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

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Who's Doing What?

- Everything
- Miscellaneous
- Data Processing
- Land surface
- Cloud properties

- Everything
- Data Processing
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- 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/thorpex/
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 cm⁻¹)
  - S-HIS (FTS, 3.3-18 microns @ .5 cm⁻¹)
  - CPL (Lidar, 1064 nm, 532 nm, and 355 nm)
  - MAS (Vis and IR @ 50 m res)

- **G4** (cruise altitude: 13 km)
  - Dropsondes
Case Study
03 March 2003
Principal Component Regression Retrieval

Collect set of Local (Time & Space) Radisonde: T,WV

Simulate Calibrated Deapodized Radiances (LBLRTM 8.1)

Generate PCs & Compress Simulated Radiances

Generate Linear Regression Coef. That map T,WV onto Compressed Spectra

Generate PCA Compressed Observed Spectra

Apply Regression Coefficient to Compressed Observations

Read in Calibrated deapodized Observed Radiances

Retrieved T,WV,ST
Selected Channels
S-HIS Water Vapor (MR) Cross-Section

Thorpe 030303 Filtered data: S-HIS Water Vapor

Pressure [mb]

Latitude
S-HIS Radiosonde Validation

S-HIS Retrieval Validation. TS: LBLRTM 8.1; Unfiltered Data; Test: C30; Dropsonde: 2003, 03, 04 @ LHI: 00:00:00 UTC

- Temperature [K]
- Water Vapor [g/kg]
- Relative Humidity [%]
Thorpe 030303: Dropsonde Temperature (Deviation from the Mean)

Dropsonde Temperature Deviation

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

S-HIS Temp Deviation Full Spatial Res.
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?