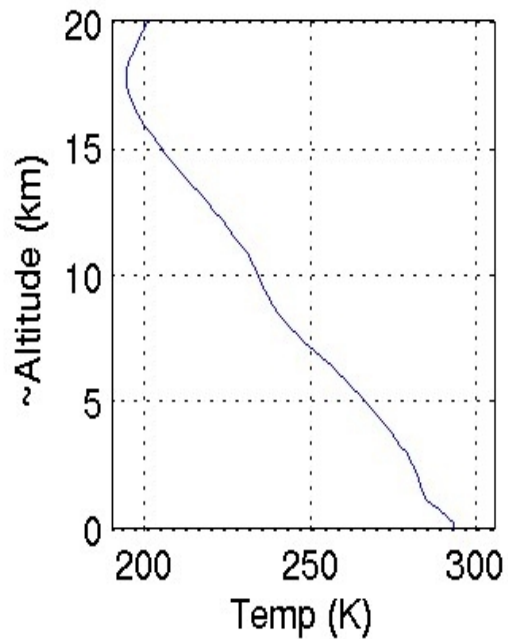


ThorpeX 030303: S-HIS Temperature (Deviation from the Mean)



Single Profile Comparisons





Conclusions/**Discussion**

- Using S-HIS we were able to observe vertical and horizontal atmospheric structures with good accuracy
- **Would a current assimilation scheme retain or reject radiances for the presented case?**
- We found good agreement with Radiosonde and NAST-I retrievals. There are still differences between their retrievals that are going to be further investigated
- **To which extend do we expect them to agree?**
- Regression Retrieval is non-optimal (in terms of accuracy) but does take advantage of all the available data (spectrally and spatially) and provides reliable results in an efficient way.
- **How do we allow an assimilation scheme to take advantage of a larger percentage of available high spectral resolution data?**

International TOVS Study Conference, 13th, TOVS-13, Sainte Adele, Quebec, Canada, 29
October-4 November 2003. Madison, WI, University of Wisconsin-Madison, Space Science and
Engineering Center, Cooperative Institute for Meteorological Satellite Studies, 2003.