
Early Evaluation of AIRS Forward Model/Radiances

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Overview

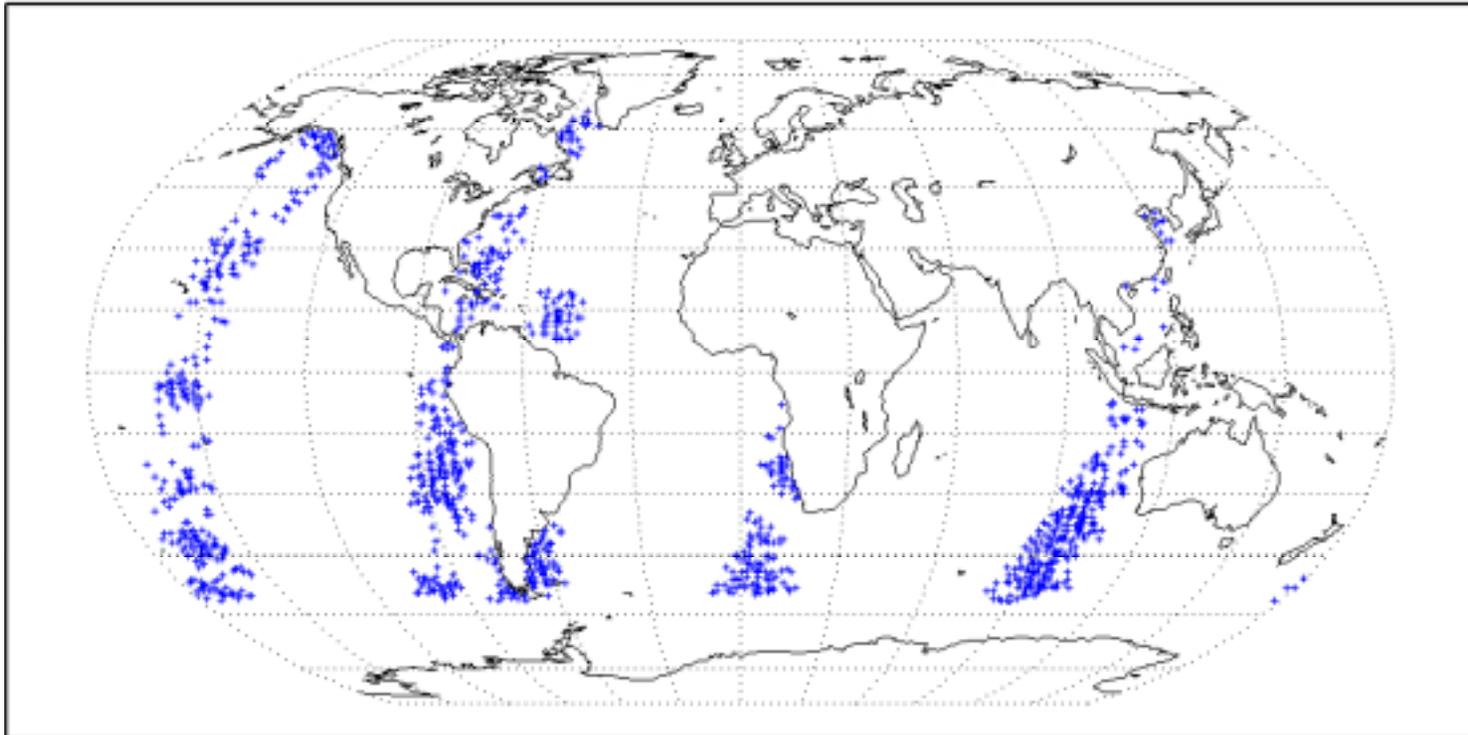
- Exercise results using Matchup files and ECMWF model
- Proposed early validation activities
- CLAMS as prototype for early validation (Thursday)

October Exercise

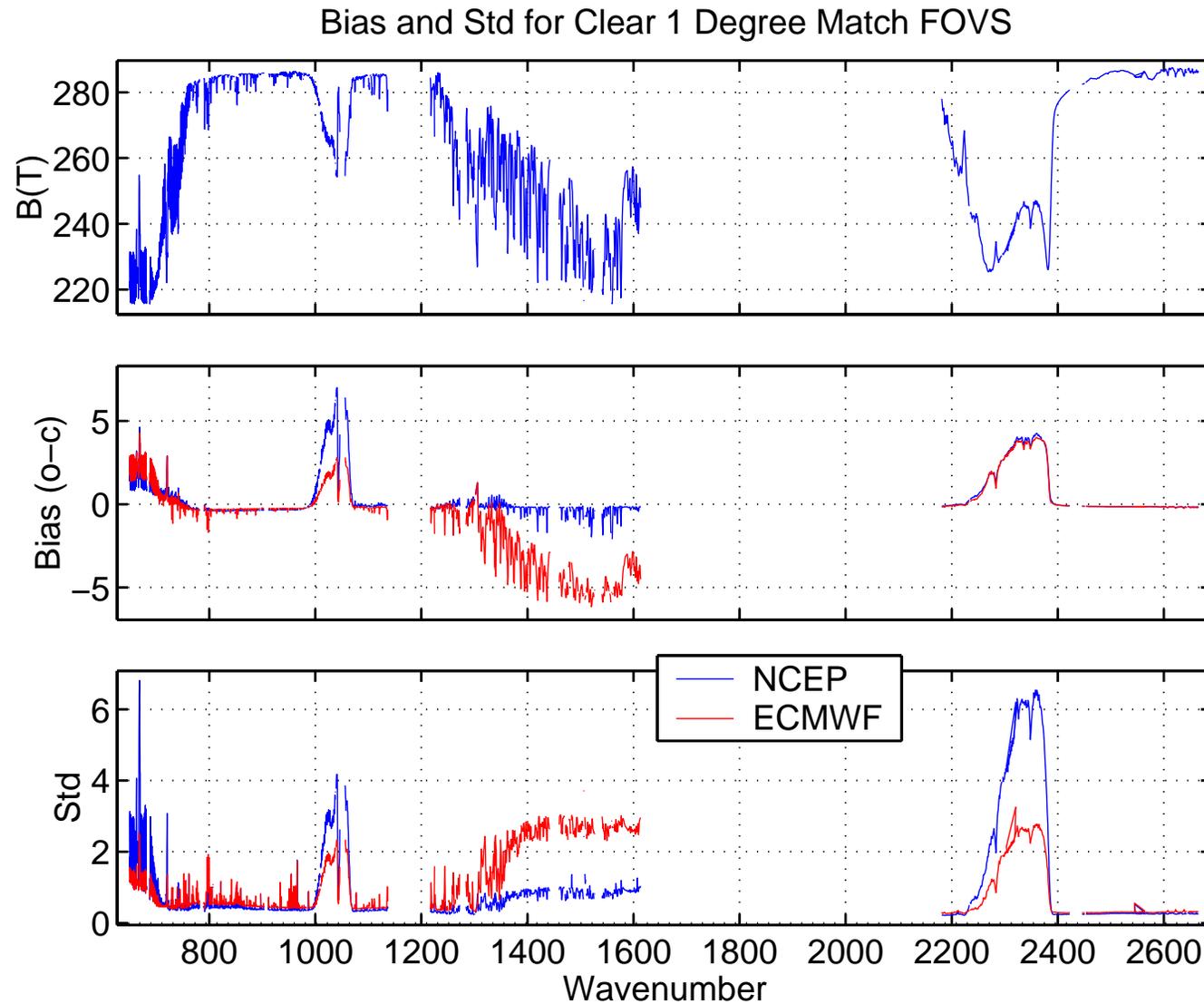
- Concentrated on using 1 degree AVN Matchup files. UMBC did validation using PREQC matchups during June exercise.
- More realistic? by using ECMWF SST for finding clear FOVs and ECMWF atmospheric fields for computing bias/std.
- Concentrated on night/ocean observations.
- Selected hottest FOV in each golfball. Declared FOV clear if
 1. $|T_{2616} - T_{ECMWF}| < 1K$. T_{2616} is the 2616 cm^{-1} B(T) corrected for atmospheric transmission/emission.
 2. $|T_{2616} - T_{900}| < 0.5K$, T_{900} also corrected for atmospheric effects.Didn't look at RMS of golfball fields, but could be easily added
- Used SARTA with RTP formatted profiles/radiances produced from Matchup files and ECMWF profiles.

Location of Clear FOVS in the 4 Daily Matchup Files

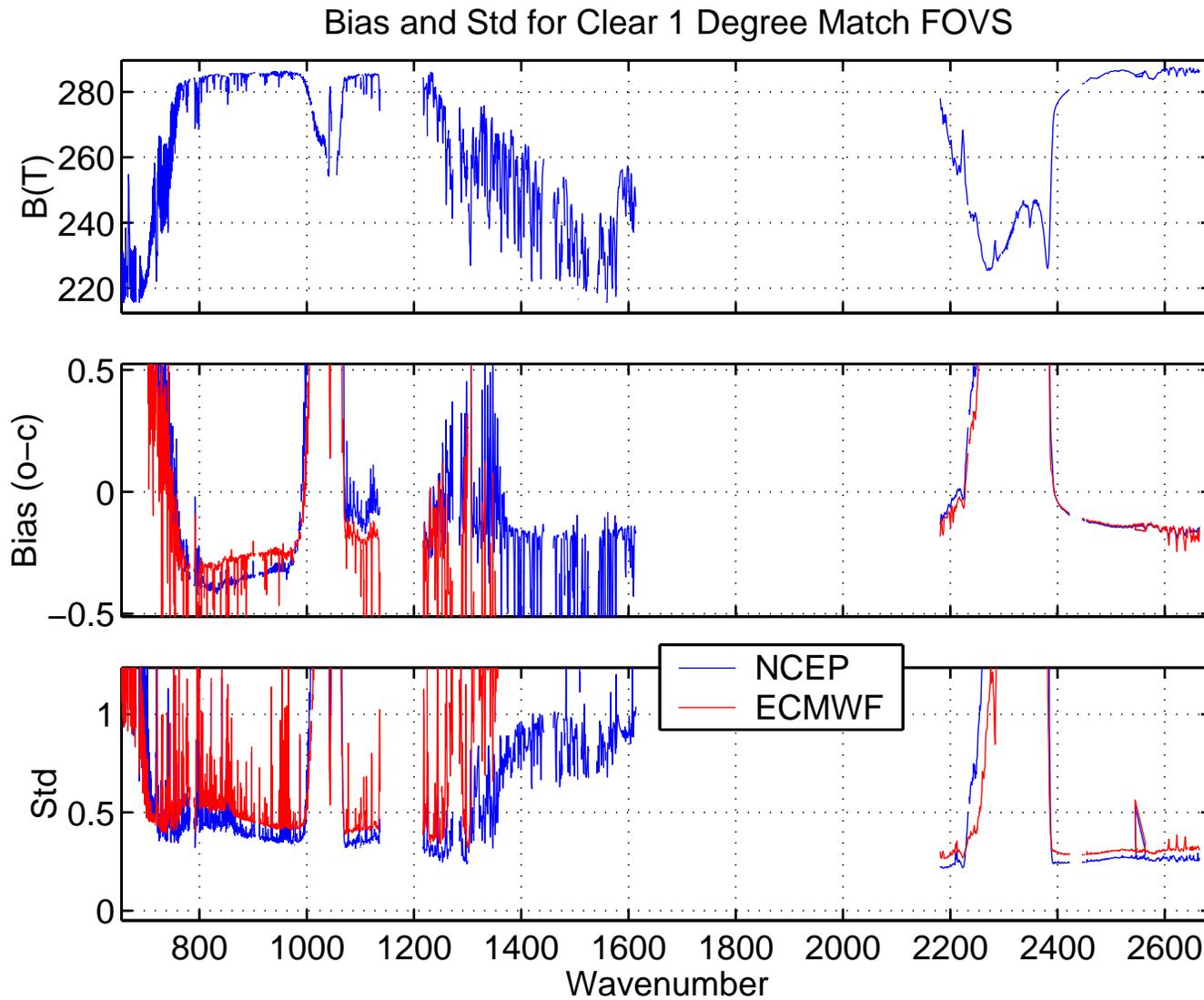
Clear/Night/Ocean 1 Degree Match FOVS



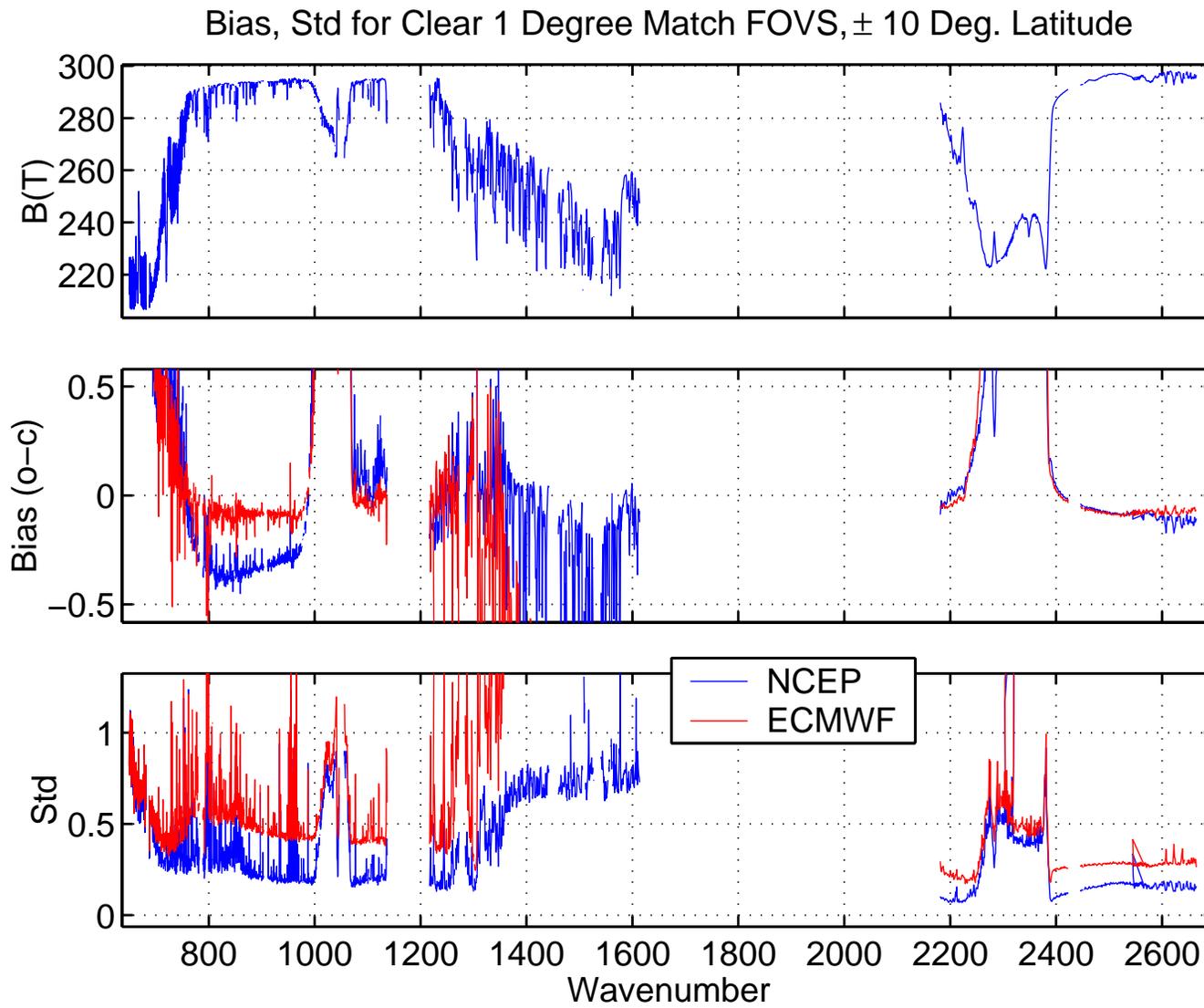
Matchup File Bias/Std using NCEP/ECMWF, all Latitudes



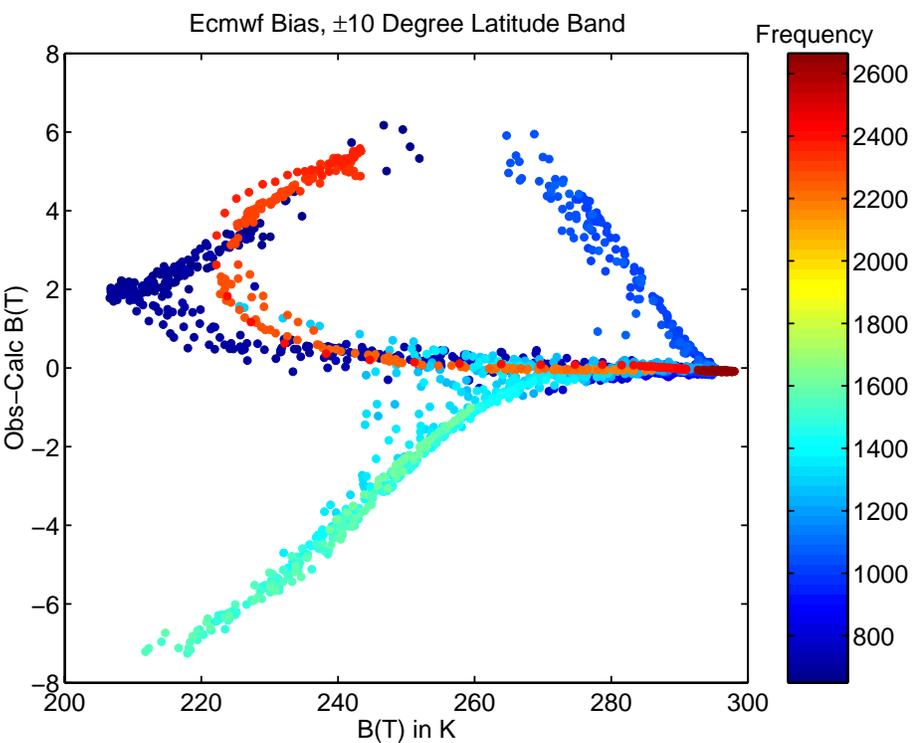
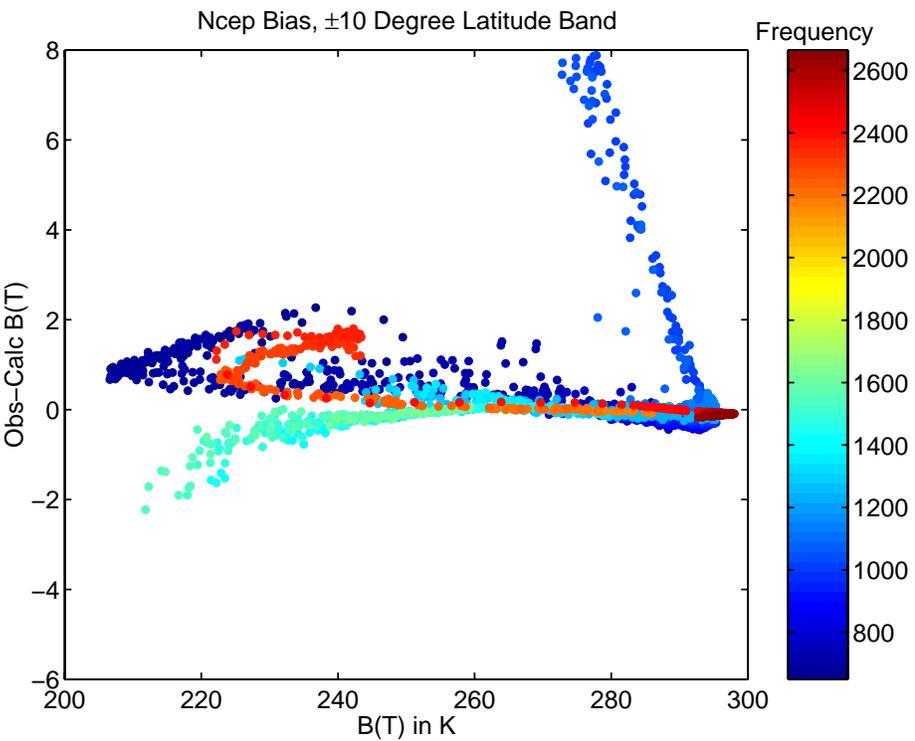
Matchup File Bias/Std, all Latitudes (Zoom)



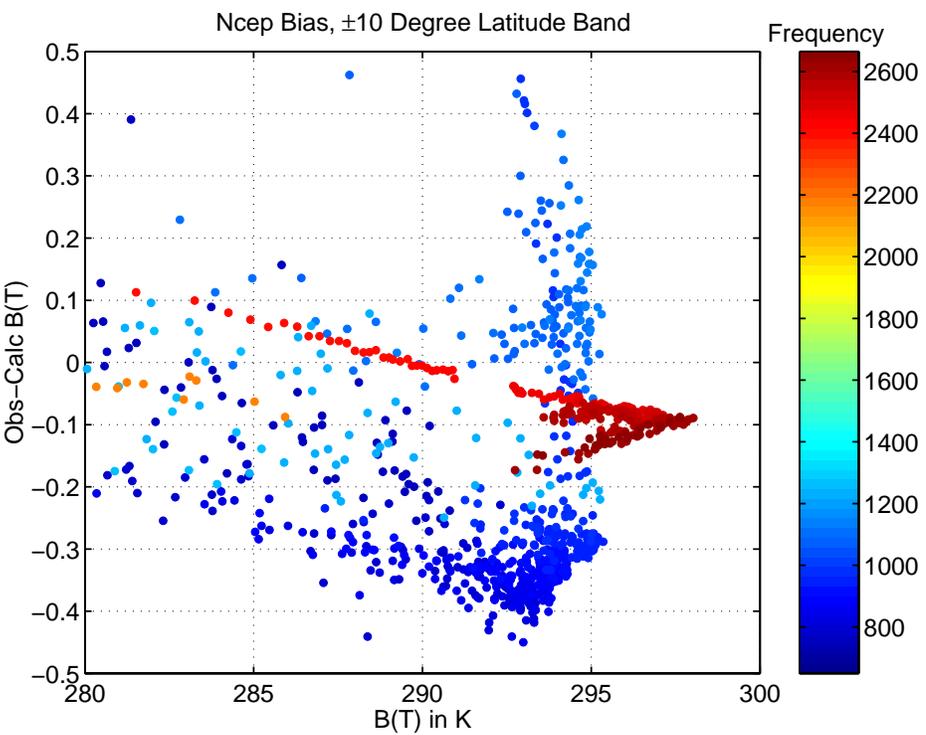
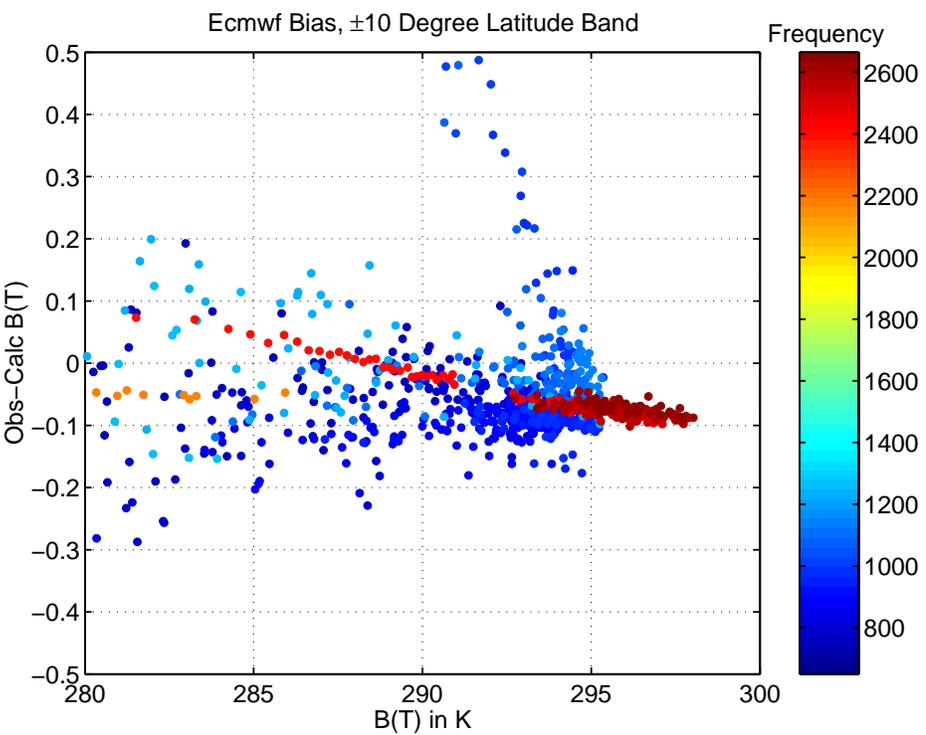
Matchup File Bias/Std using NCEP/ECMWF, $\pm 10^\circ$ Latitude



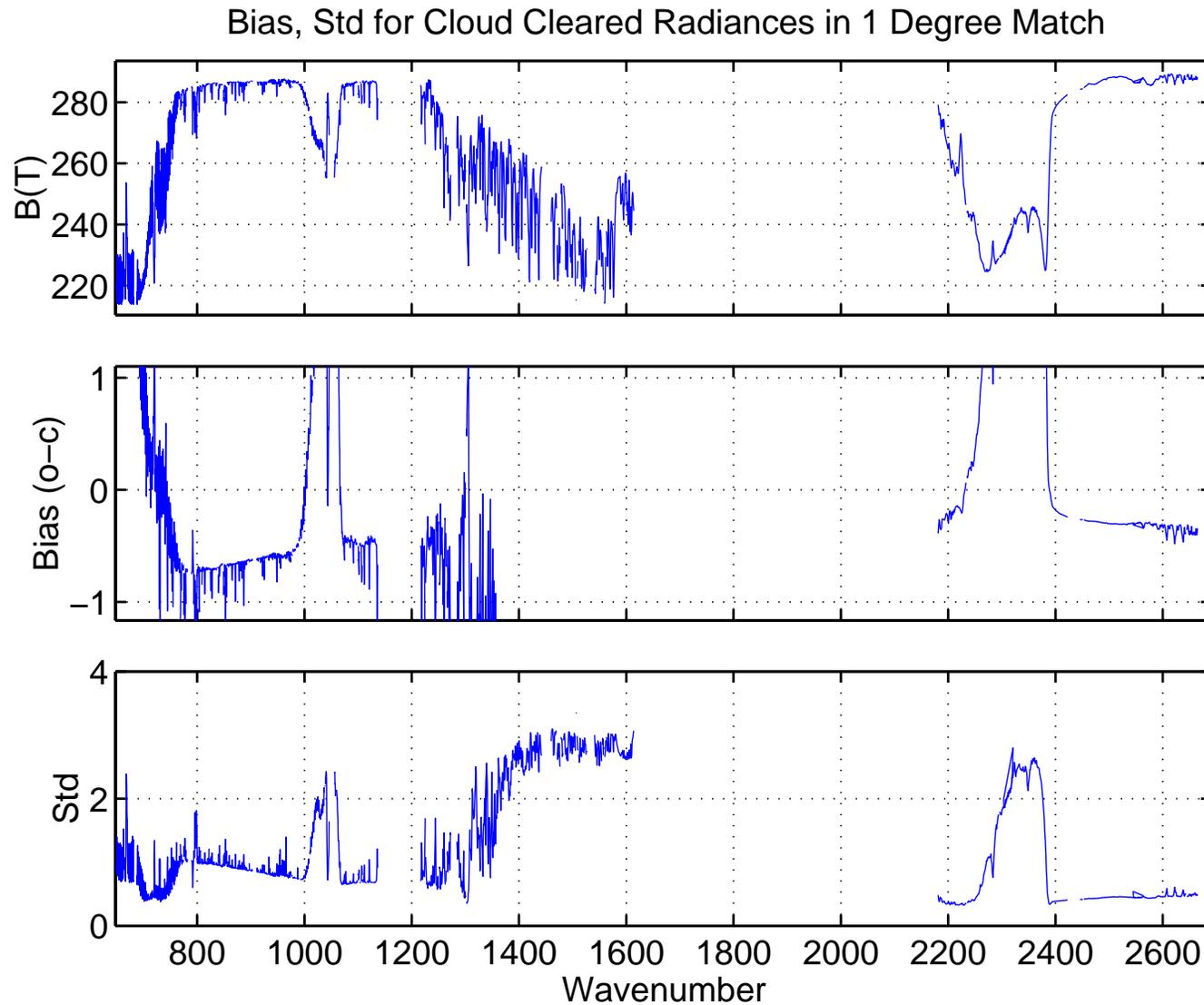
Bias Errors vs B(T) as Proxy for Altitude



Bias Errors vs B(T) as Proxy for Altitude:Surface Channels



Matchup File Bias/Std using Cloud-Cleared Radiances



Status of Proposed Early Validation Activities

1. Use kCARTA to verify L1b-provided channel frequencies are correct. Use computed spectra for all channels and cross-correlate with observed B(T)'s on a per array basis. Use ECMWF/NCEP for computed B(T)'s.
 - Software in hand to extract model fields from ECMWF files
 - Routine convolutions of kCARTA monochromatic spectra with SRFs not yet finished. Will either use wrapper of f77 kCARTA to look like SARTA or Matlab version of kCARTA driven by RTP fields.
 - Correlation routines tested long ago, need to re-code and test with simulated data.
2. Per granule, evaluate Obs- ECMWF computed B(T)'s for clear, tropical ocean scenes (day/night) *before* instrument stabilization. Must use kCARTA and determine channel centers independently. Compare std. dev. to L1b noise estimates.
 - As above, need to finish kCARTA-based frequency calibration and routine generation of convolved spectra with kCARTA.

3. Global bias and std. dev. versus NWP models using fast RTA. Use ECMWF/NCEP for atmospheric fields and SST's. Also evaluate bias and std. dev. using NOAA-RTG and TMI for SST. Attempt to separate instrument artifacts from RTA/model errors. Use correlation analysis (model vs observed) in addition to absolute comparisons.
 - Software to extract NWP fields, AIRS clear FOVs from Matchup files and construct RTP files essentially finished.
 - NOAA-RTG and TMI SST fields have been read, need to write standard software for insertion into RTP files.
 - Visualization software for correlation analysis needed.
 - Need to set up cron jobs to download weekly RTG and TMI. Wouldn't mind getting these from TDS at JPL instead.
4. Determine if fixed trace gas amounts in fast RTA are appropriate, especially N₂O over clear ocean. Modify amounts in future RTA.
 - Software does not exist for this.
 - May have to generate our own simulation set.
 - Will base this on Matchup files

5. AMSU vs AIRS for early evaluation of AIRS high altitude channels.
 - Basic idea is to validate higher altitude AIRS H₂O channels with microwave.
 - These channels difficult to validate with models/radiosondes
 - Generate synthetic prediction of microwave B(T)'s from sets of IR channels. Compare to actual predictions.
 - Might be more appropriate for MIT to do this??

Summary

- Matchup files appear to be working well for bias evaluation
- Results from October exercise somewhat suspect because of low cloud amounts
- Use Matchup file clear flags in future? For early validation will still need to do our own clear flag since best channels for clear determination will be changing with time. (Will *some* of the Level 2 clear flags discussed Tuesday be in the Matchup files even if Level 2 processing cannot proceed?)
- Extend matchup files to poles, especially for early production of global images.
 - Use more sparse gridding for poles?
 - Produce two smaller files instead? (File 1:) instead of golfball, save clearest FOV (is this possible with present matchup system?) and (File 2:) instead of golfball, save center FOV only.
 - These files will be much smaller and allow full global coverage.
- Need ECMWF fields located at JPL in TDS so can perform clear flag subsetting of Matchup files at JPL. Will lower my download requirements during frantic early evaluation. Will transfer RTP file back to UMBC for SARTA and analysis. Will be using (at times) 1-2 Matlab licenses for this (1) for production of RTP files and (2) for analysis of results during production.