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ATMS Microwave Retrieval Status

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Goals

- Adapt the AIRS/AMSU/HSB retrieval algorithm to ATMS
  - Developed by P. Rosenkranz (MIT)

- Maintain a unified code which runs on ATMS, AMSU/HSB and is adaptable to other instruments and platforms.

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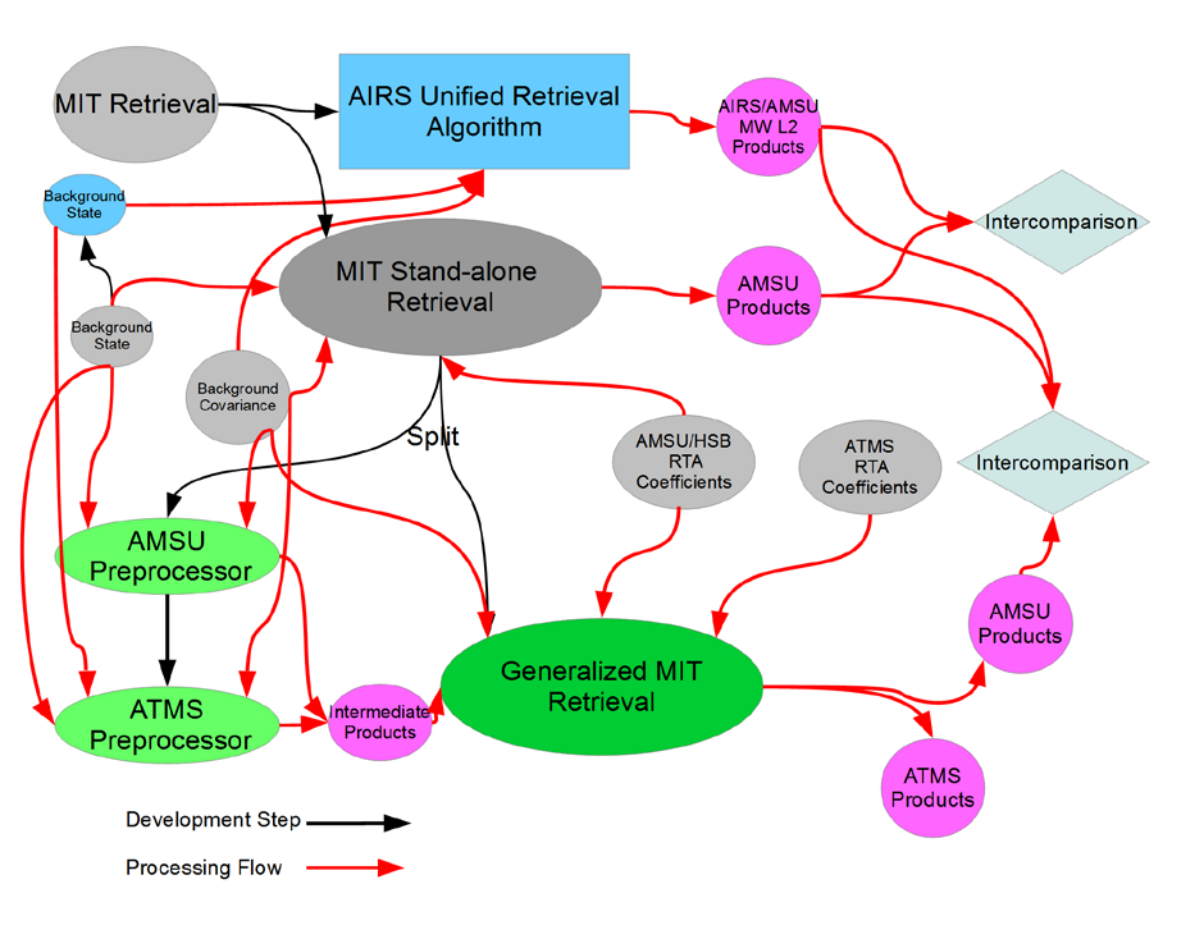
Development Plan

- Split retrieval in preprocessor and retrieval stages
- Move all steps which can be separated from retrieval iterations
  - Observation Q/C and error model
  - Background state and covariance,
  - Surface classification and background emissivity
  - Magnetic field
- Using AMSU intercomparisons to monitor development and catch errors



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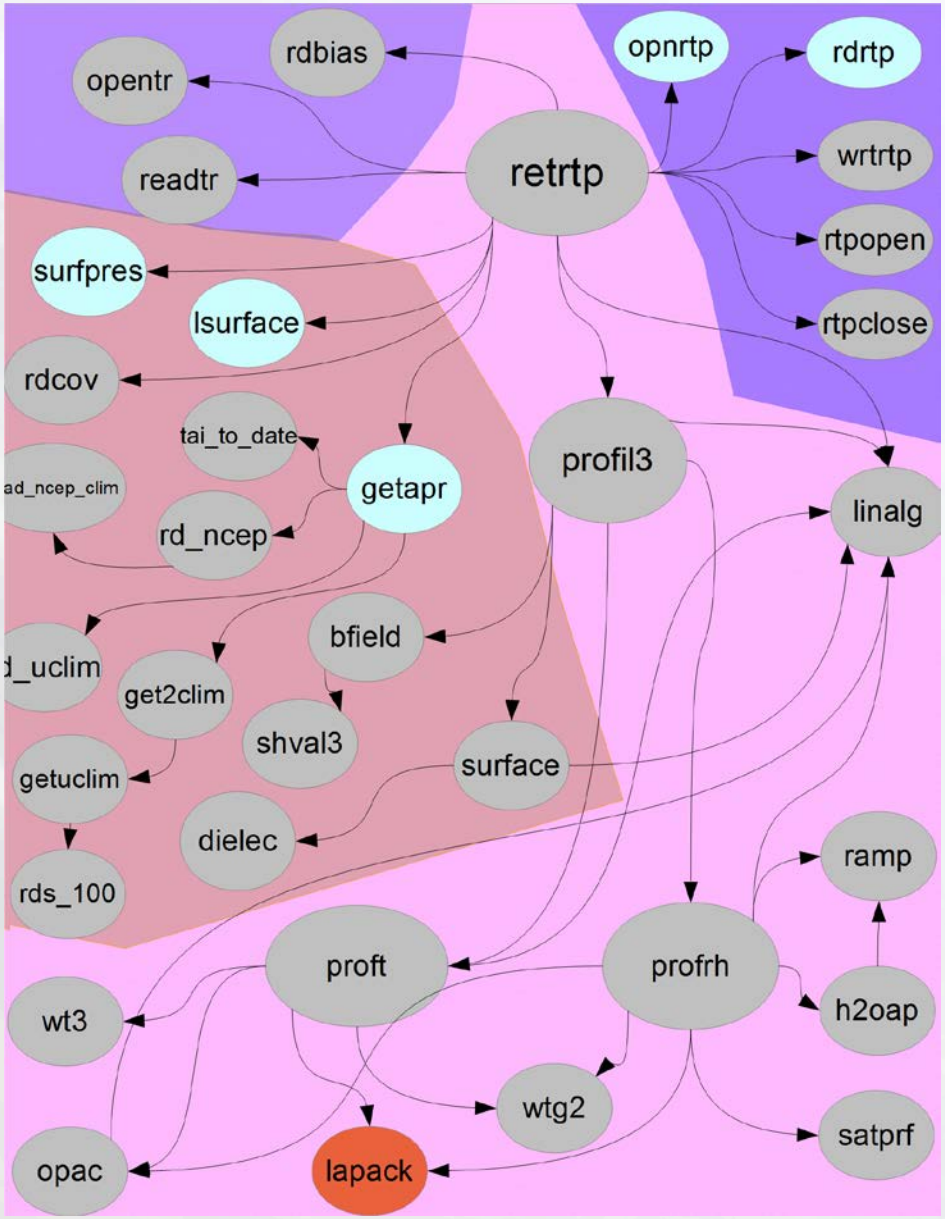
Microwave Stand-Alone Module Diagram

- RTA I/O: upper left block
- Product I/O, modified for intermediate products: upper left block (purple)
- Background state and covariance; surface classification, surface properties and magnetic field moved to preprocessor (left block)
- Generalized retrieval algorithm (lower block)

- Preprocessor is in IDL, extracted FORTRAN converted to F2003, uses iso_c_binding to standardize idl to FORTRAN interface.
  - Using gfortran 4.9
- IDL fastem2 surface emissivity model



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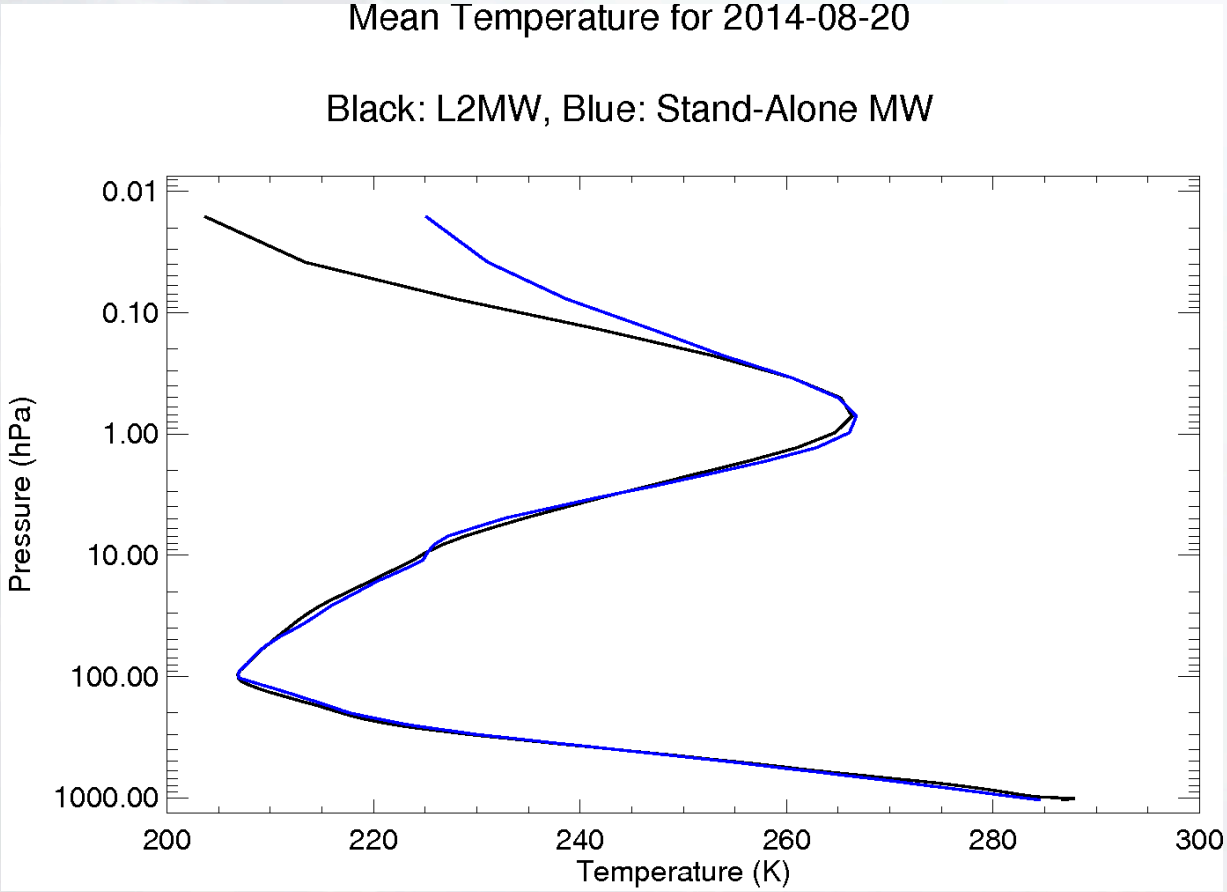
AMSU Baseline Intercomparison Mean Temperature Profiles

- Good agreement except above highest sounding channel
- Not to numerical noise



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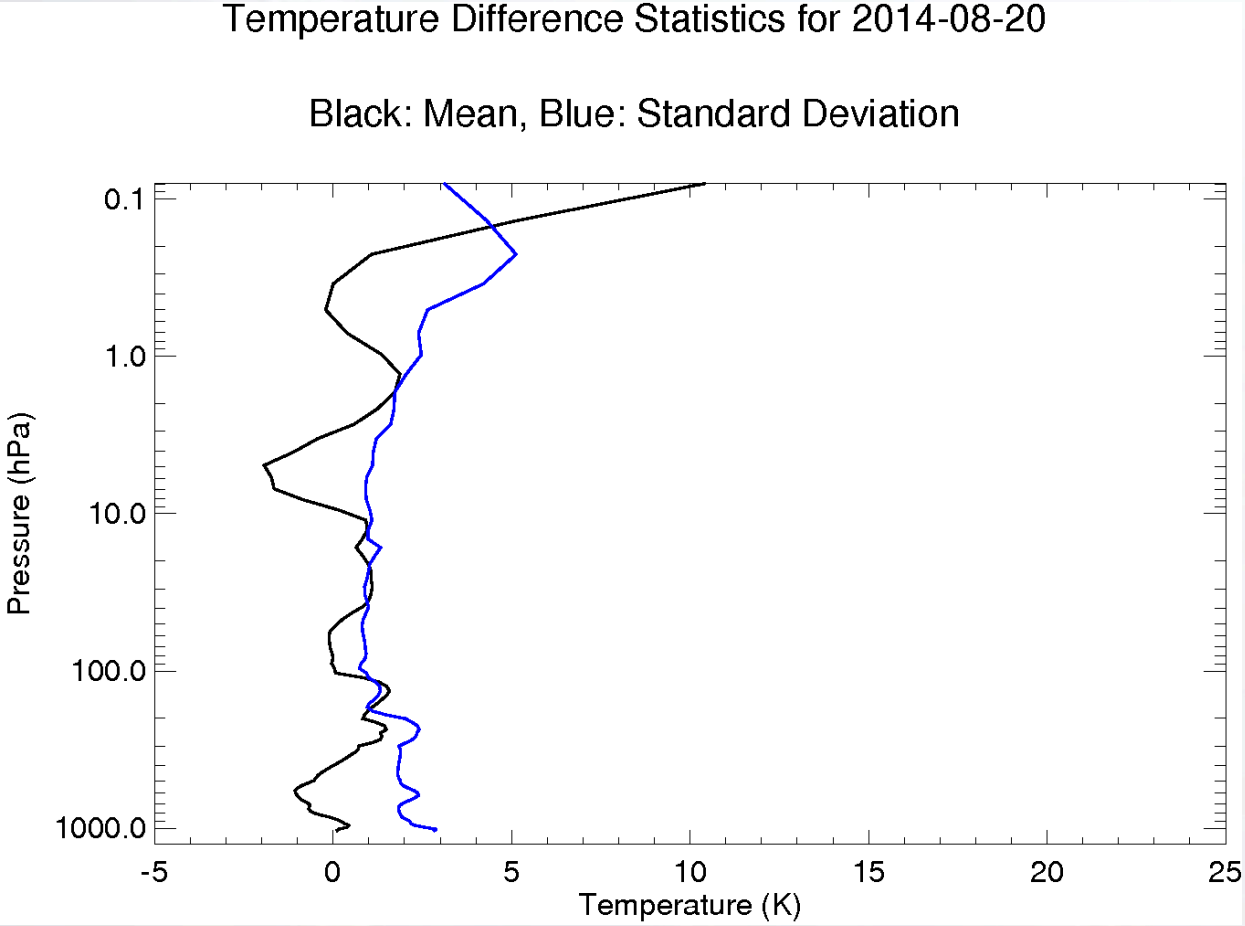
AMSU Baseline Intercomparison Statistics of Temperature Differences

- Largest differences where solution is primarily from background
- Source of differences in troposphere will be identified after algorithm split
  - Feed AURA background state through pre-processor



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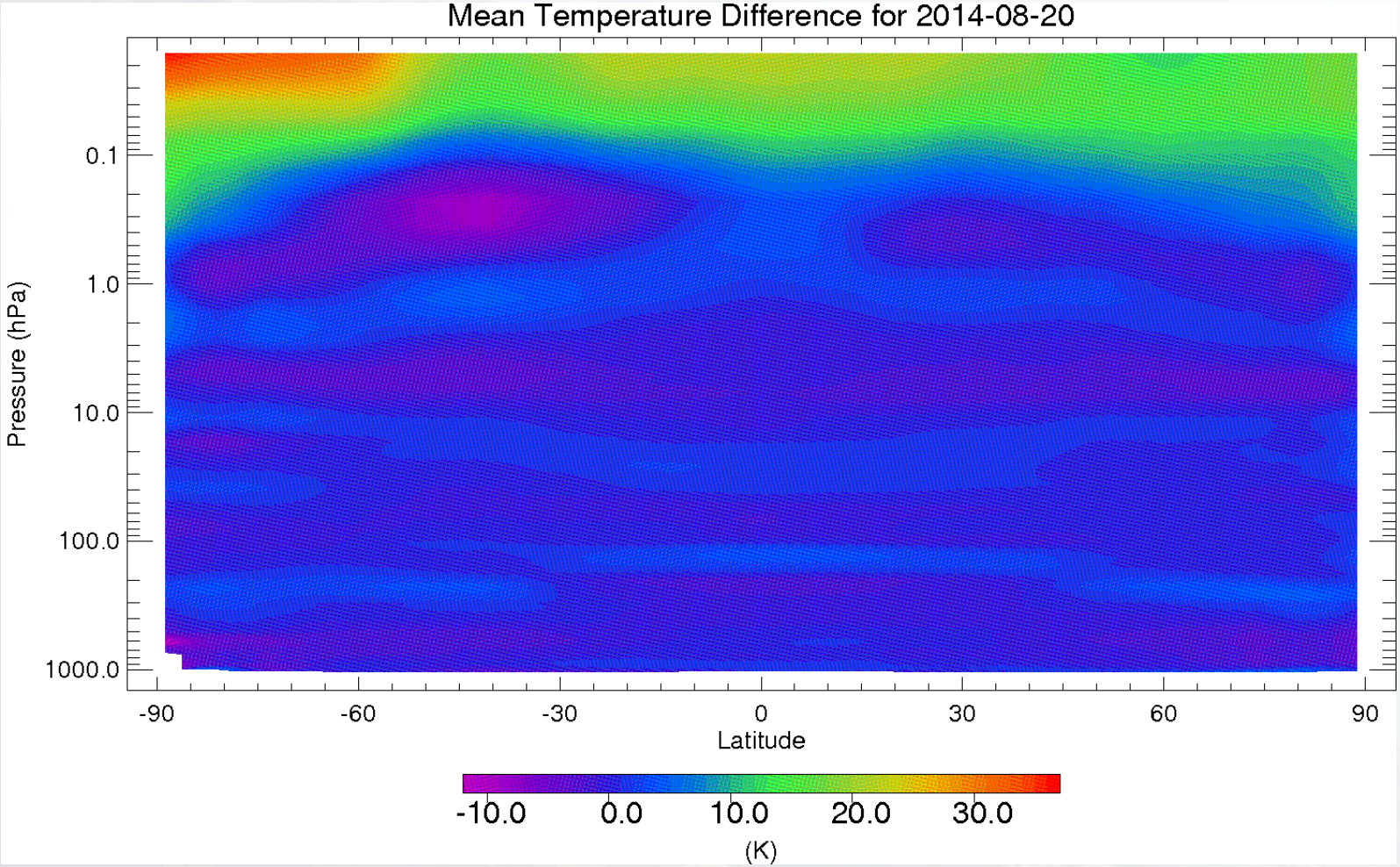
Initial AMSU Baseline Comparisons
Zonal Mean Temperature Differences



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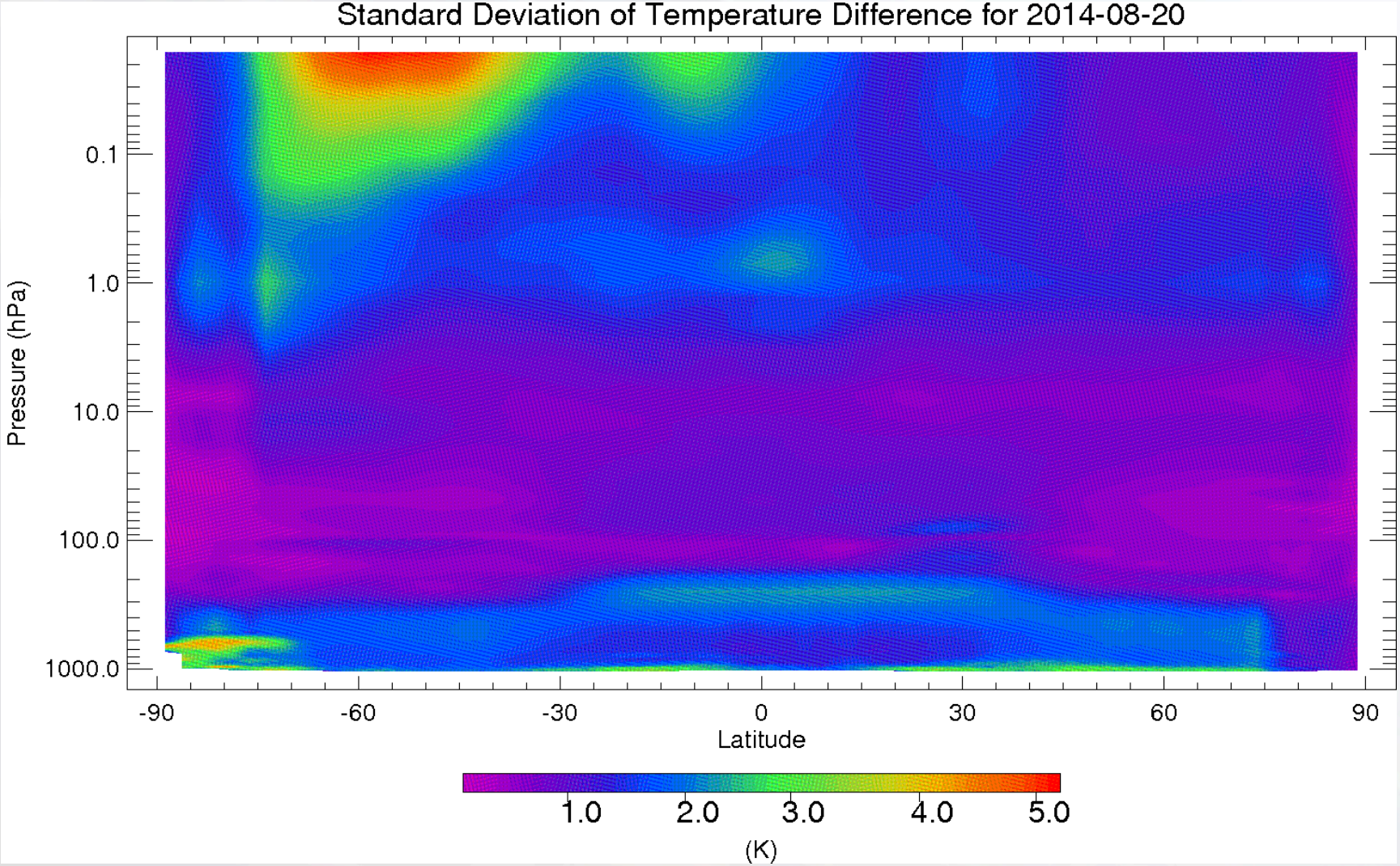
Initial AMSU Baseline Comparisons
Zonal Standard Deviation



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Comparison with IDPS (AER) Microwave Retrieval Algorithm

- Radiative transfer model
  - Band-averaged parameterized opacities (BPO) versus optimal spectral sampling
- Temperature profile retrieval
  - Background-covariance dampened 100-levels versus truncated-EOFs
- Water vapor profile retrieval
  - Relative humidity versus truncated EOFs of log mixing ratio
- Cloud liquid water
  - Model of heterogeneous cloud cover based on pseudo-saturation versus cloud height, thickness and cloud amount
- Surface property retrieval
  - Surface emission using emissivity background versus EOF

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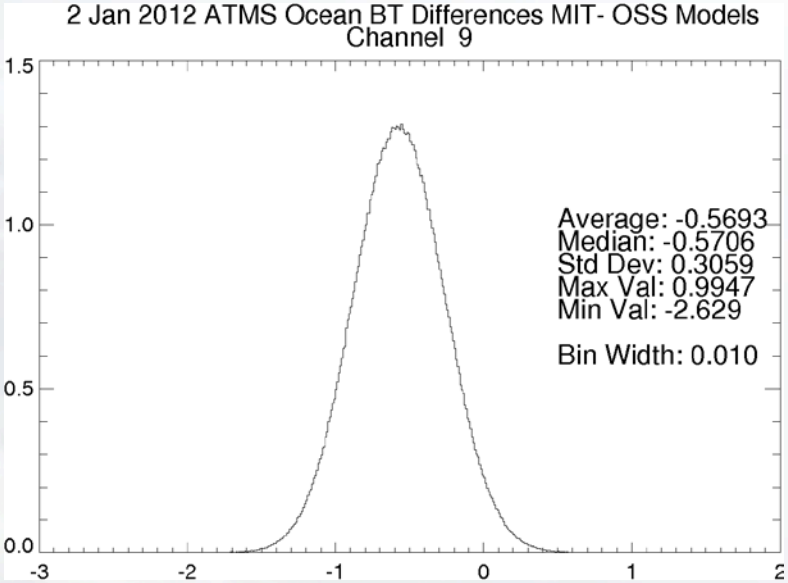
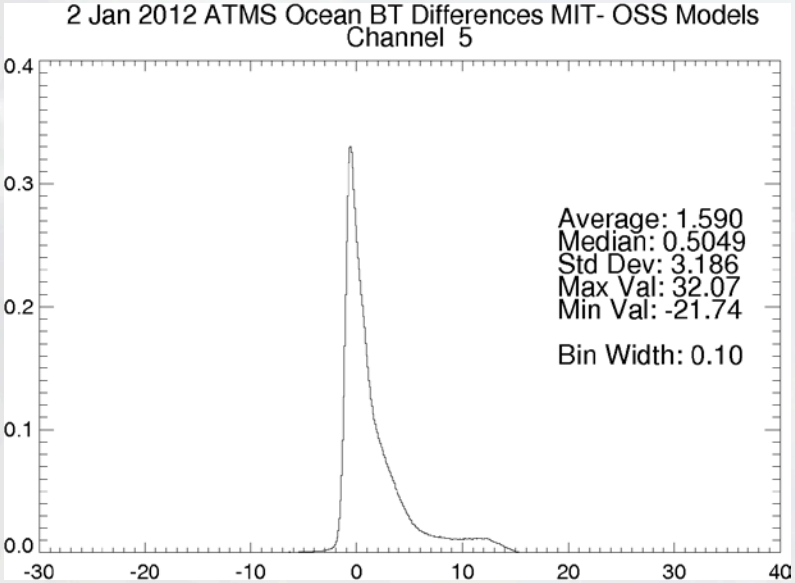
Radiative Transfer Comparison BPO versus OSS





Summary

- Subtleties in the conversion
  - Most of the code is consistent with FORTRAN 2003
  - Moving hard coding of channel properties to modules and namelist
  - Conversion to a 1 instrument RTA or convert ATMS RTA to a two instrument model
  - ATMS RTA has parameterization for variable O_3
- Exploring feasibility to run in forward model-only mode.
- Breakup into preprocessor and retrieval offers flexibility to try different surface models and backgrounds
  - Output from preprocessor and retrieval is in netcdf4 to facilitate sharing development products.