Early Evaluation of AIRS Level 1B

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- Noise characterization using Earth scene data
- Obs-Calcs based on global radiosonde and ARM site profiles using SARTA and kCARTA
- Broadband radiance evaluation using GEOs

and Thanks to the UMBC group

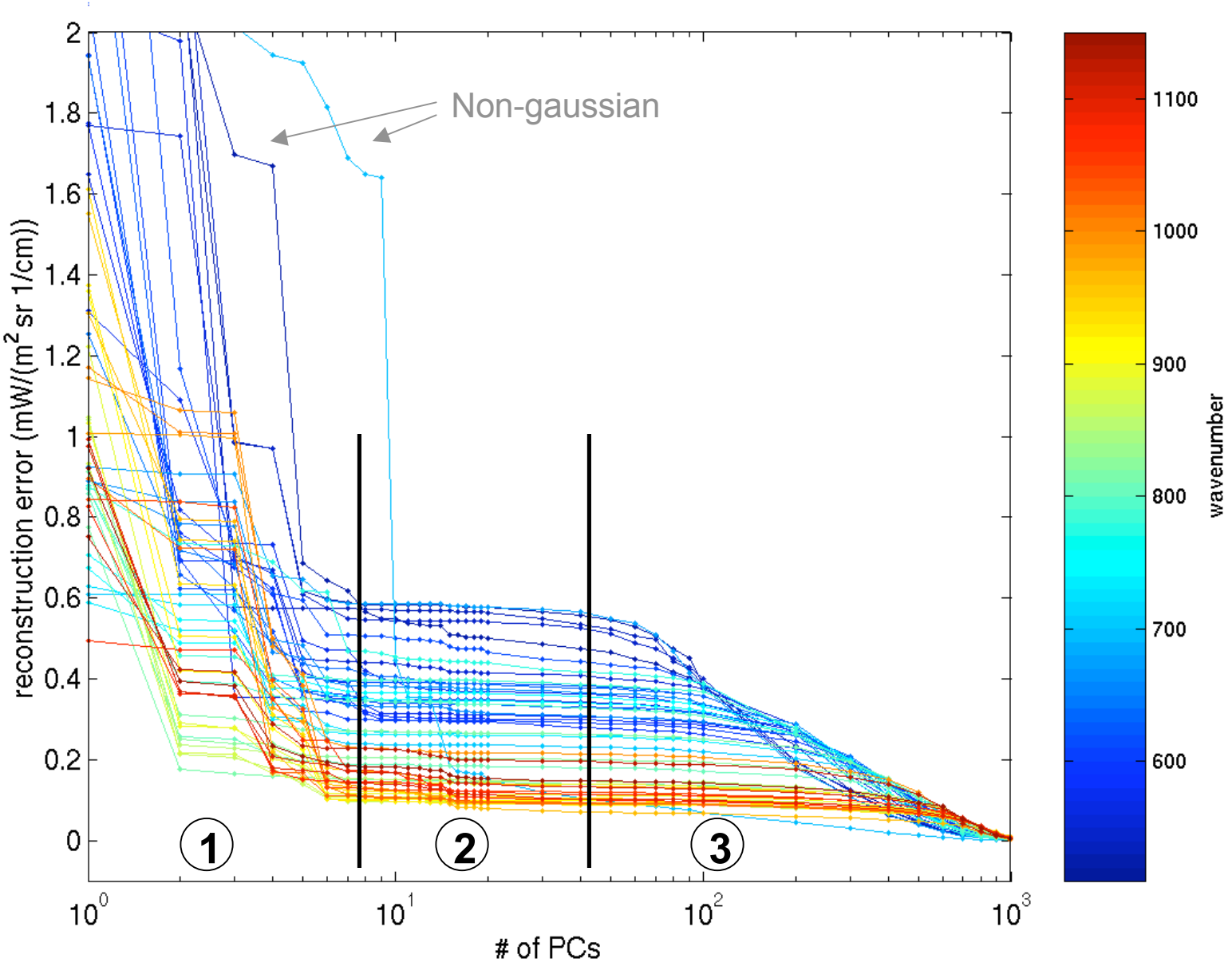
Noise characterization using Earth Scene Data

- **Goal**

  Characterize AIRS spectral noise using Earth view data

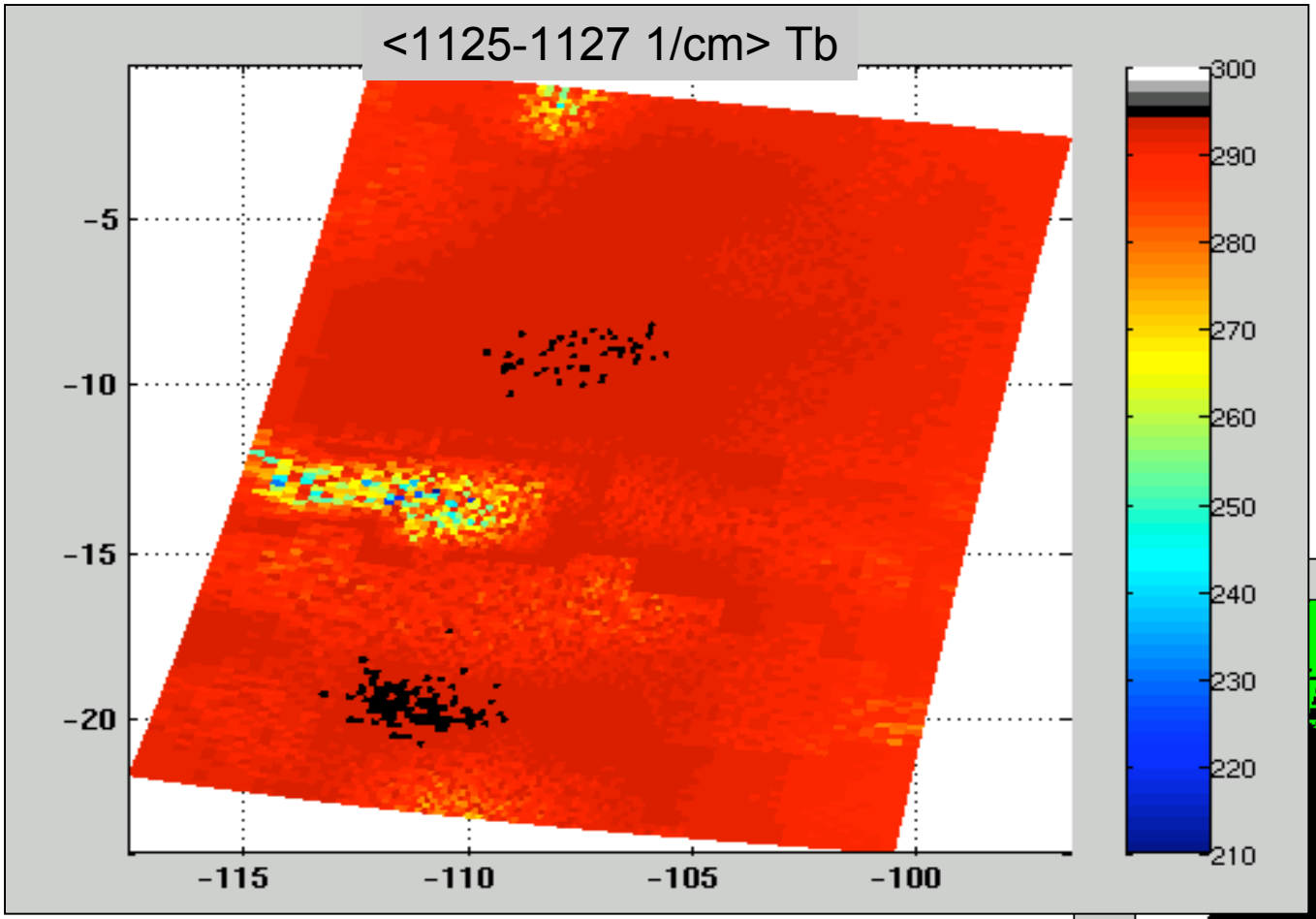
- **Approach**
  - Using spectra from any granule:
    1. generate principle components (PCs)
    2. reconstruct the spectra using a limited number of PCs, and
    3. use statistics of the reconstruction error to derive noise estimates
  - Assumes gaussian distribution spatially and spectrally uncorrelated noise
- **Examples** using 15-Dec-2000 granules ...

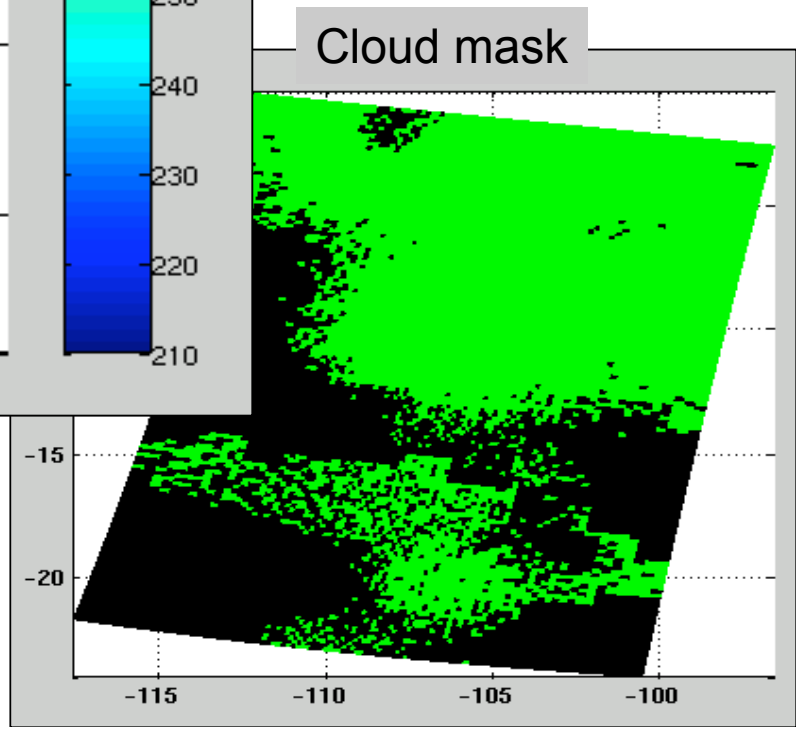
Reconstruction error (NEDN) versus #PCs



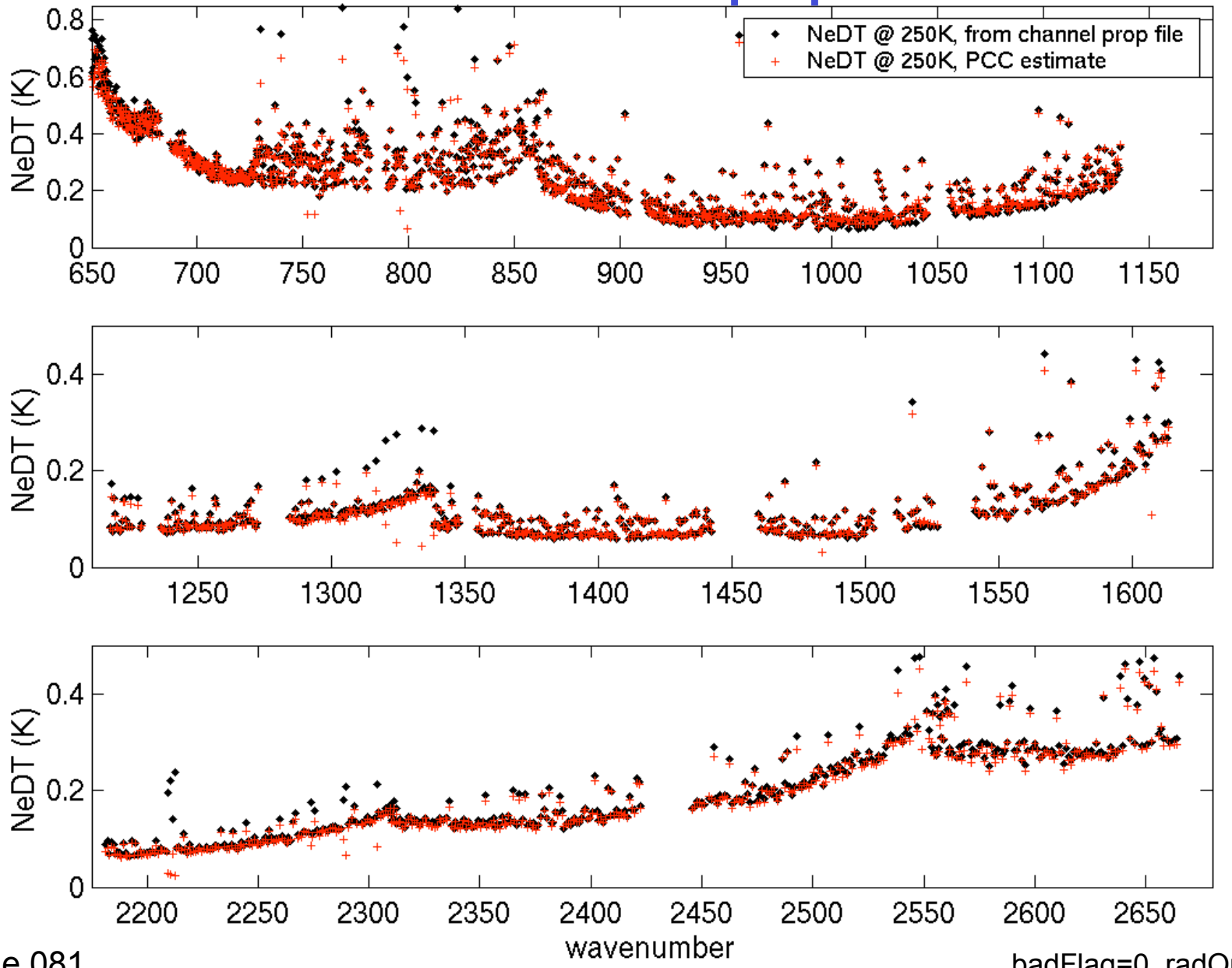
Granule 081

15-Dec-2000 granule 084





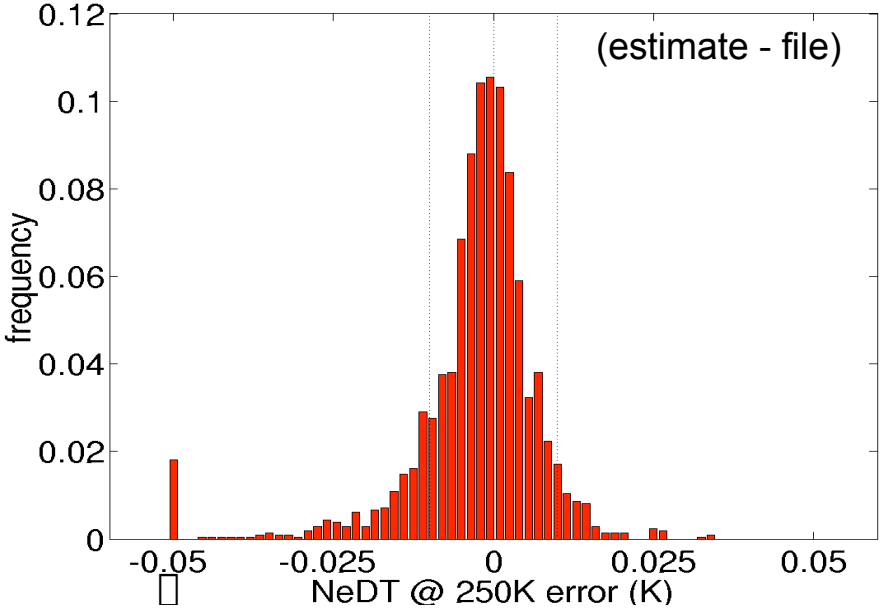
NeDT@250K: estimated from granule 084 and values from channel properties file

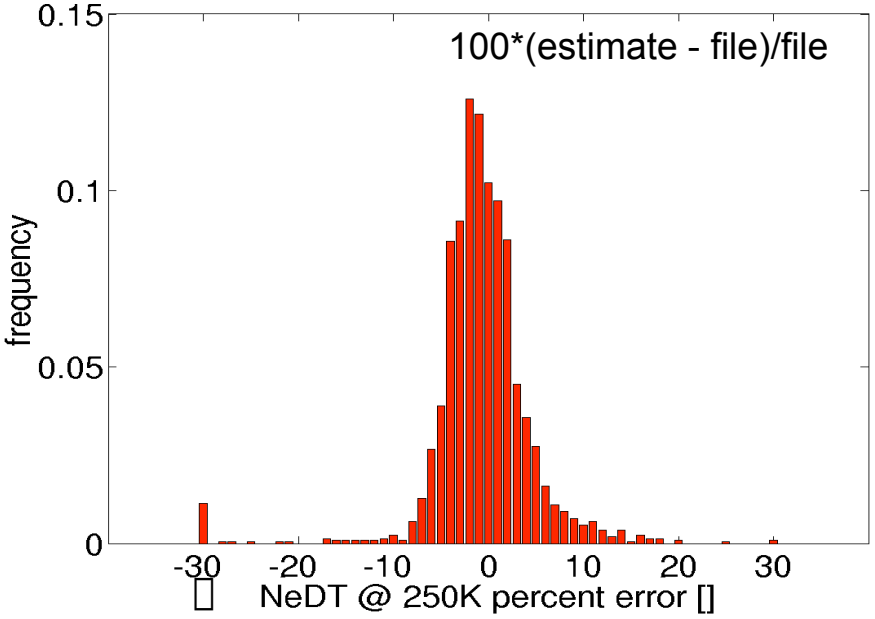


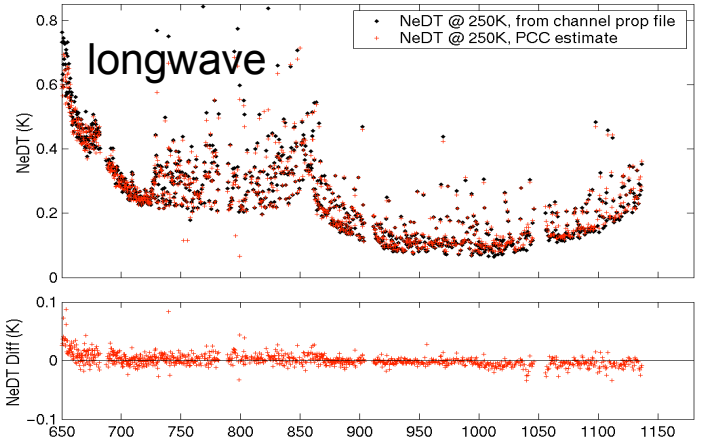
Granule 081

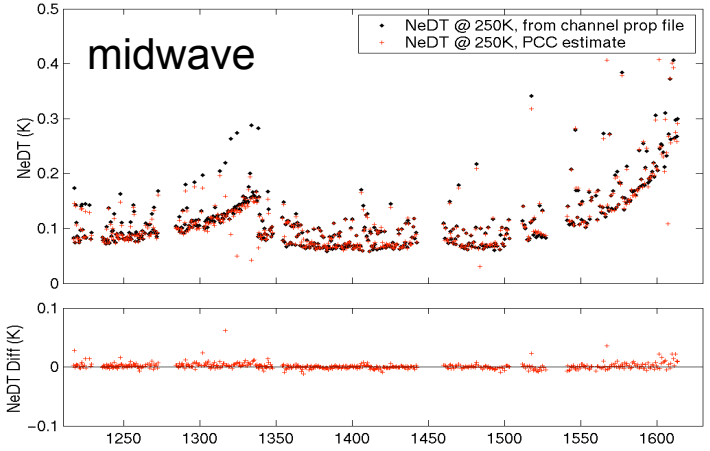
badFlag=0, radQuality <=2

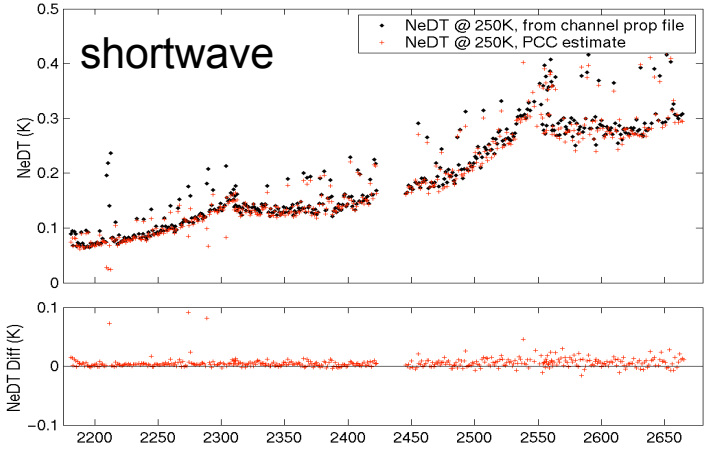
Estimated versus Channel properties file



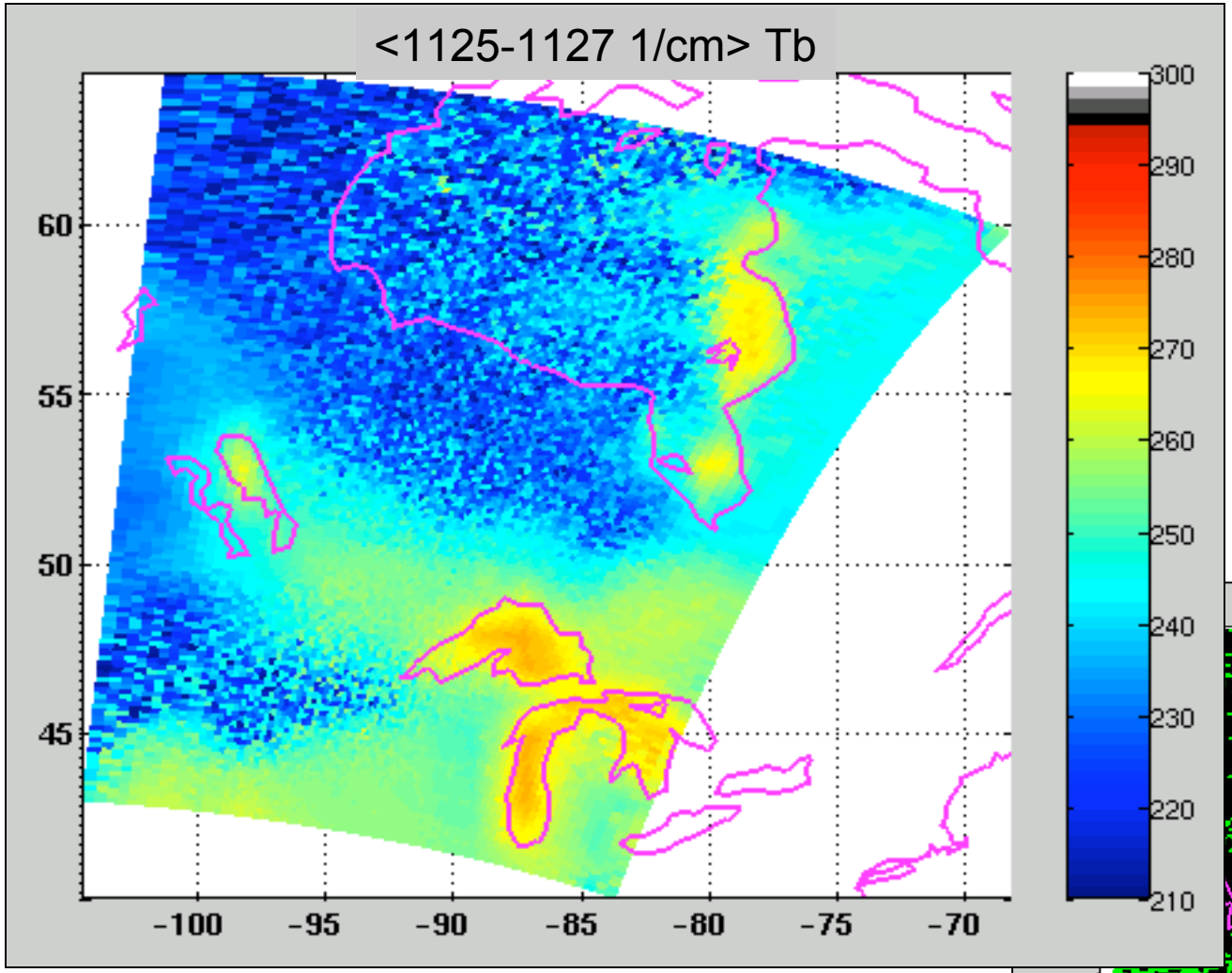


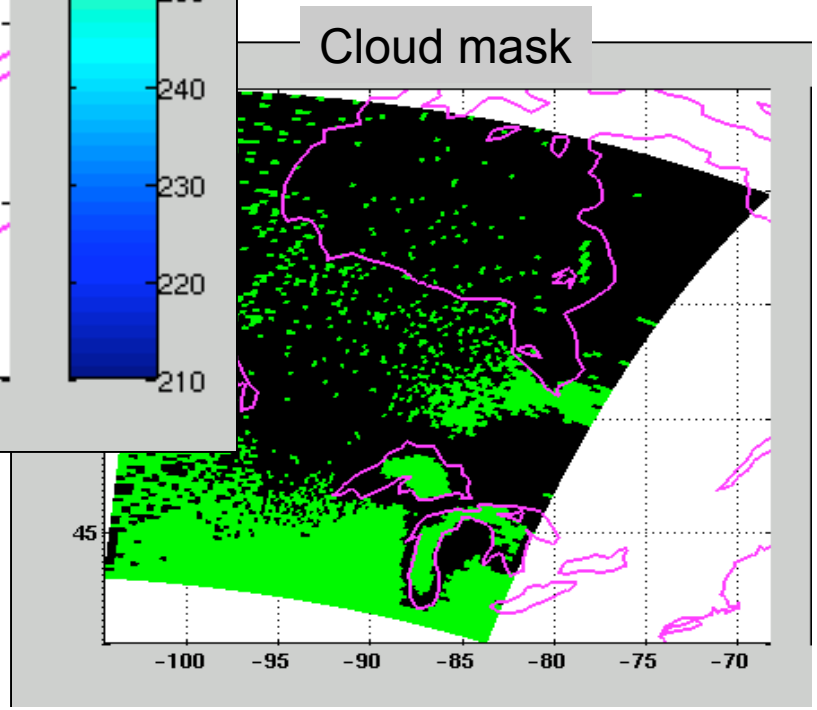




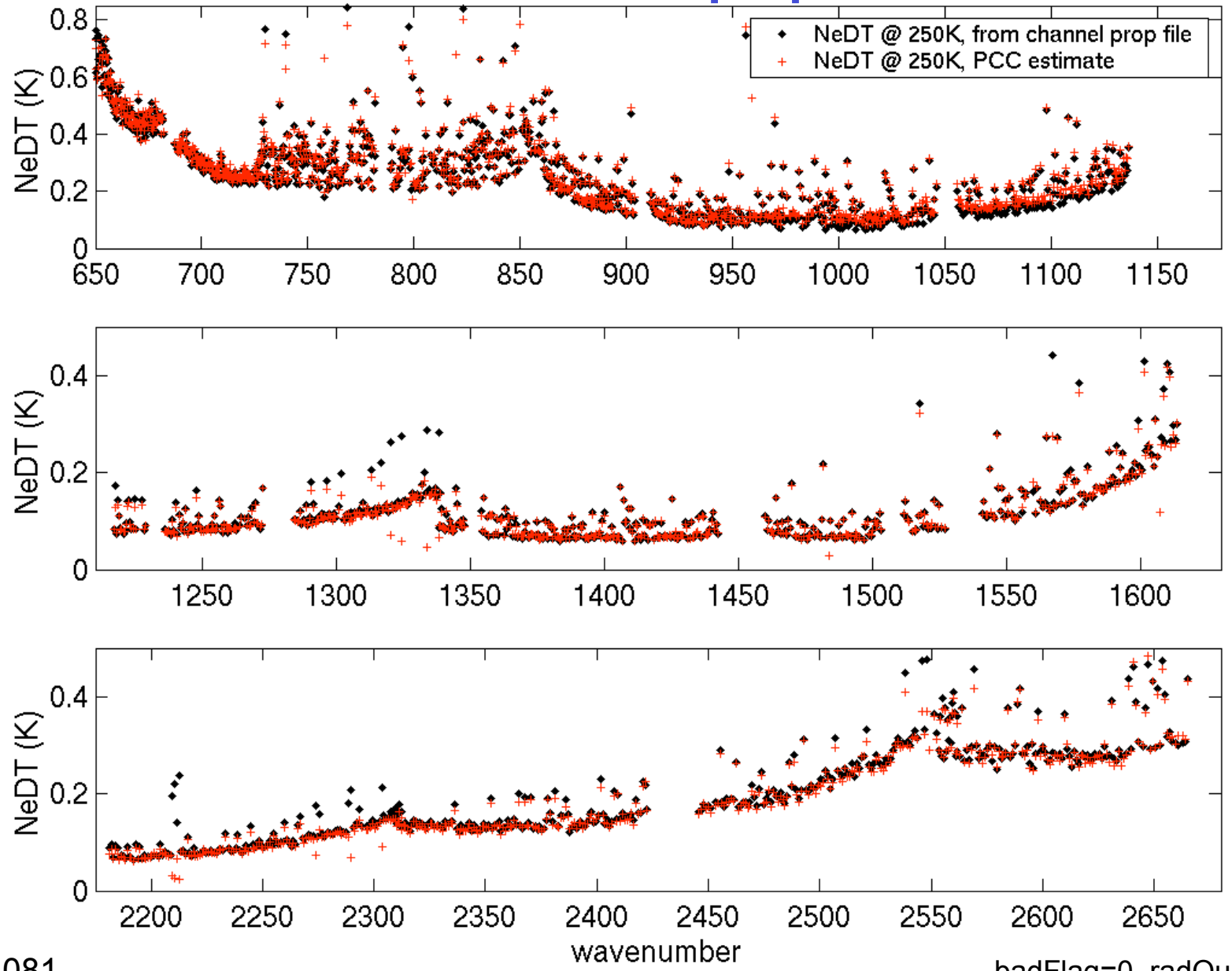


15-Dec-2000 granule 081



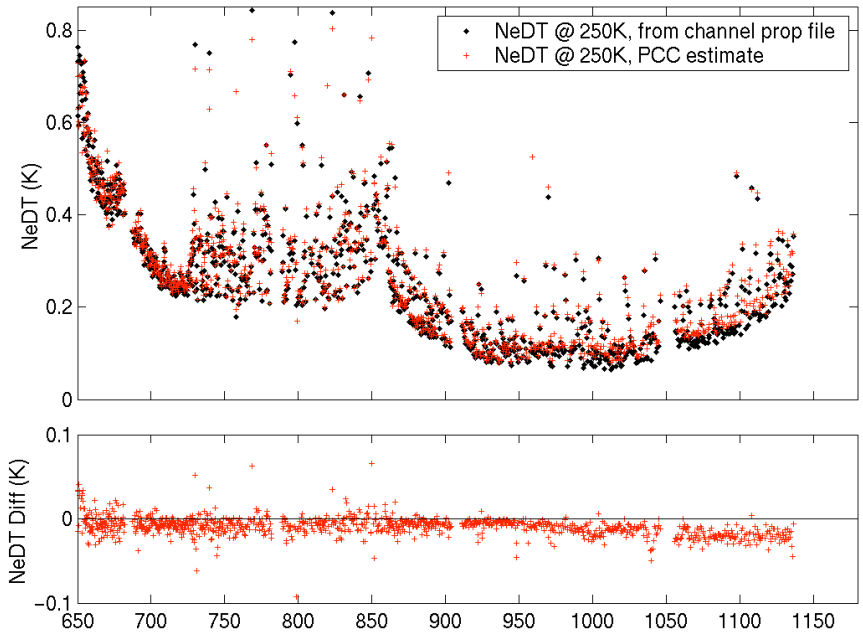


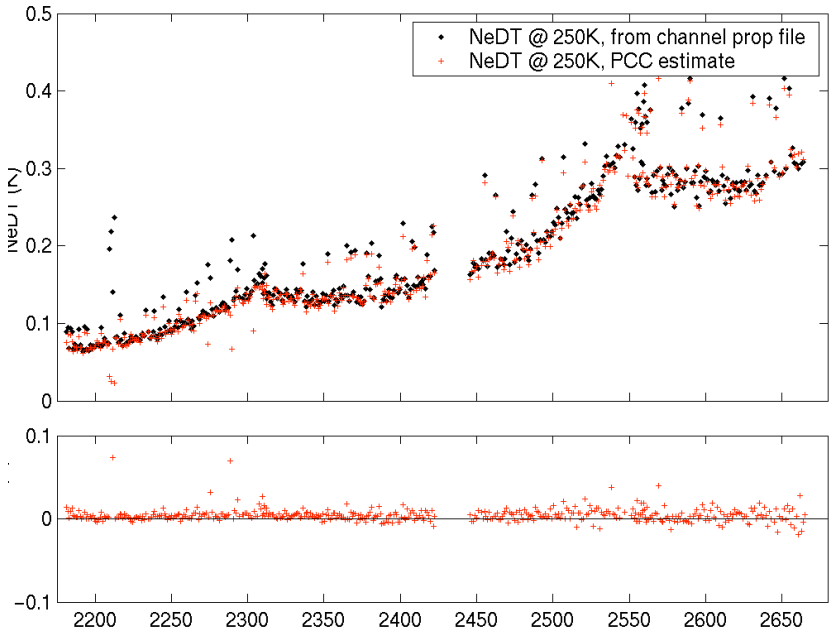
NeDT@250K: estimated from granule 081 and values from channel properties file

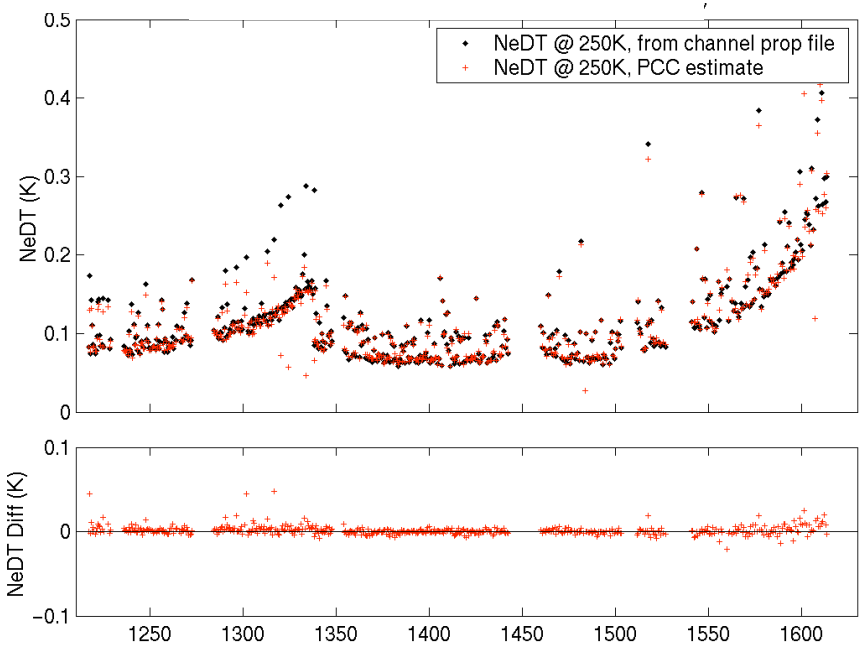


Granule 081

badFlag=0, radQuality <=2


NeDT @ 250K, from channel prop file
NeDT @ 250K, PCC estimate
NeDT (K)
NeDT Diff (K)


NeDT @ 250K, from channel prop file
NeDT @ 250K, PCC estimate


NeDT @ 250K, from channel prop file
NeDT @ 250K, PCC estimate
NeDT (K)
NeDT Diff (K)

Granule 081

Early evaluation using radiance calculations based on global radiosonde and ARM site profiles

- **Goal**

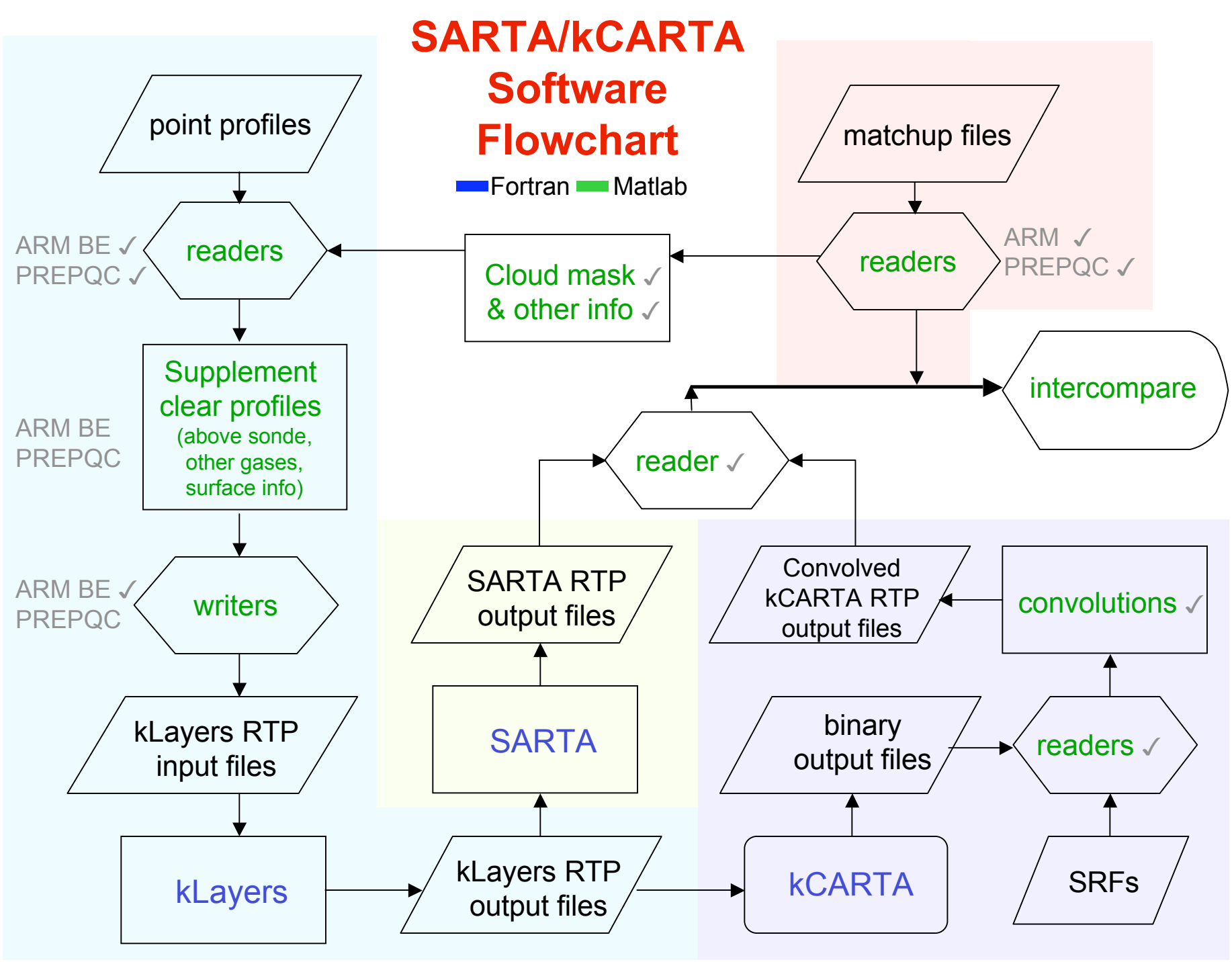
  Early spectral calibration evaluation and early radiance evaluation of mid-tropospheric channels. And monitoring of spectral behavior during transient cool down periods.

- **Approach**

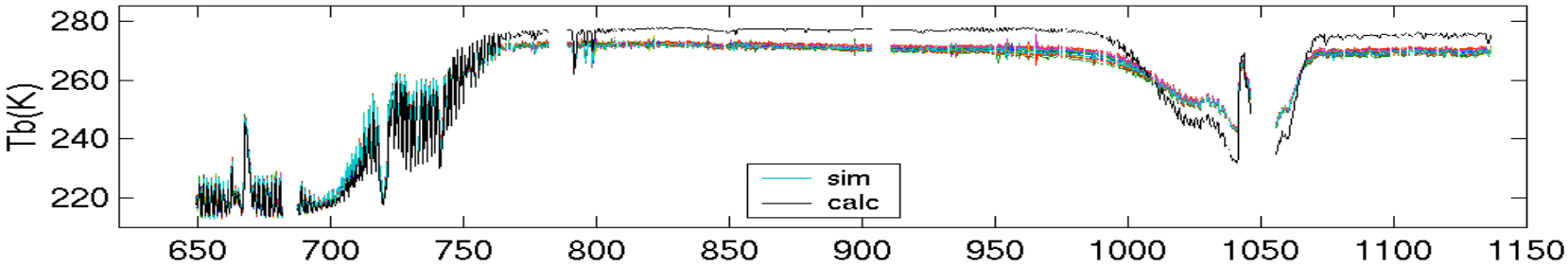
  Using ARM site best estimate, PREPQC, and matchups:

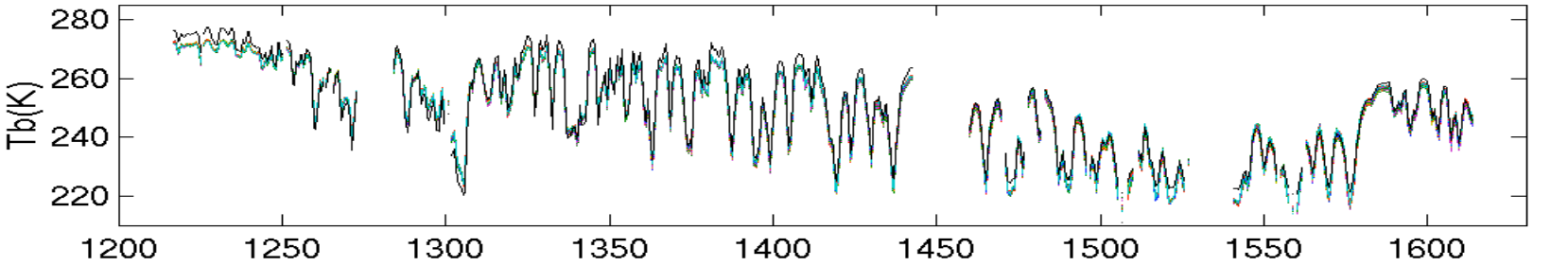
  - choose Tskin to minimize 10 μm window obs-calcs.
  - feed profiles and surface info into SARTA, or kCARTA as required
  - apply cloud mask and analyse obs-calcs

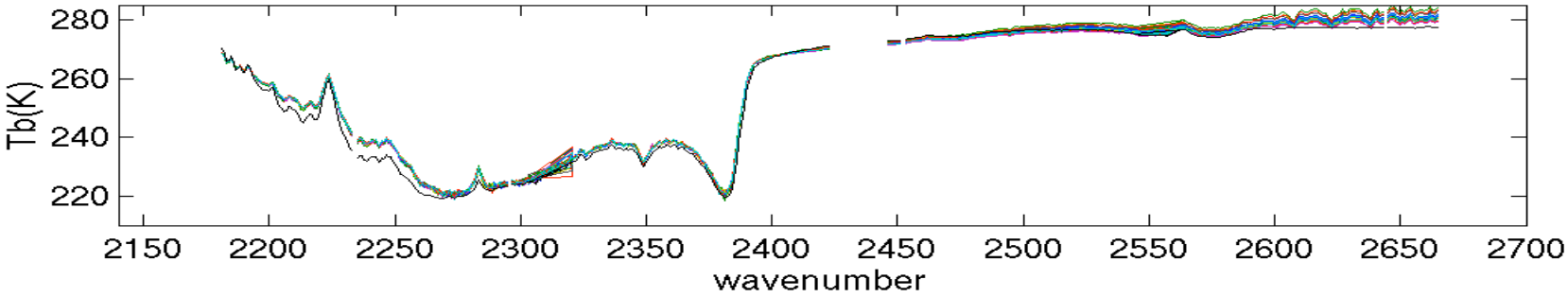
- Currenlty putting AIRS matchup and RT software pieces together
- **Examples** showing feasability using MODIS overpasses of ARM site


SARTA/kCARTA
Software
Flowchart
Fortran
Matlab
point profiles
matchup files
ARM BE ✓
PREPQC ✓
readers
Cloud mask ✓
& other info ✓
readers
ARM ✓
PREPQC ✓
Supplement
clear profiles
(above sonde,
other gases,
surface info)
ARM BE
PREPQC
intercompare
reader ✓
ARM BE ✓
PREPQC
writers
SARTA RTP
output files
Convolved
kCARTA RTP
output files
convolutions ✓
kLayers RTP
input files
SARTA
binary
output files
readers ✓
kLayers
kLayers RTP
output files
kCARTA
SRFs

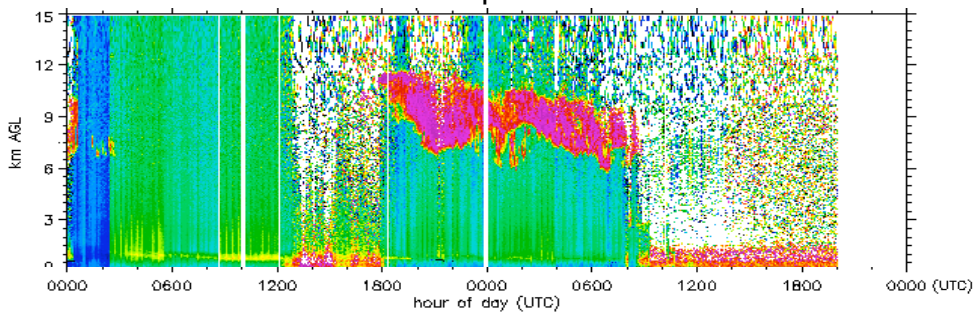
SARTA Calc and Matchups for SGP ARM site 15-Dec-2000 1915 UTC



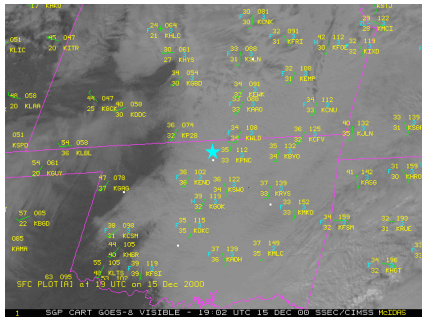




Raman Lidar Depolarization Ratio

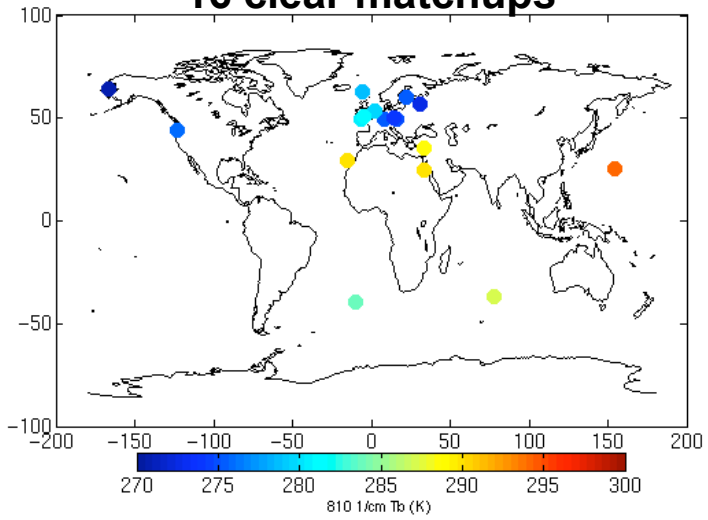


GOES8 VIS at 1902 UTC

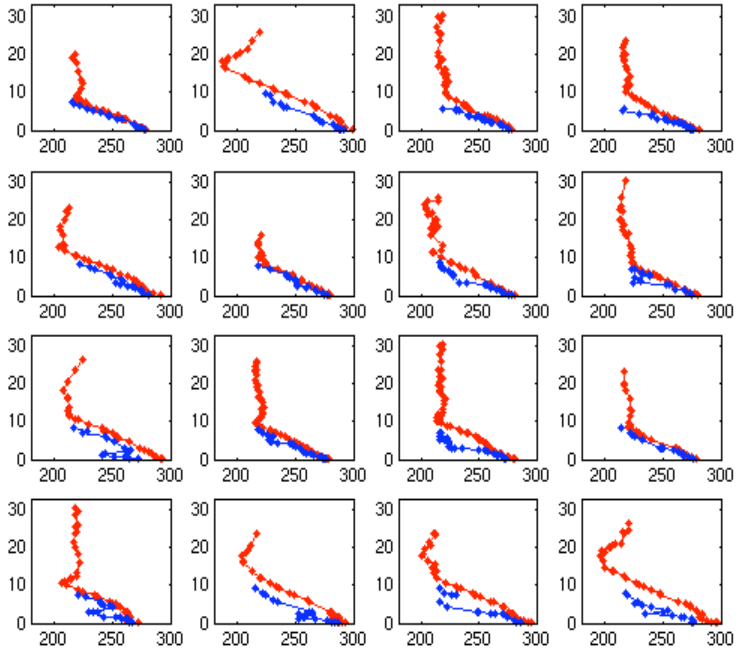


Global Radiosondes for 15-Dec-2000

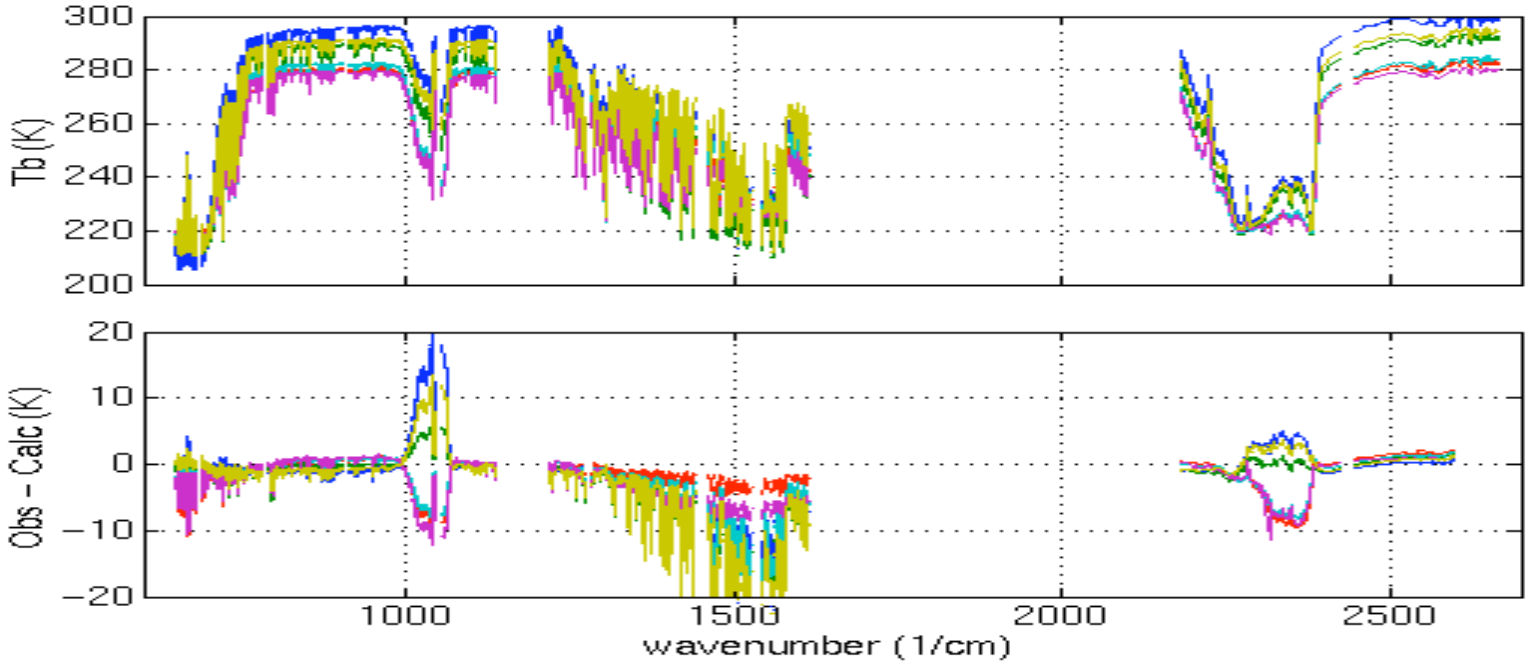
16 clear matchups



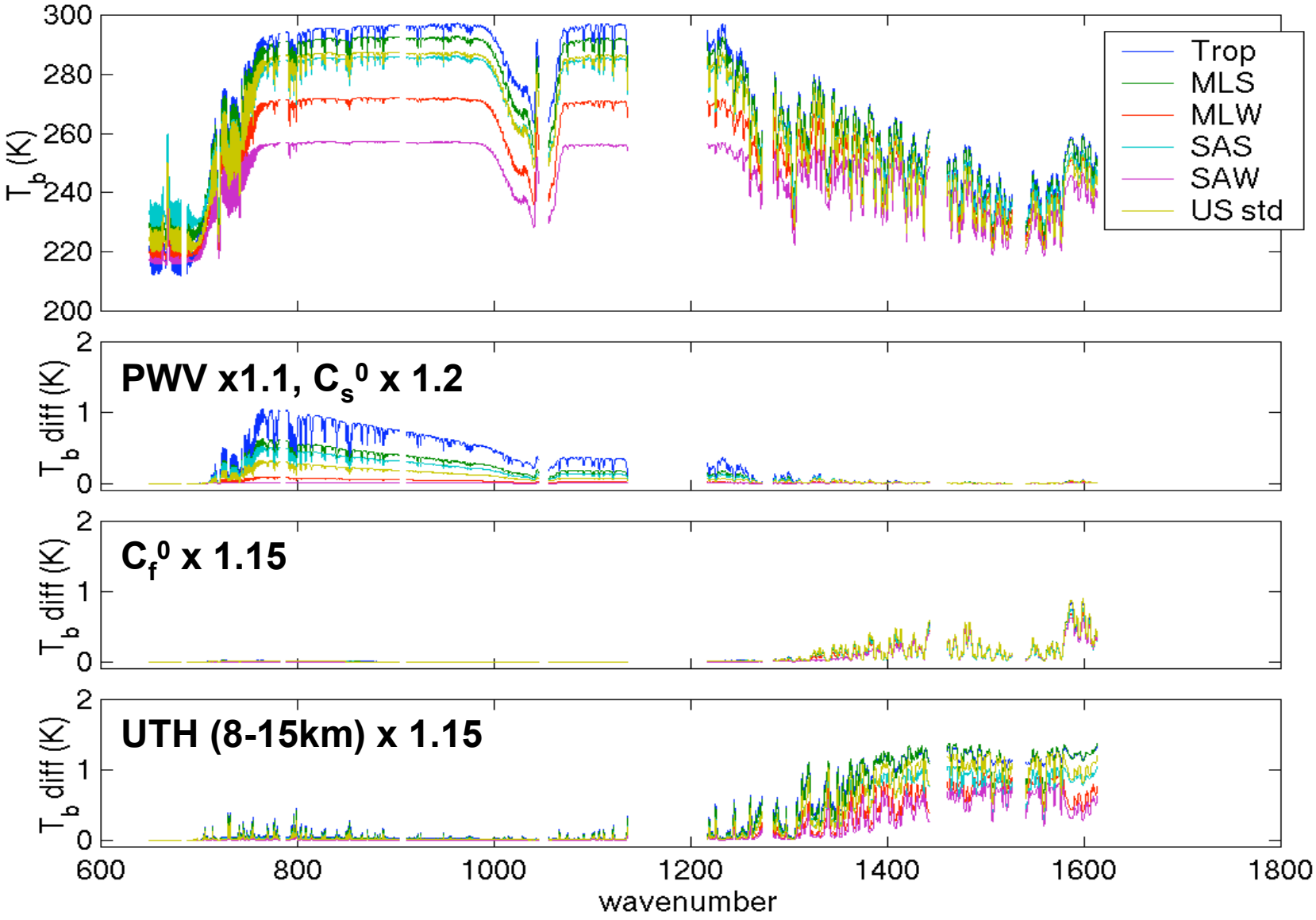
PREPQC profiles



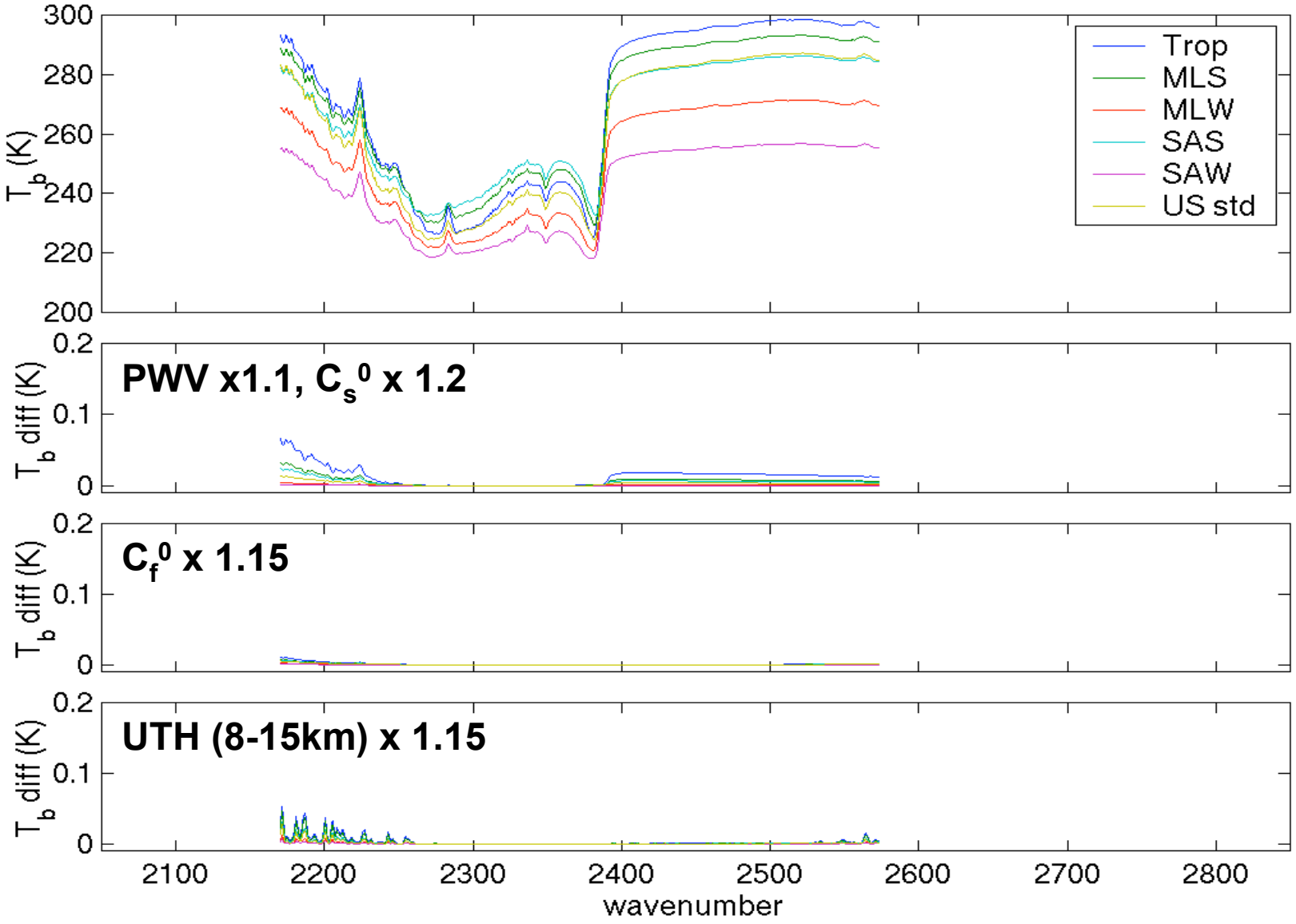
Obs-Calcs over Ocean



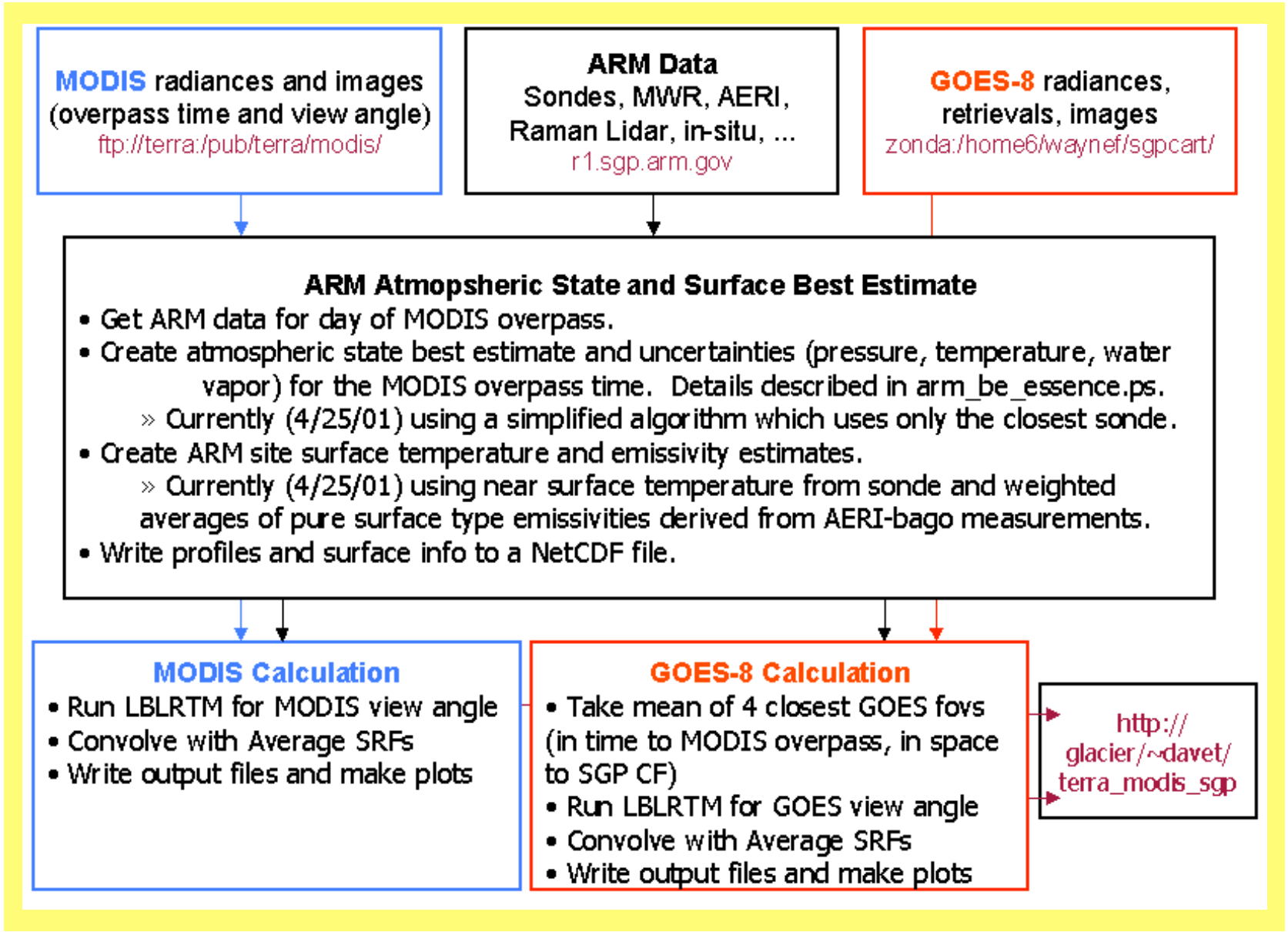
Calculation uncertainties due to water vapor concentration and continuum knowledge



Calculation uncertainties due to water vapor concentration and continuum knowledge

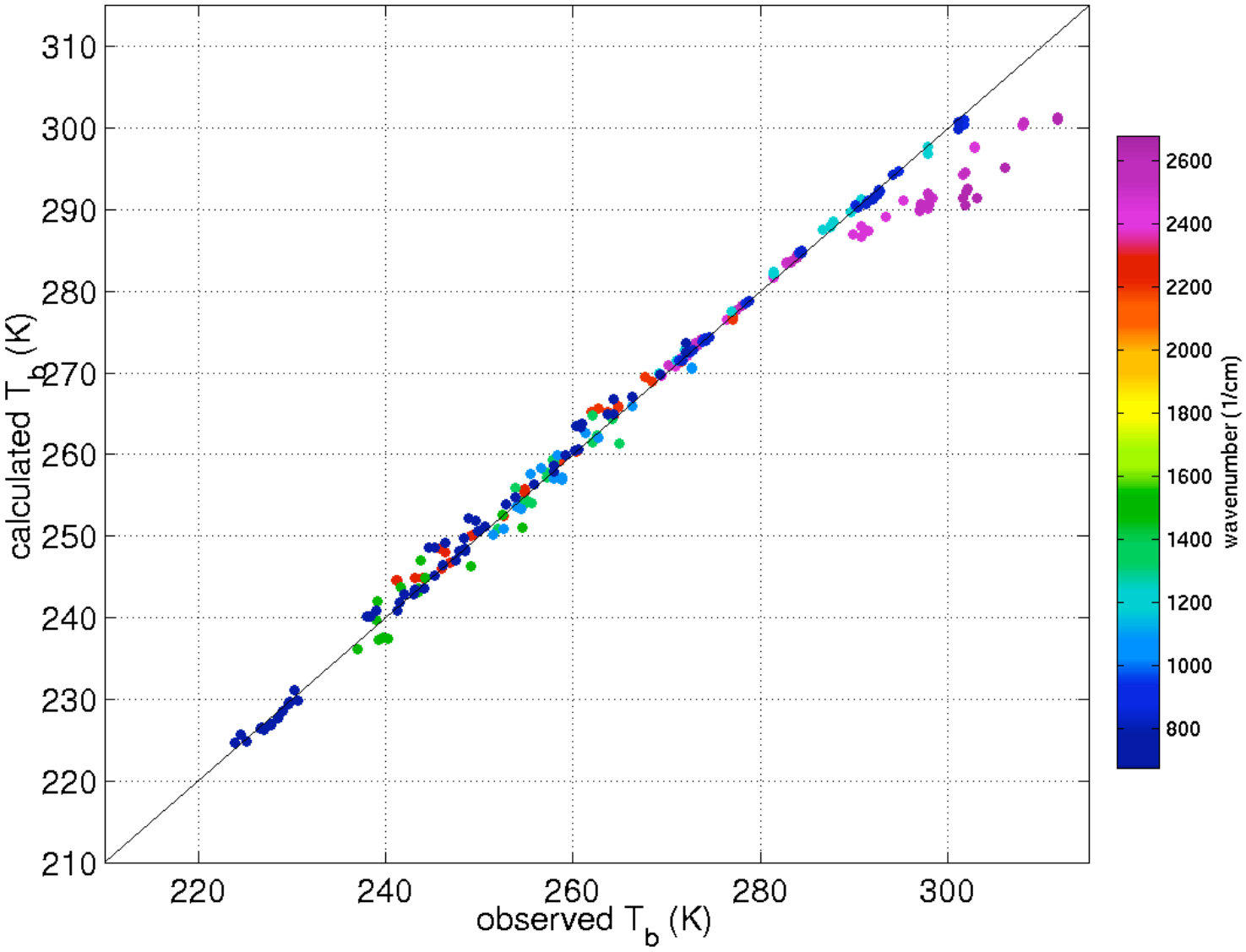


MODIS and GOES Obs-Calcs using ARM Atmospheric State Best Estimate



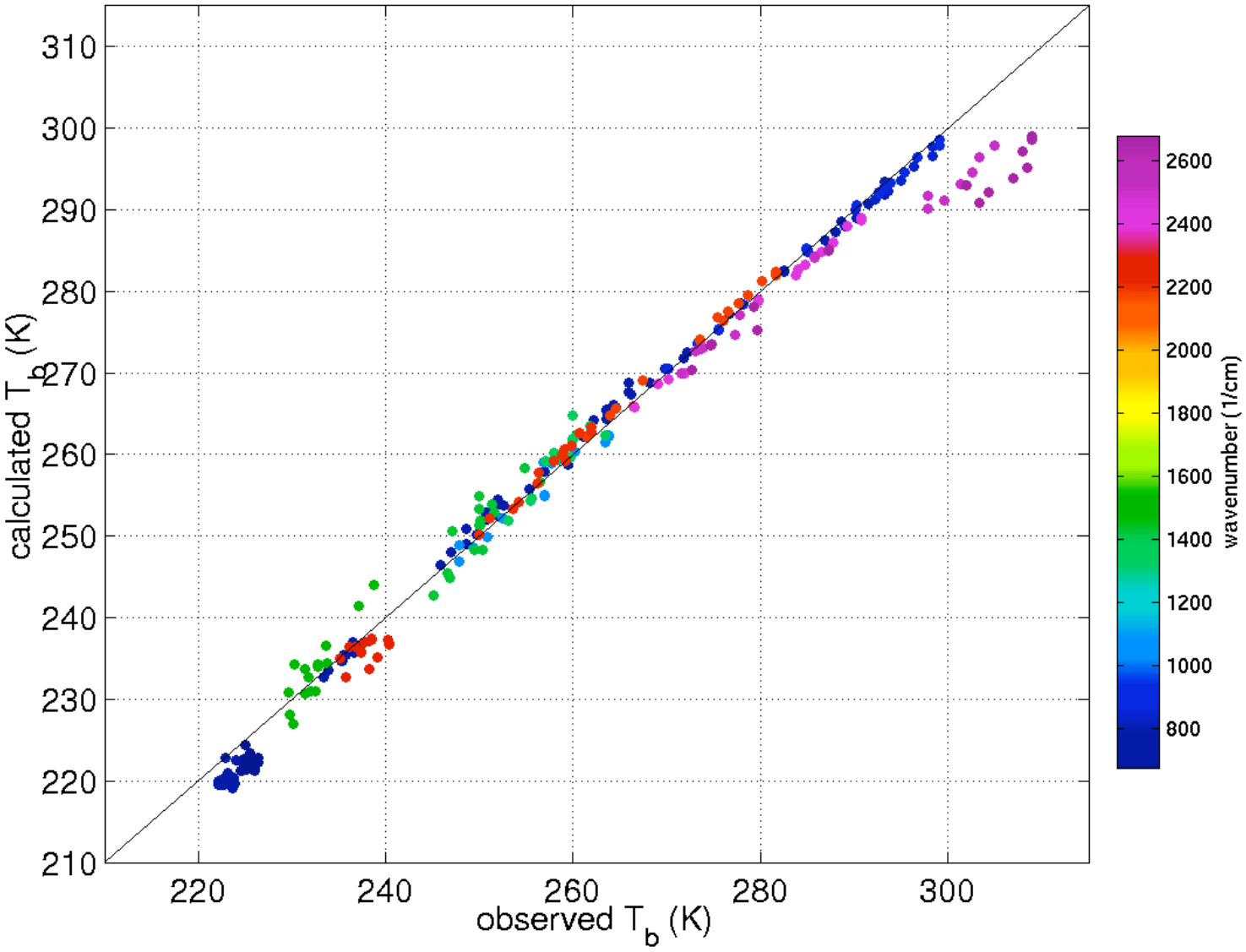
MODIS comparisons based on AASBE

- 15 clear sky cases from April 2001



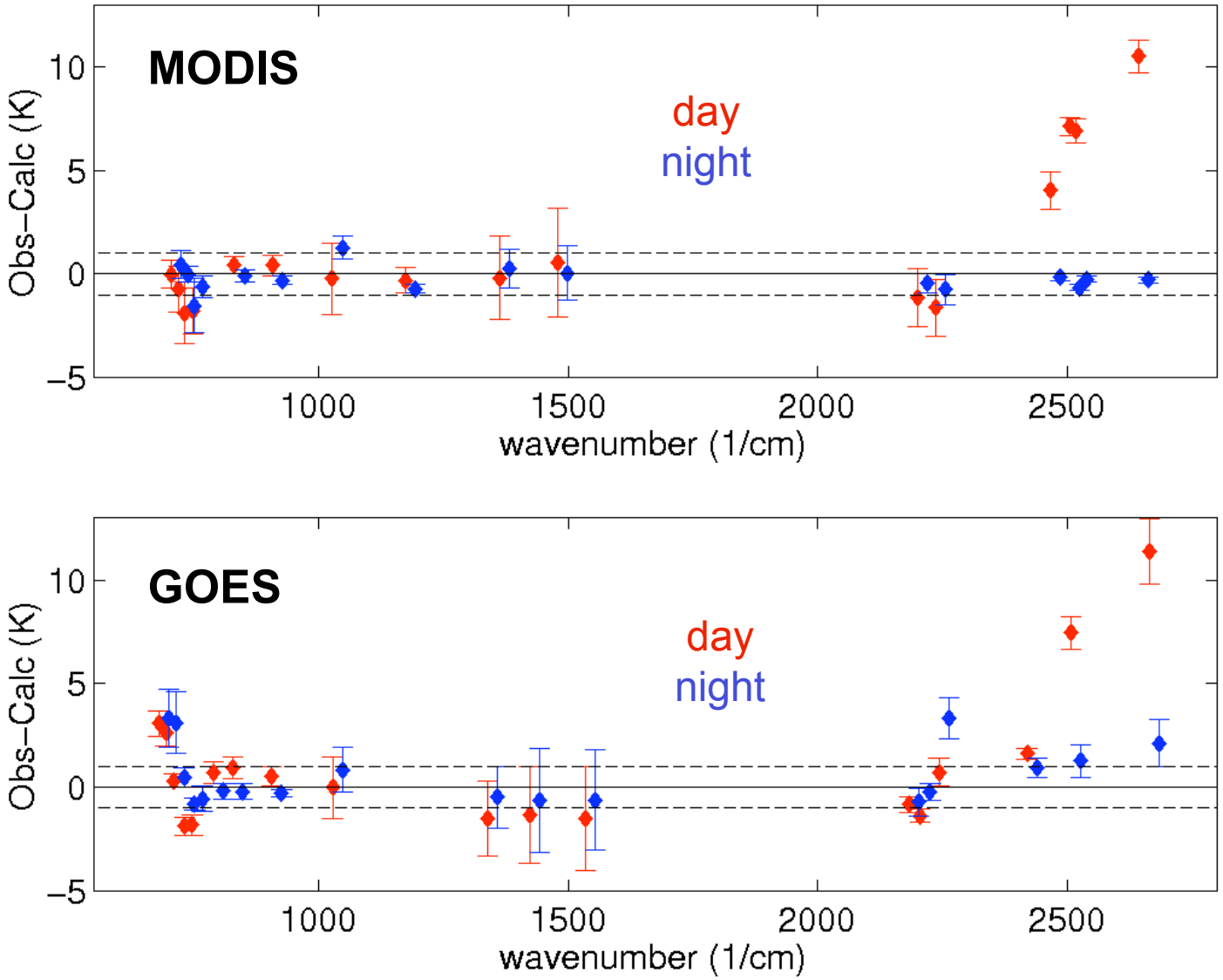
GOES8 comparisons based on AASBE

- 15 clear sky cases from April 2001



MODIS and GOES8 comparisons based on AASBE

- 15 clear sky cases from April 2001



Early evaluation using Geo's

- **Goal**

  Early radiance evaluation, broadband

- **Approach**

  - convolve AIRS with GEO SRFs and make comparisons with GEOs at GEO sub-satellite points

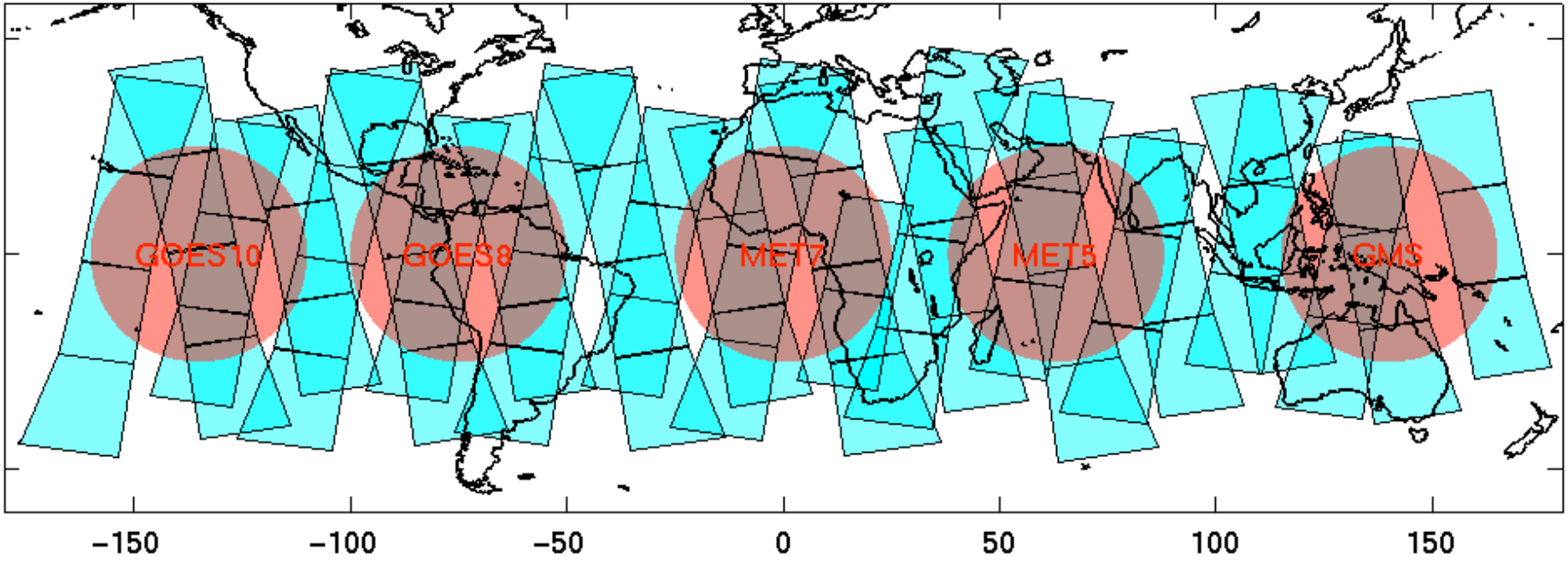
  - GEO offers good colocation and can use consecutive GEO images to characterize change. Clear and cloudy comparisons.

- Good to ~1K for LW IR channels, ~2-3K for 6.7□m WV channel

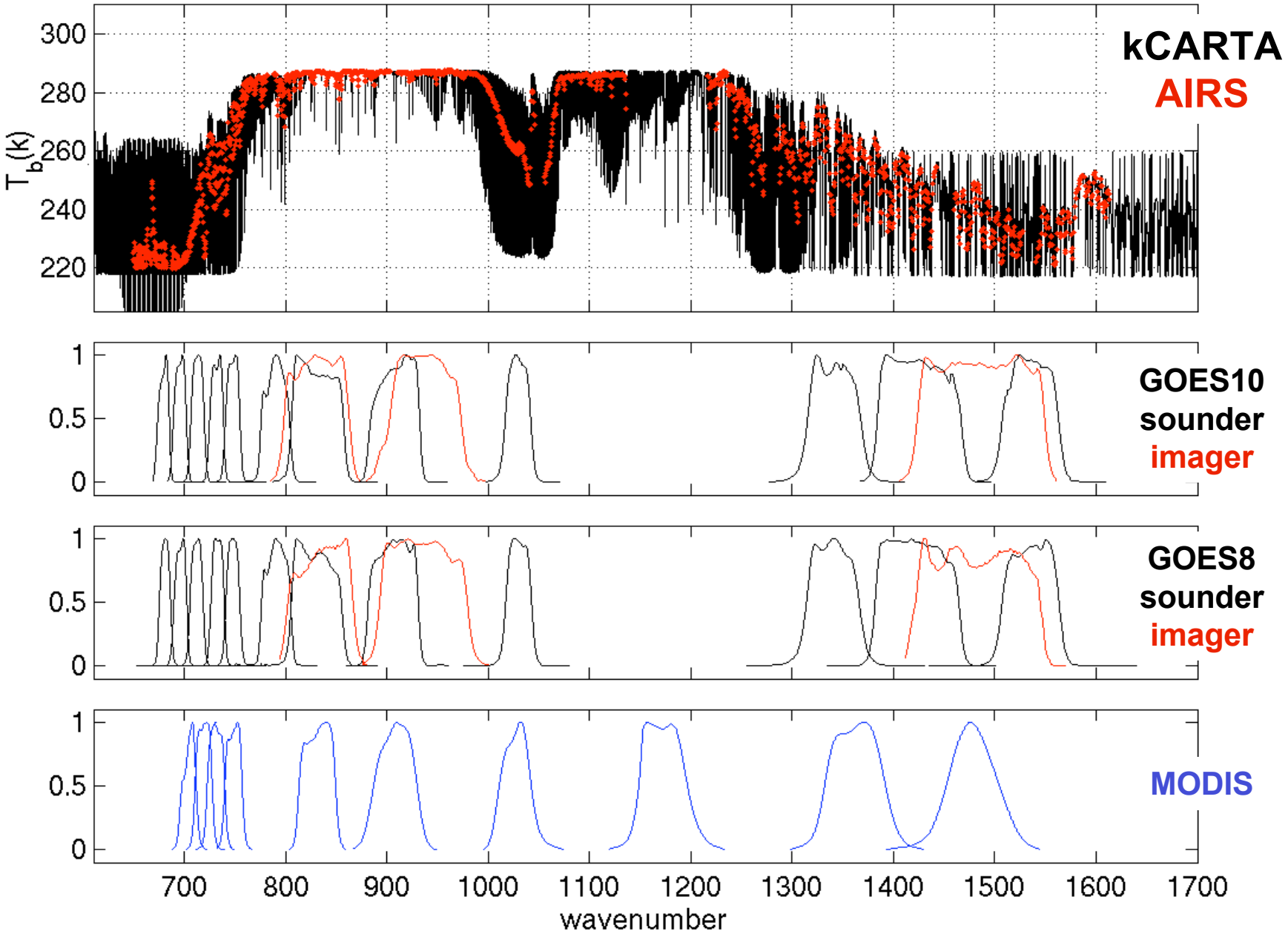
- **Examples** using GOES8 and 15 Dec 2000 simulated data …

- Continued comparisons will help to improve GEOs

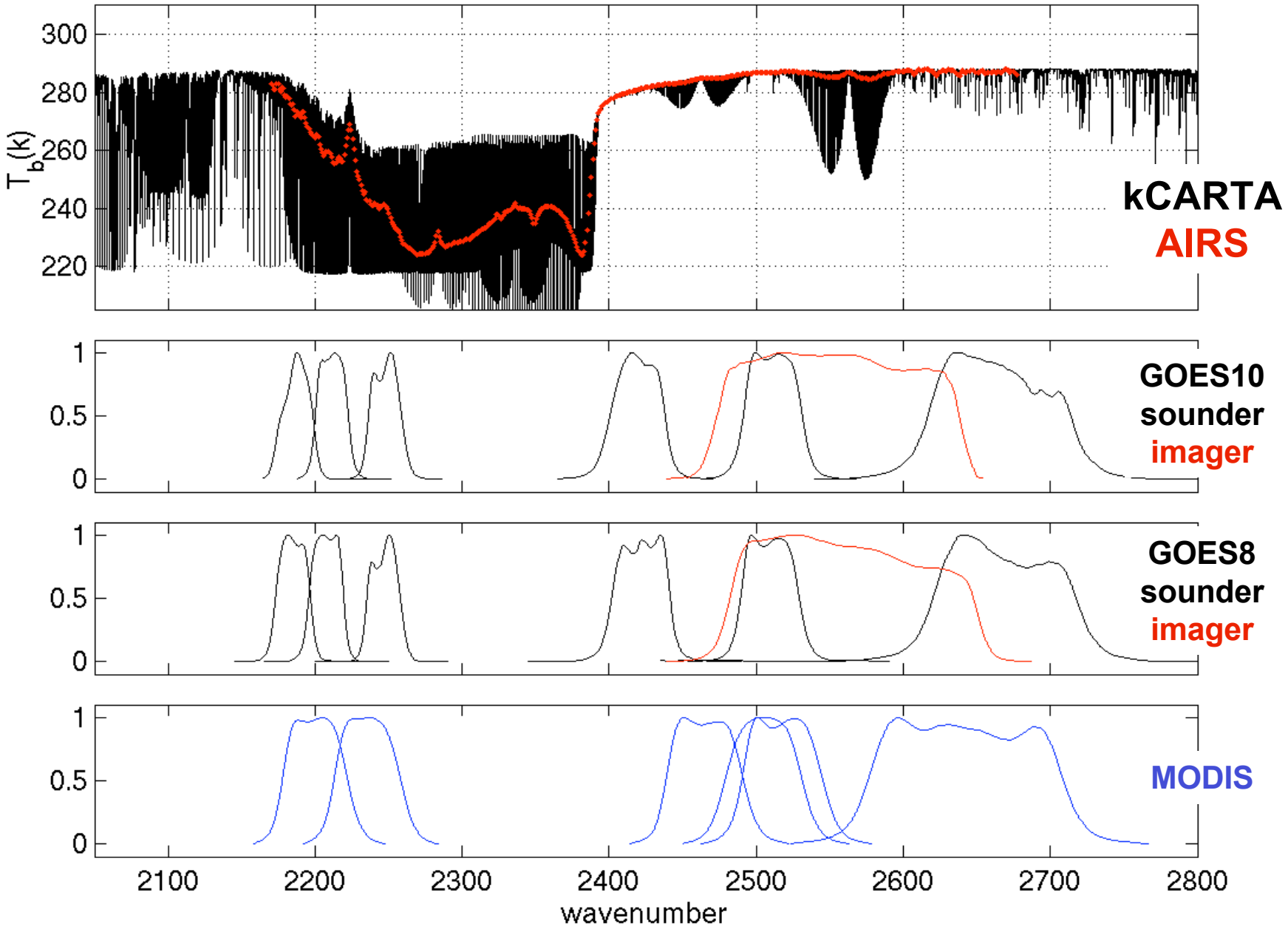
25 degree GEO footprints and 15-Dec-2000 AIRS graunules



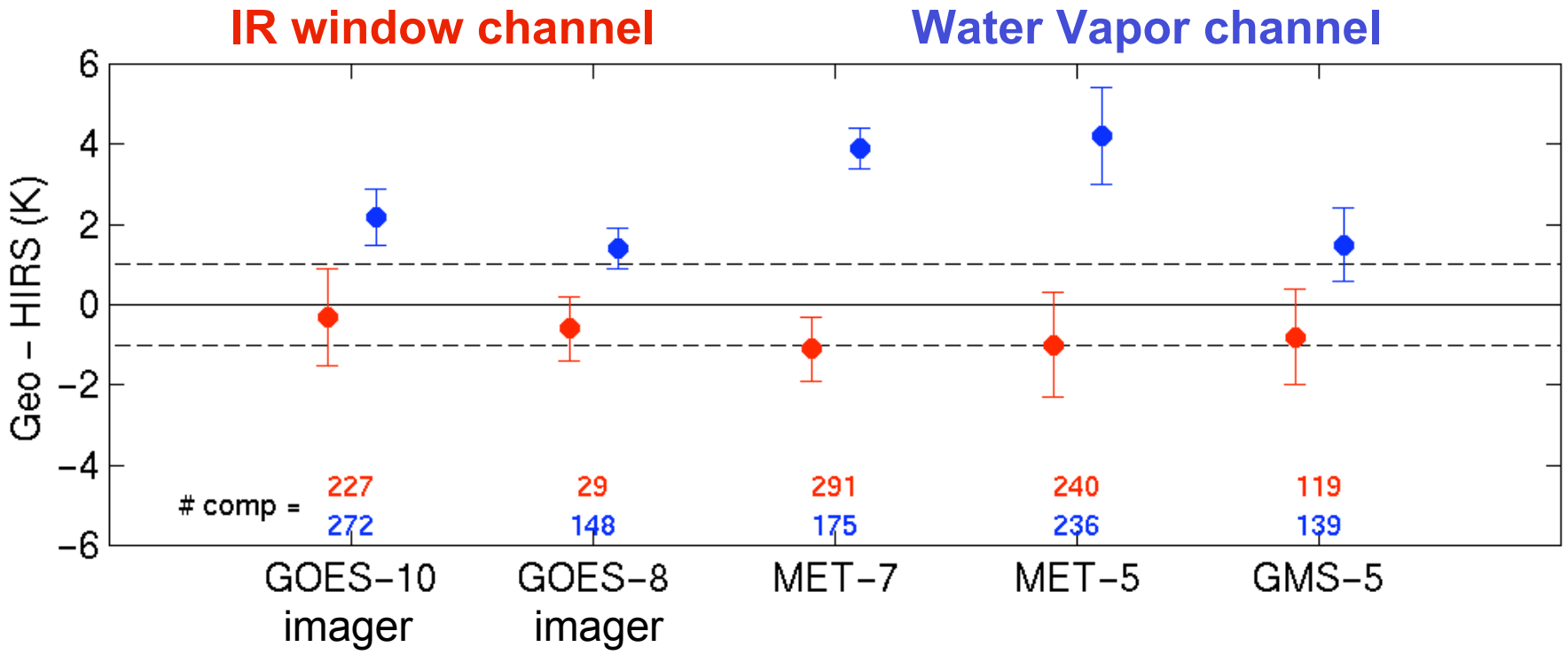
Long/Midwave SRFs



Shortwave SRFs

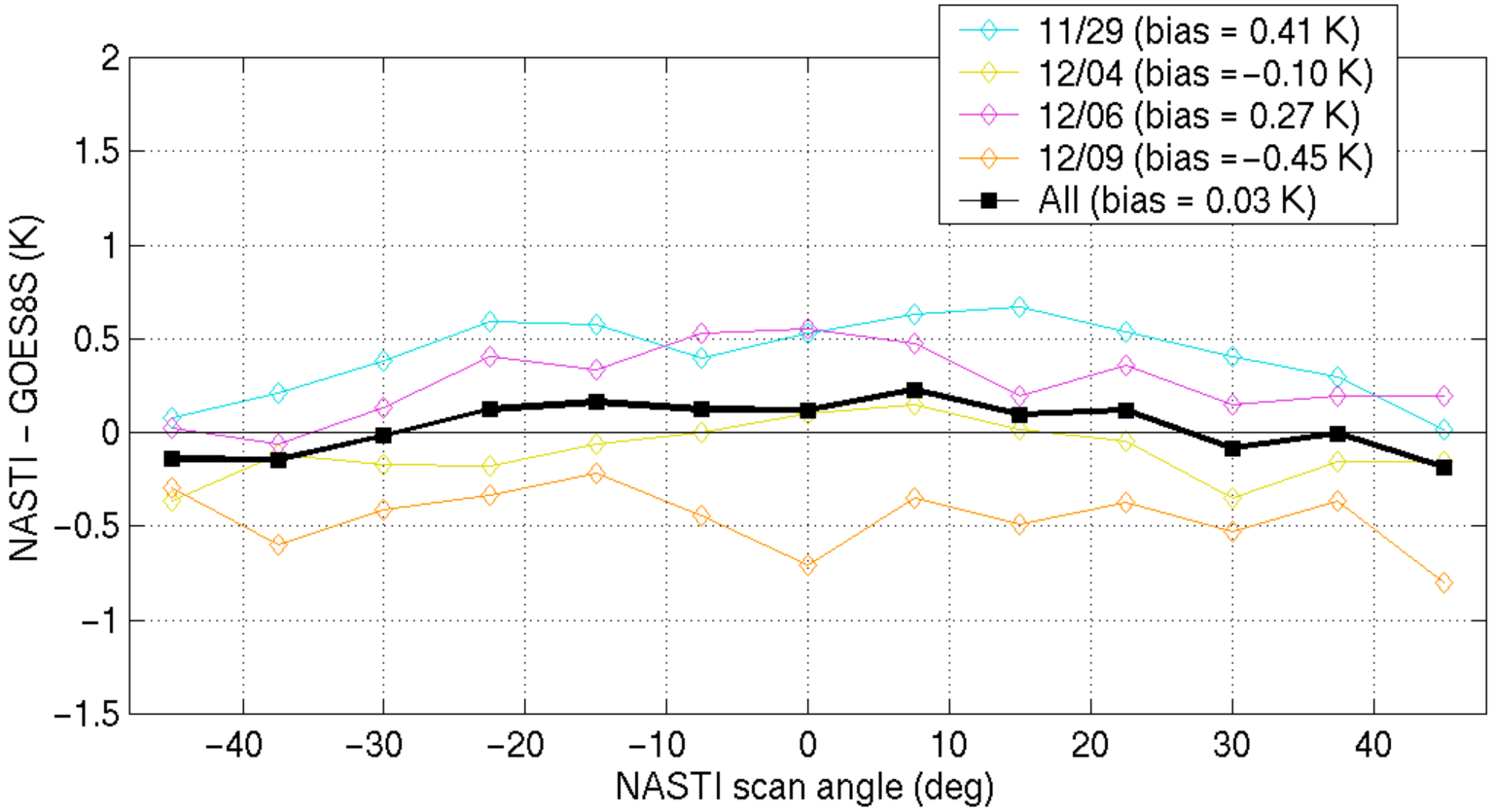


January 2000 to July 2001 Infrared Window and Water Vapor channel comparisons of geostationary satellites and NOAA-14 HIRS



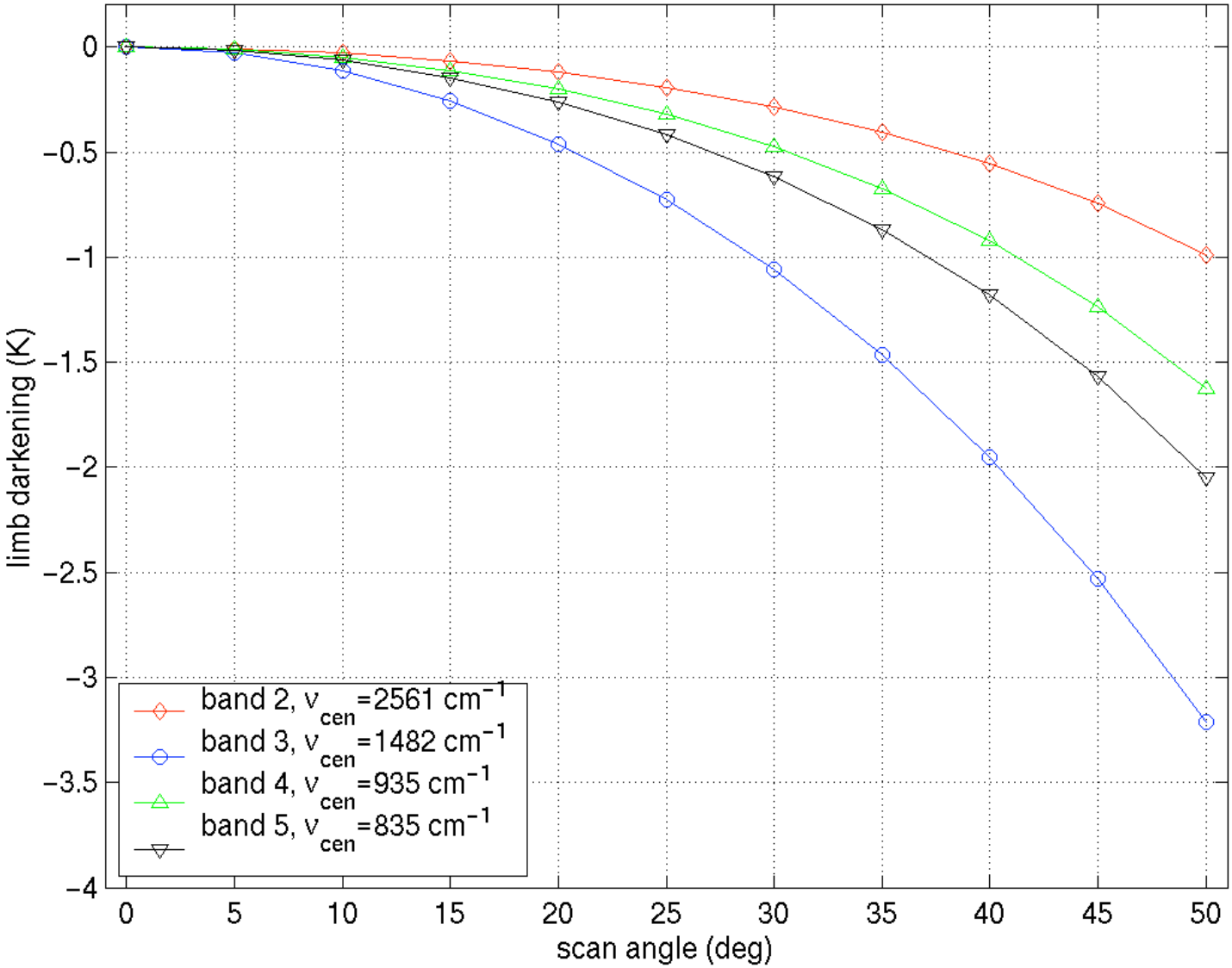
Gunshor et al., 2000

Comparisons of NASTI and GOES8 Sounder 6.7□m channel Tbs from AFWEX



GOES8 Imager limb darkening

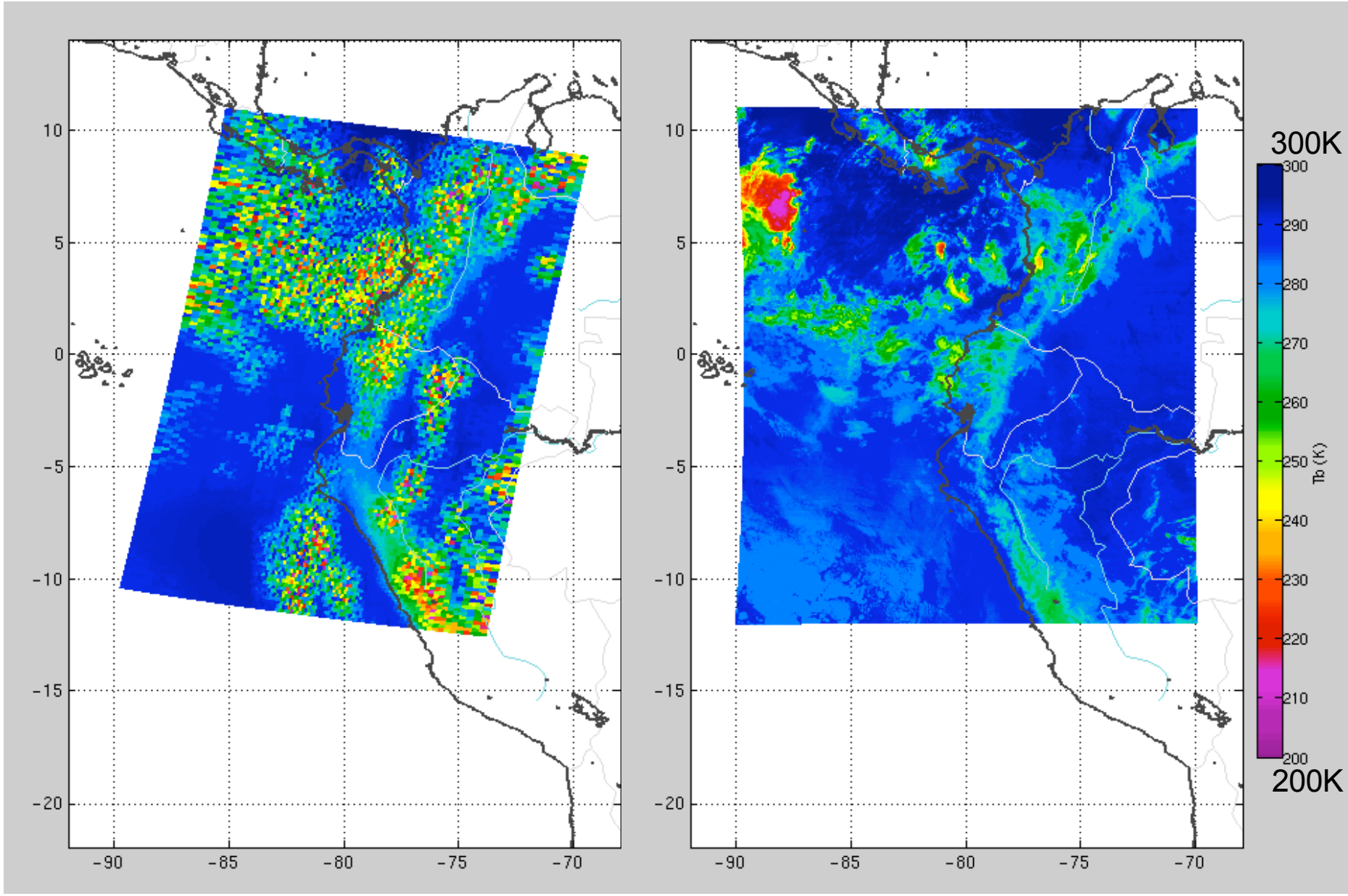
standard Tropical atmosphere



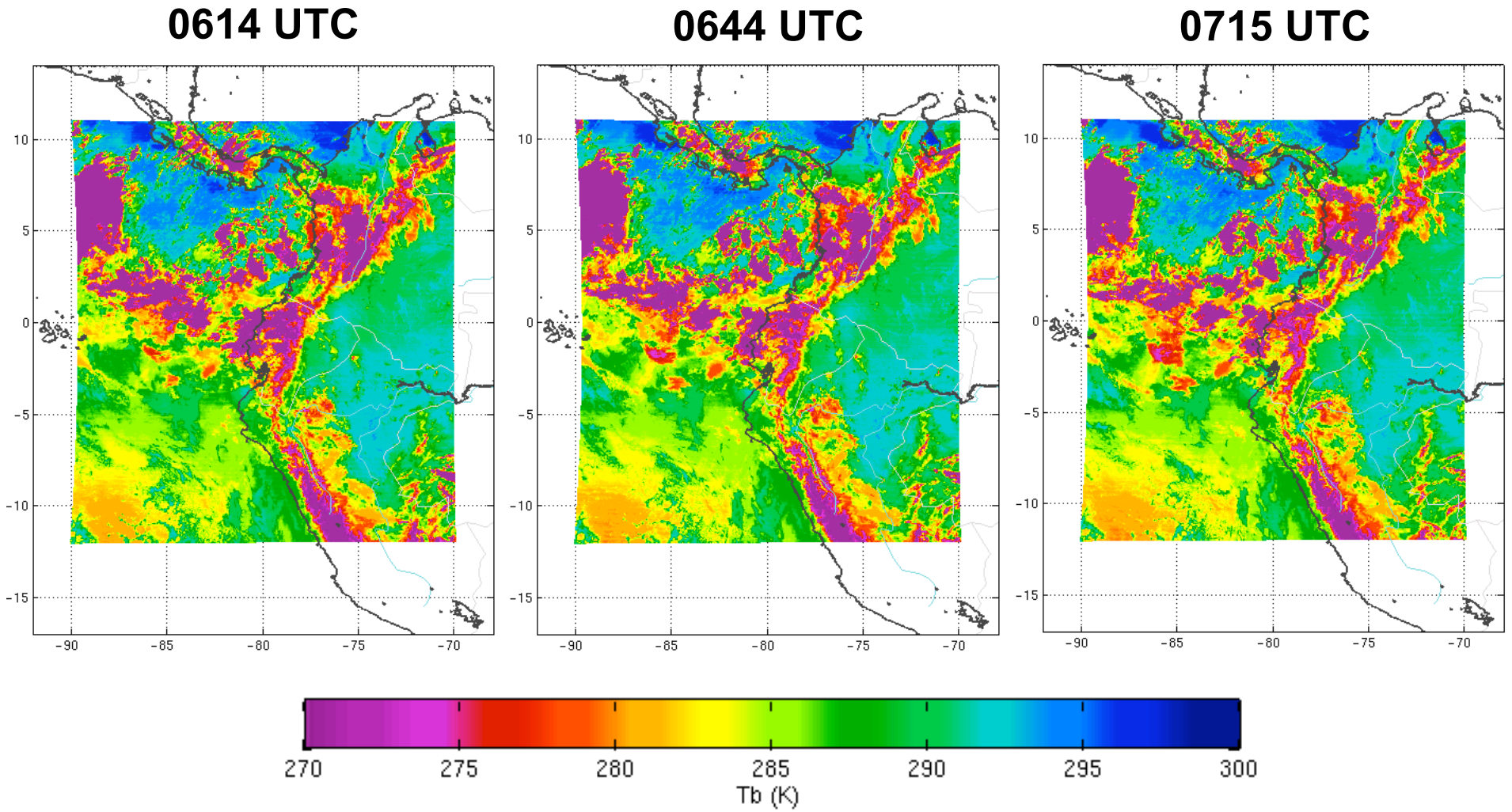
Granule 067. 10□m window T_bs

AIRS. 0641-0647 UTC

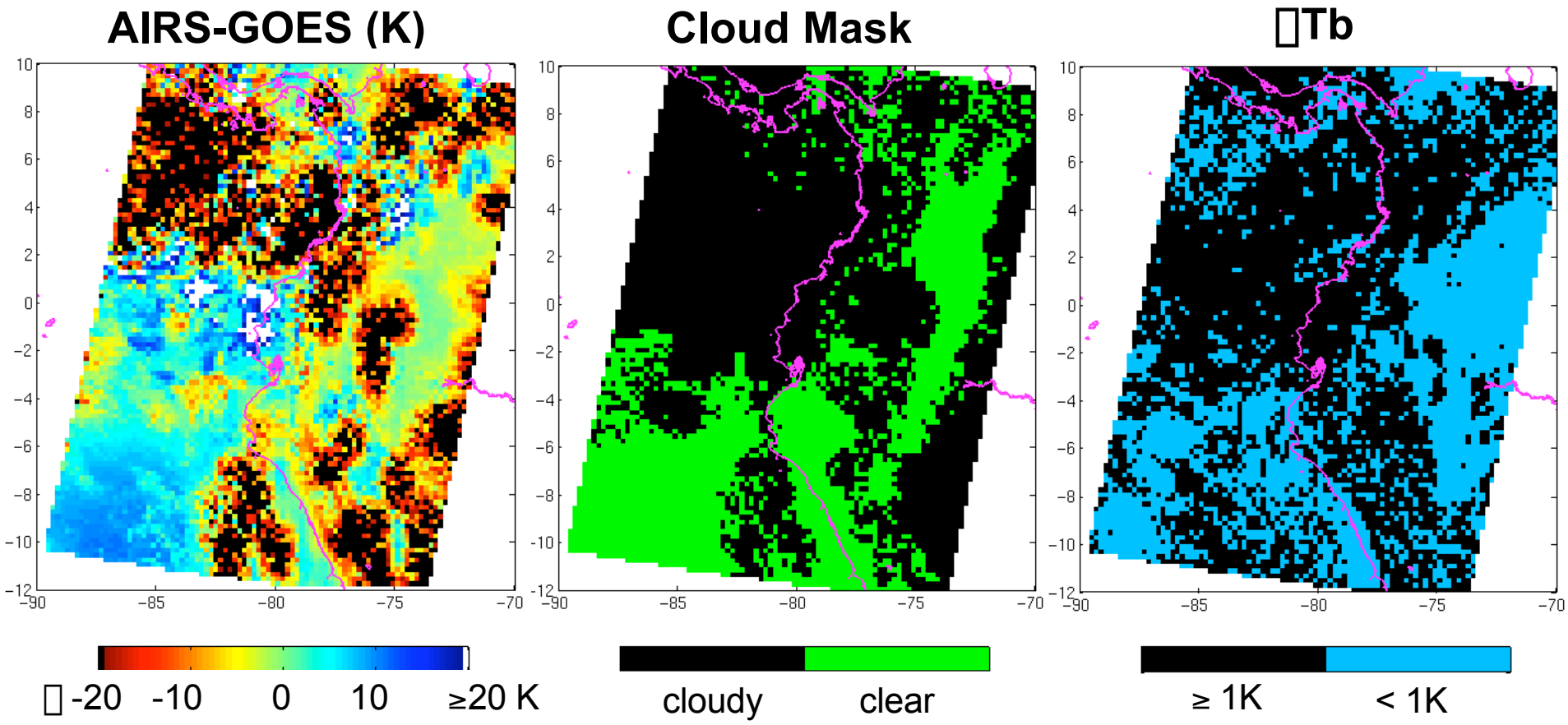
GOES8I. 0644 UTC



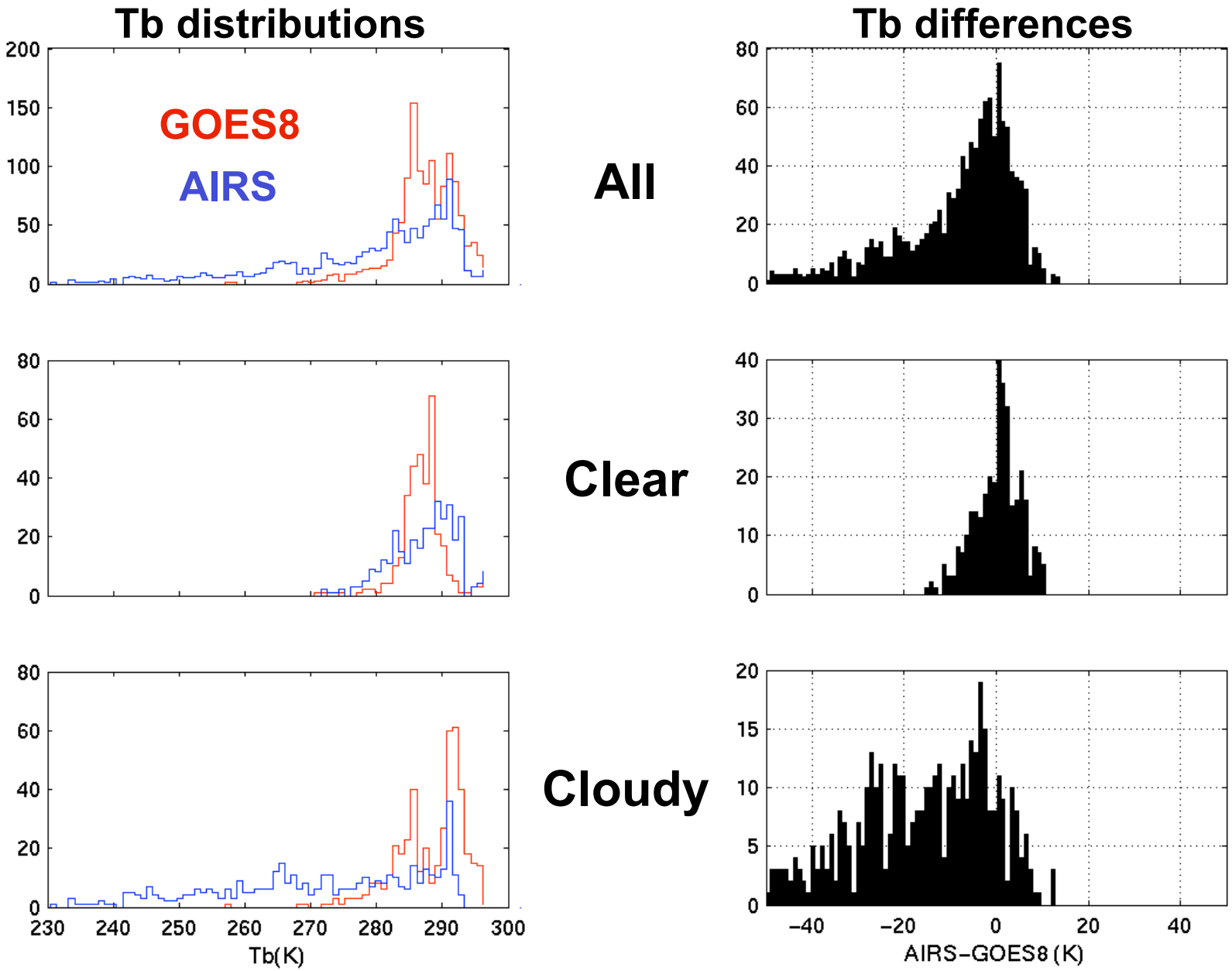
GOES8 10□m window T_bs



10 m T_b comparisons



10 μm T_b comparisons

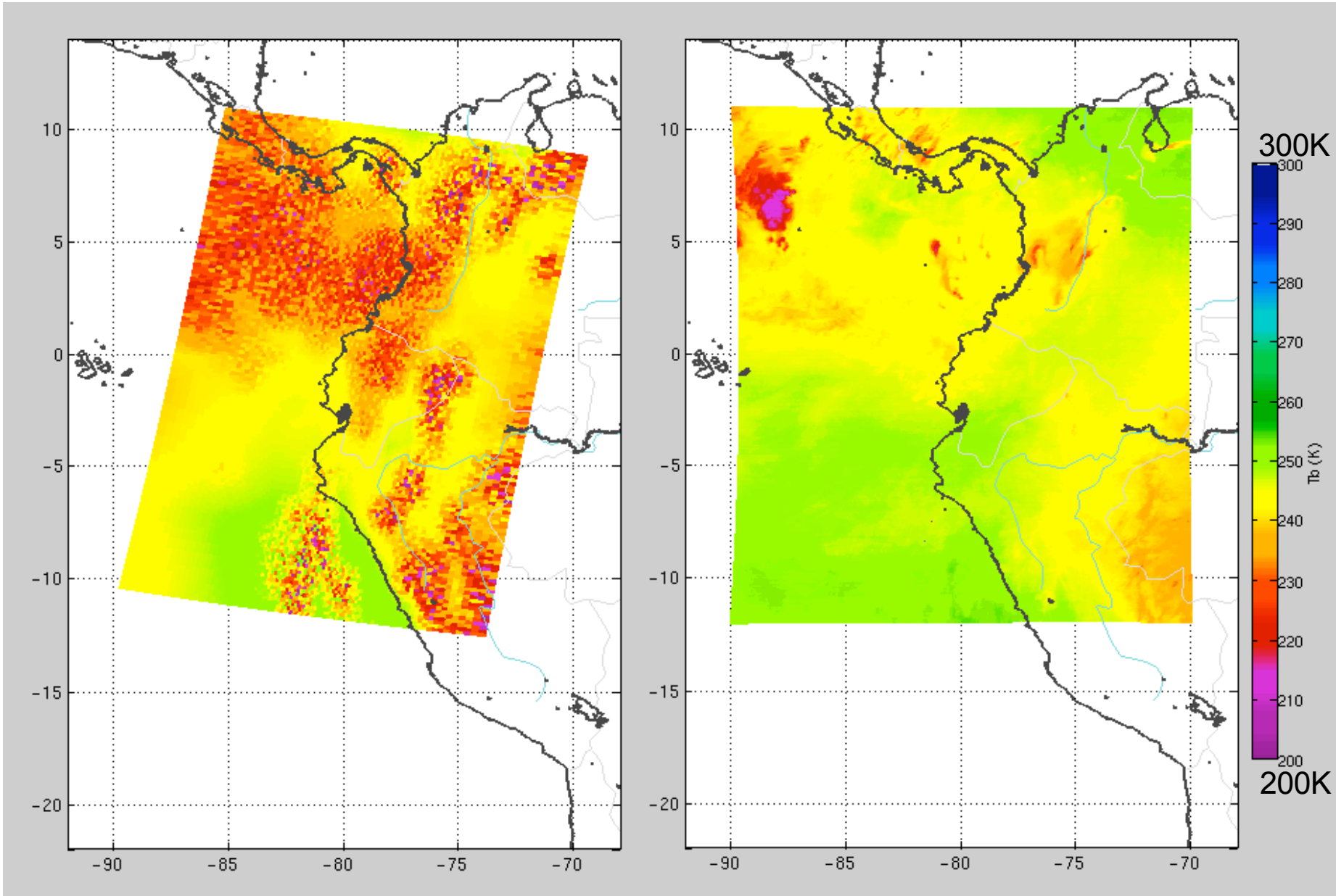


|view angle| ≤ 30 deg and |Tb| < 1K

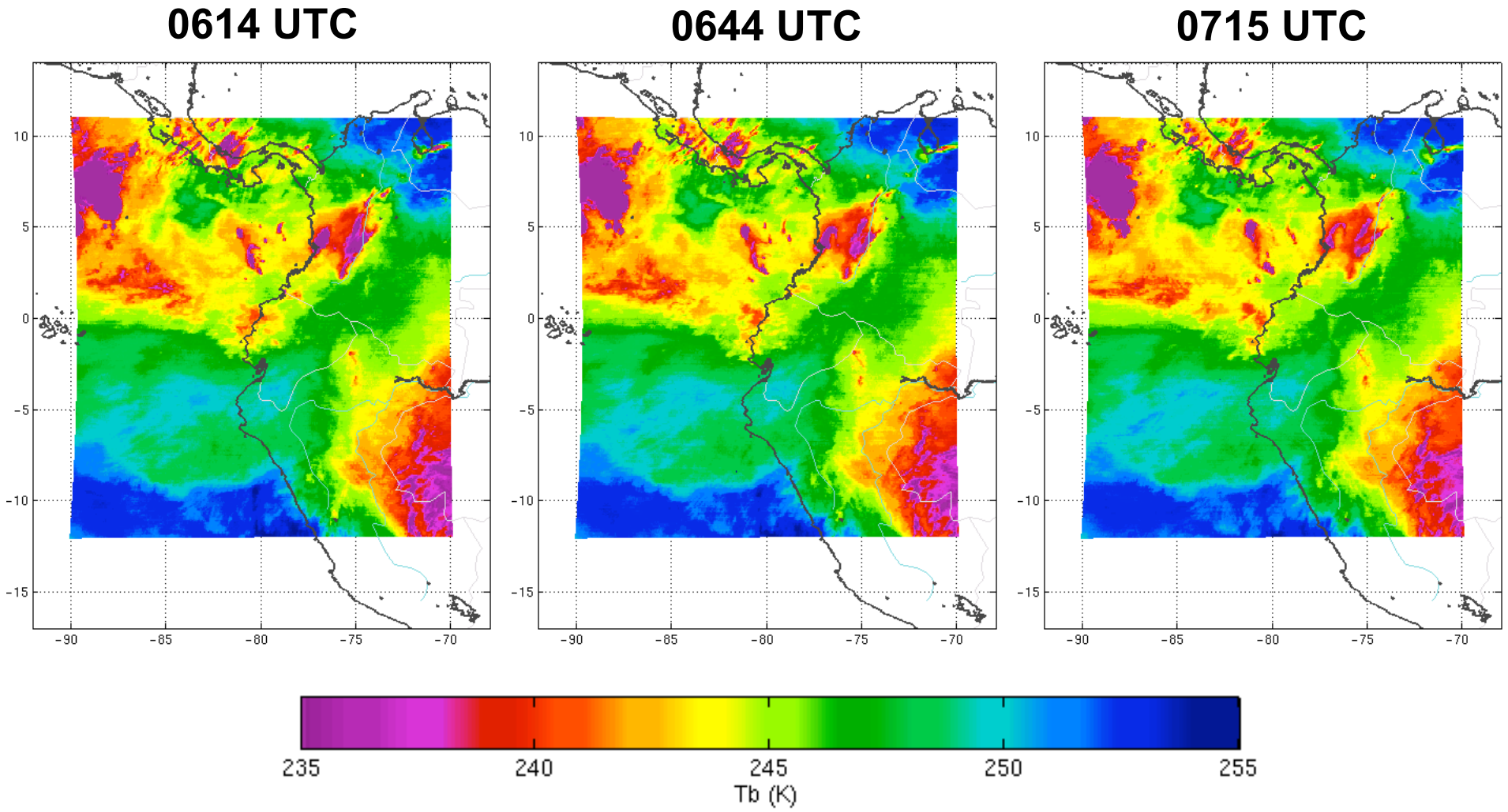
Granule 067. 6.7□m band T_bs

AIRS. 0641-0647 UTC

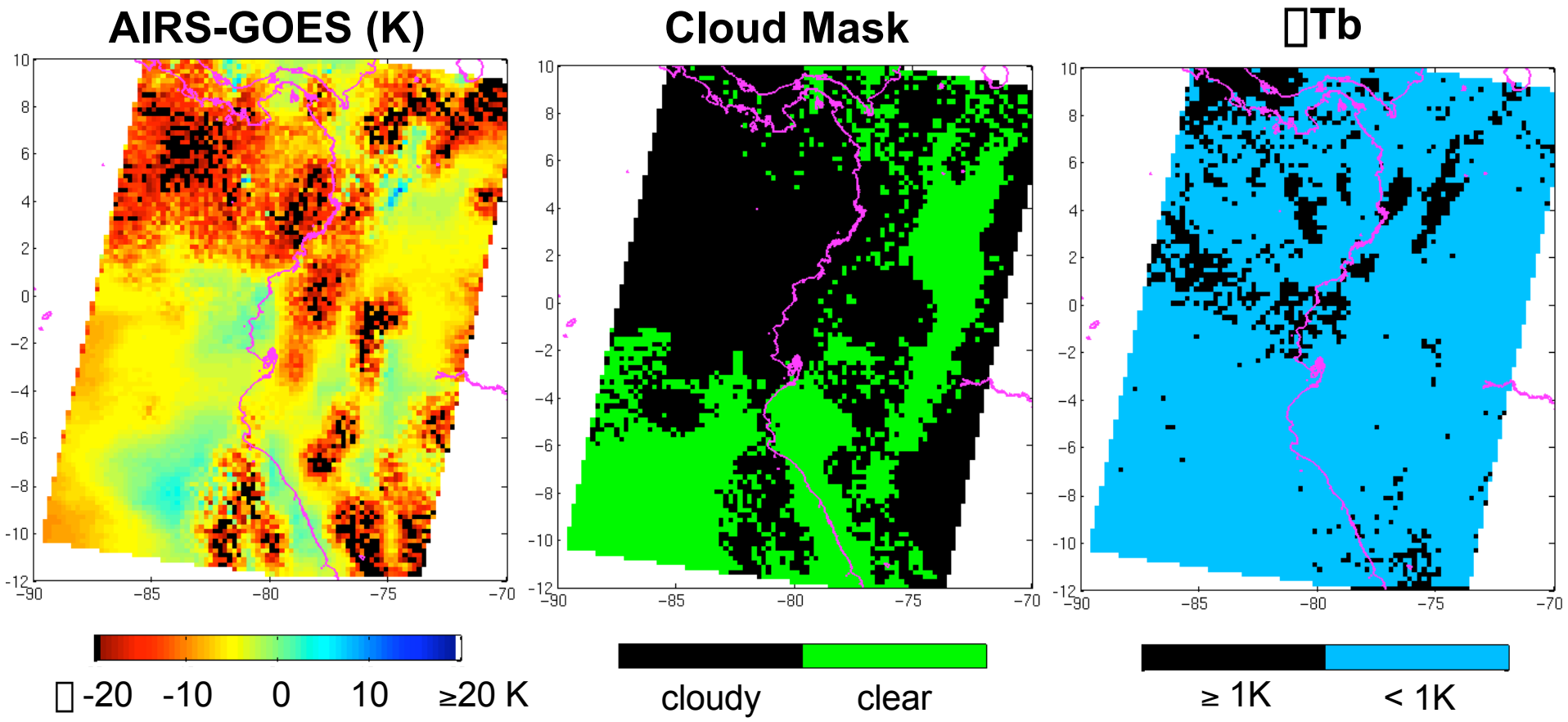
GOES8I. 0644 UTC



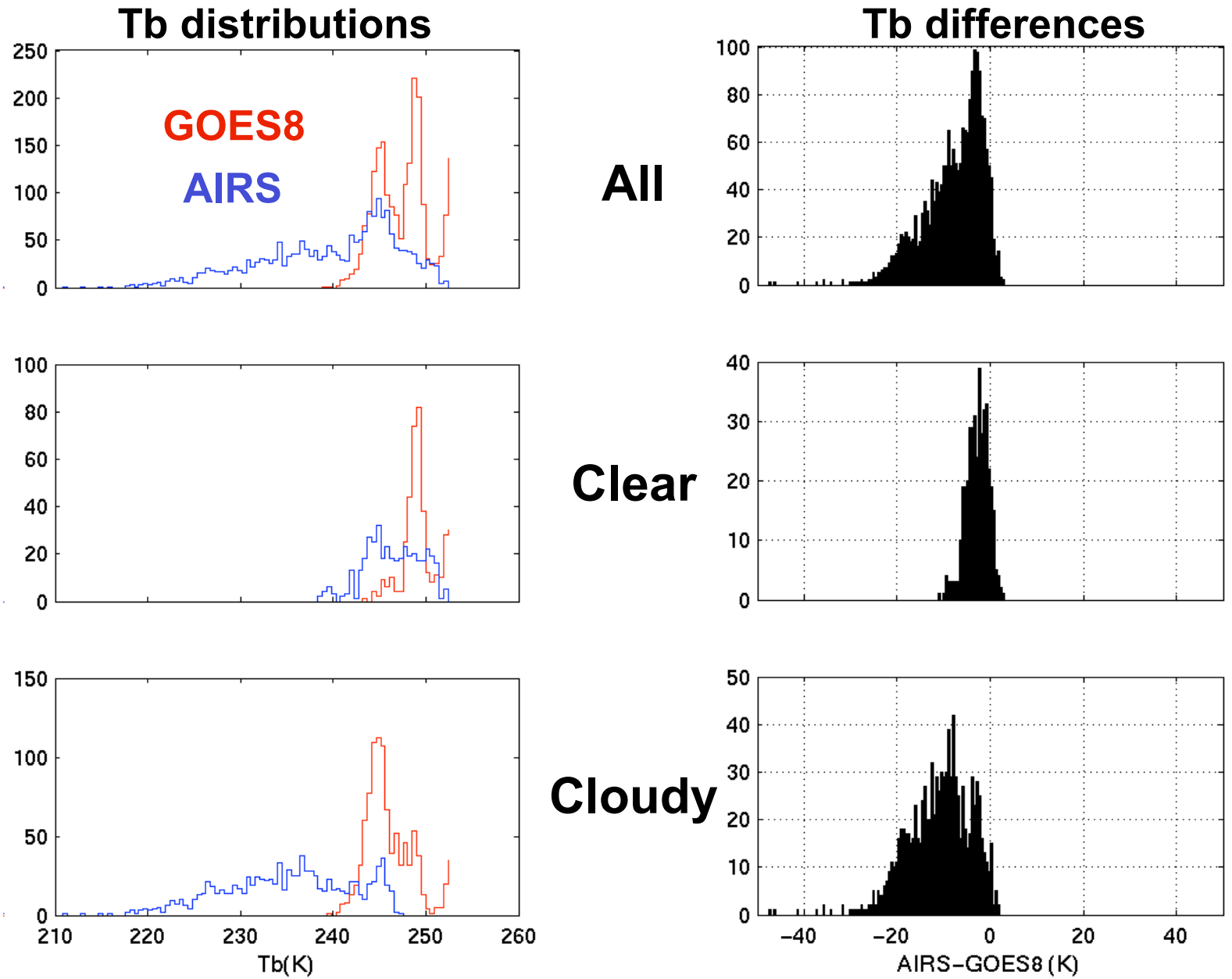
GOES8 6.7□m band T_bs



6.7□m T_b comparisons

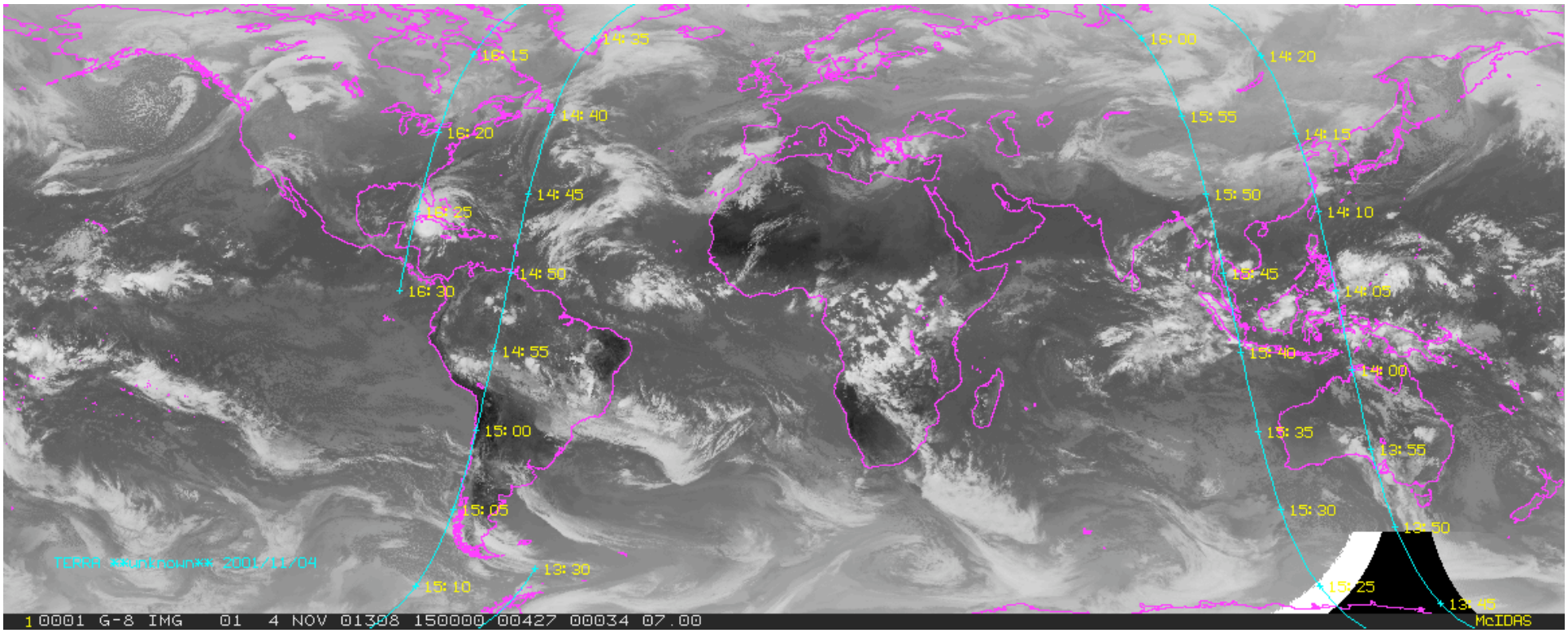


6.7 μm T_b comparisons



|view angle| < 20 deg and |Tb| < 1K Note: +0.5K bias in (AIRS Band 3 SRF)

Geo Quicklooks



IR window composites with orbit tracks updated every three hours

ftp://pm.ssec.wisc.edu/pub/terra_ir_orbs/

CIMSS