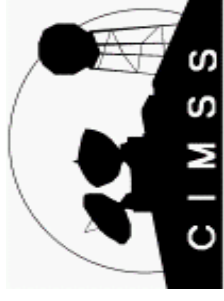


Atmospheric Profile Retrievals From GIFTS-IOMI

*Jun Li, Fengying Sun, Suzanne Seemann, Weisz Elisabeth, and
Allen H.-L. Huang*

Cooperative Institute for Meteorological Satellite Studies
Space Science and Engineering Center
University of Wisconsin-Madison

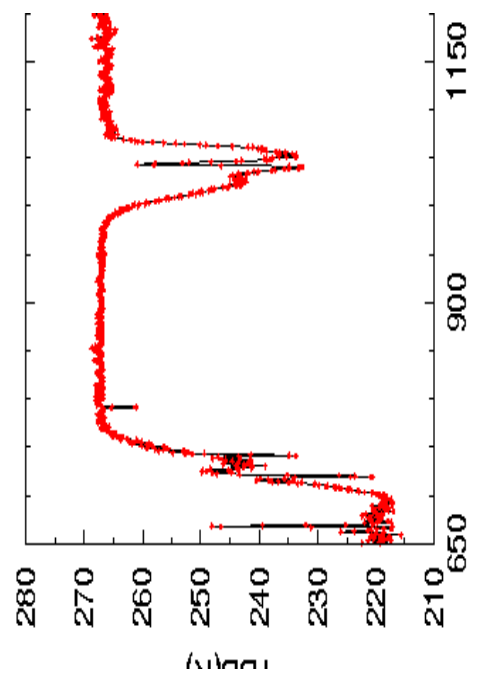
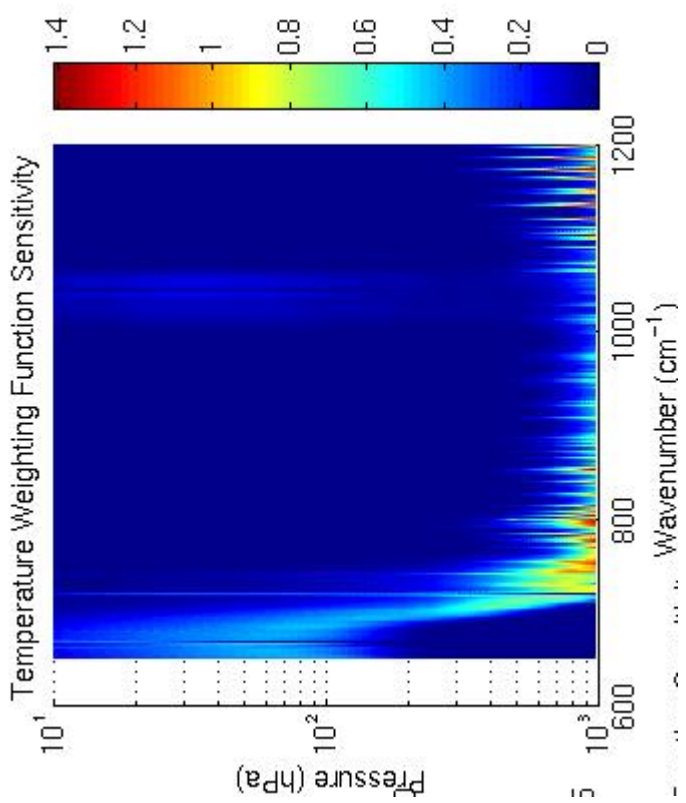
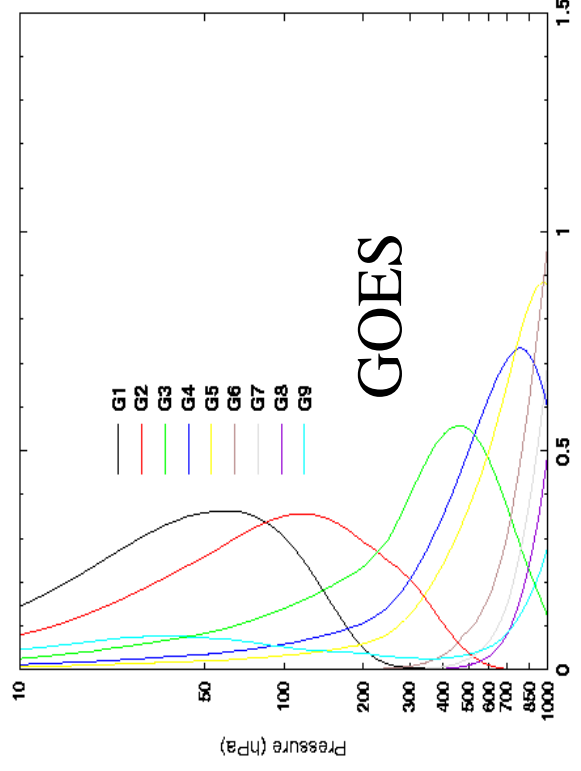
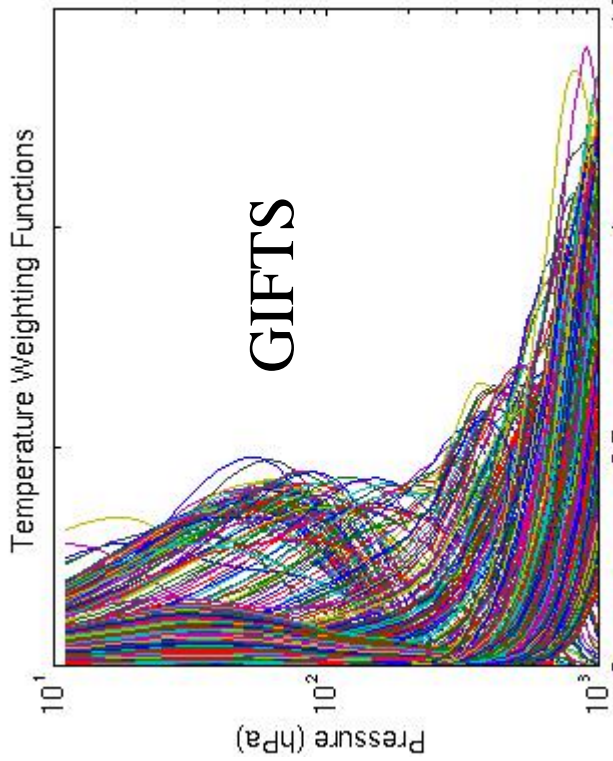
UW MURI Workshop, 28 - 29 May 2003, Madison, Wisconsin



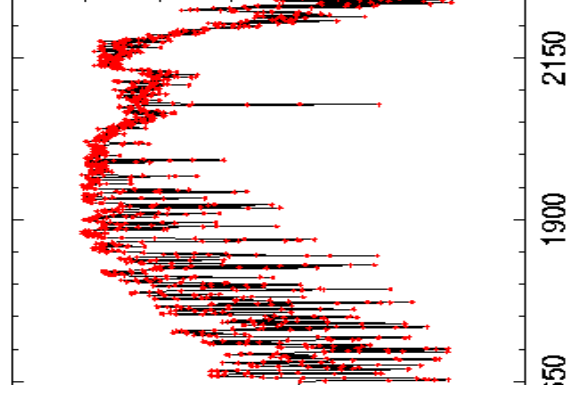
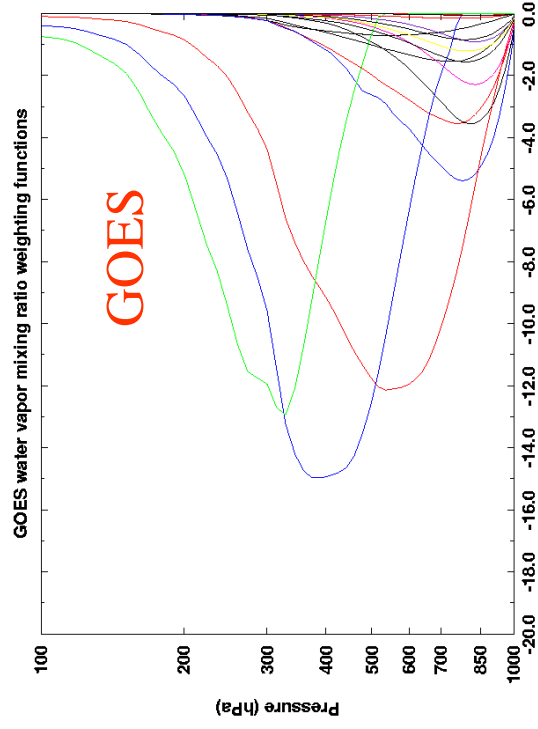
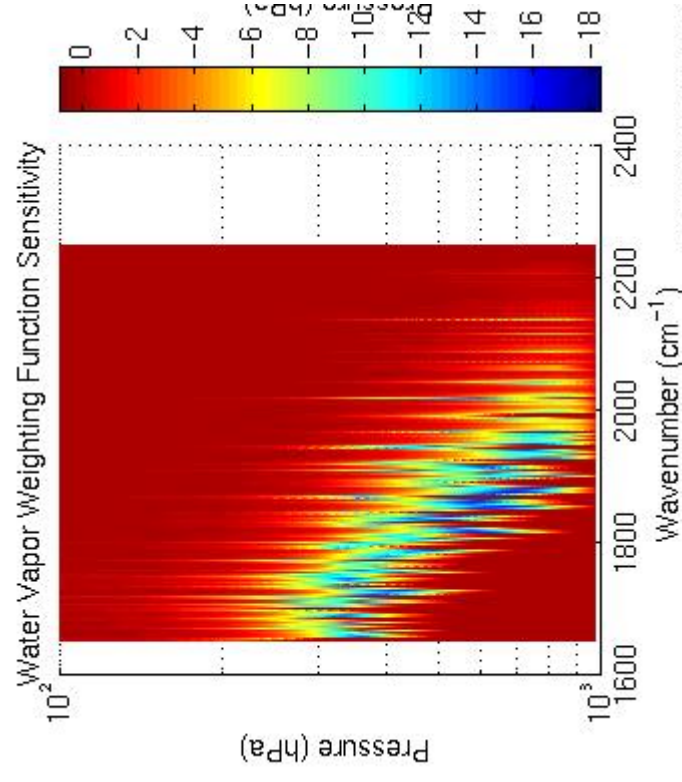
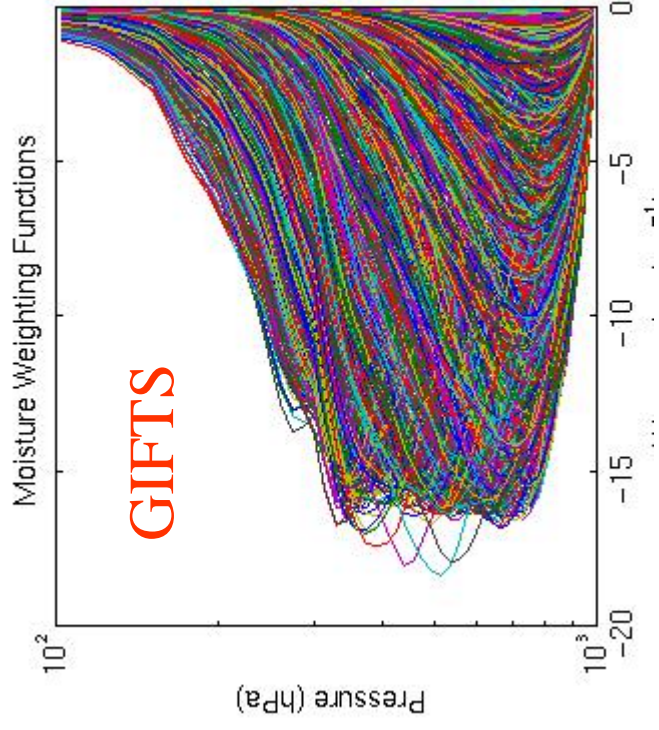
UW-Madison

GIFTS Sounding Retrieval

- **Temperature and moisture information**
- Some issues
- Simulation with cube data
- Algorithm testing using AIRS data



GIFTS LW 650 - 1150 cm⁻¹-1



GIFTS SMW 1650 - 2250 cm^{-1}

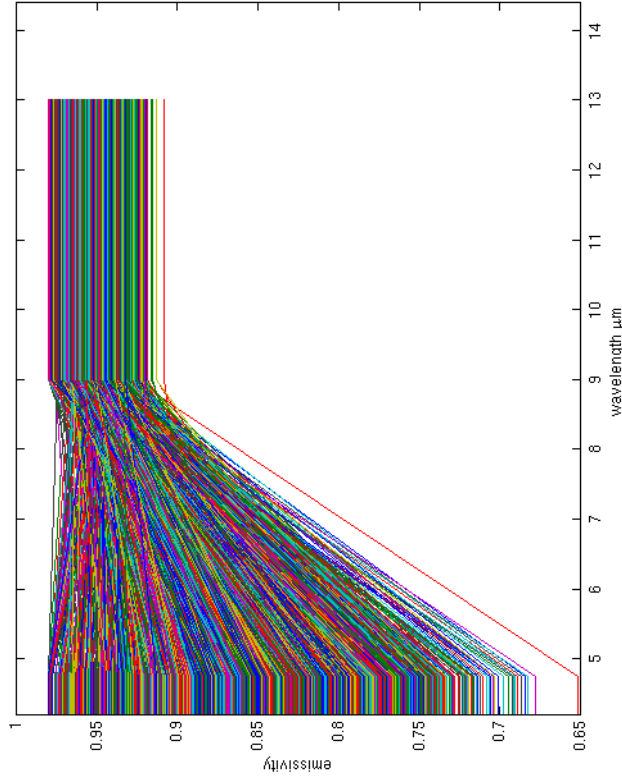
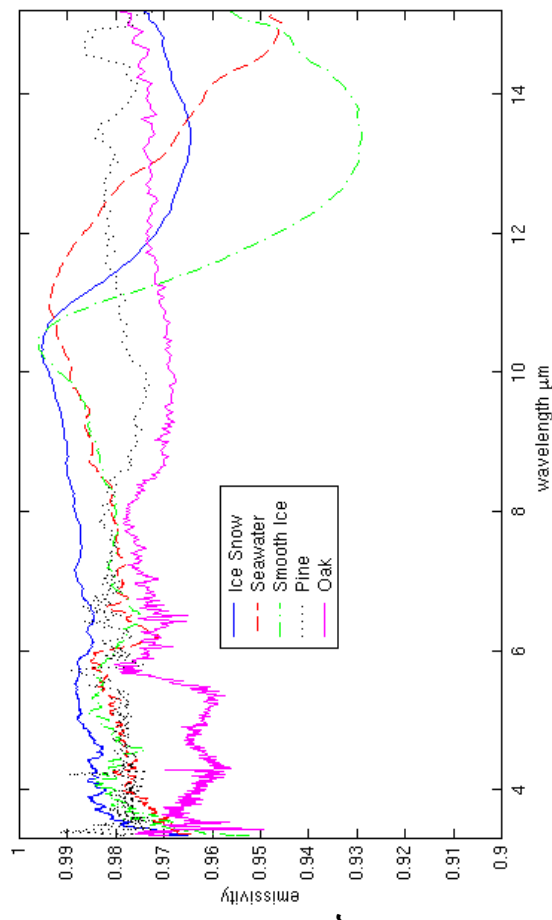
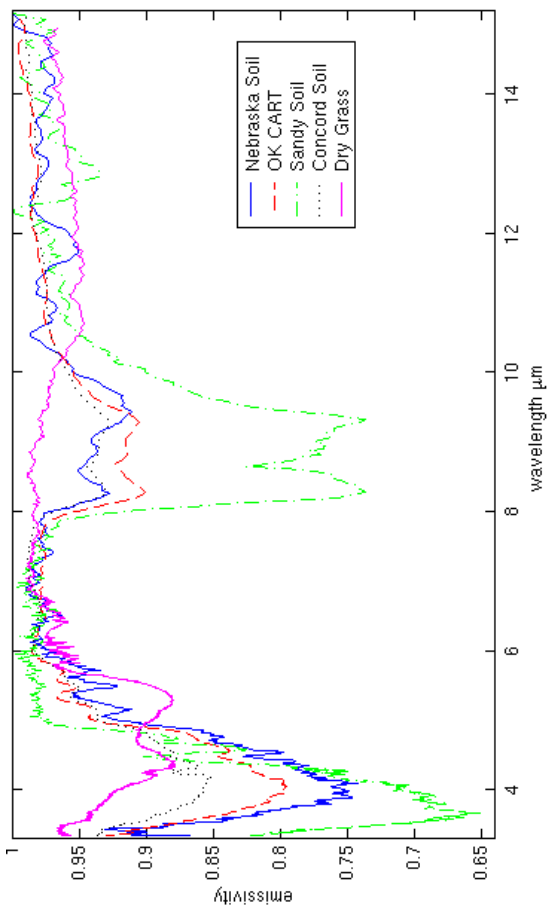
Retrieval Algorithm – two steps

- Step 1 – statistical retrieval for initial retrieval
- Step 2 – nonlinear physical iterative approach for final retrieval, the statistical retrieval serves as the first guess for physical retrieval

GIFTS Sounding Retrieval

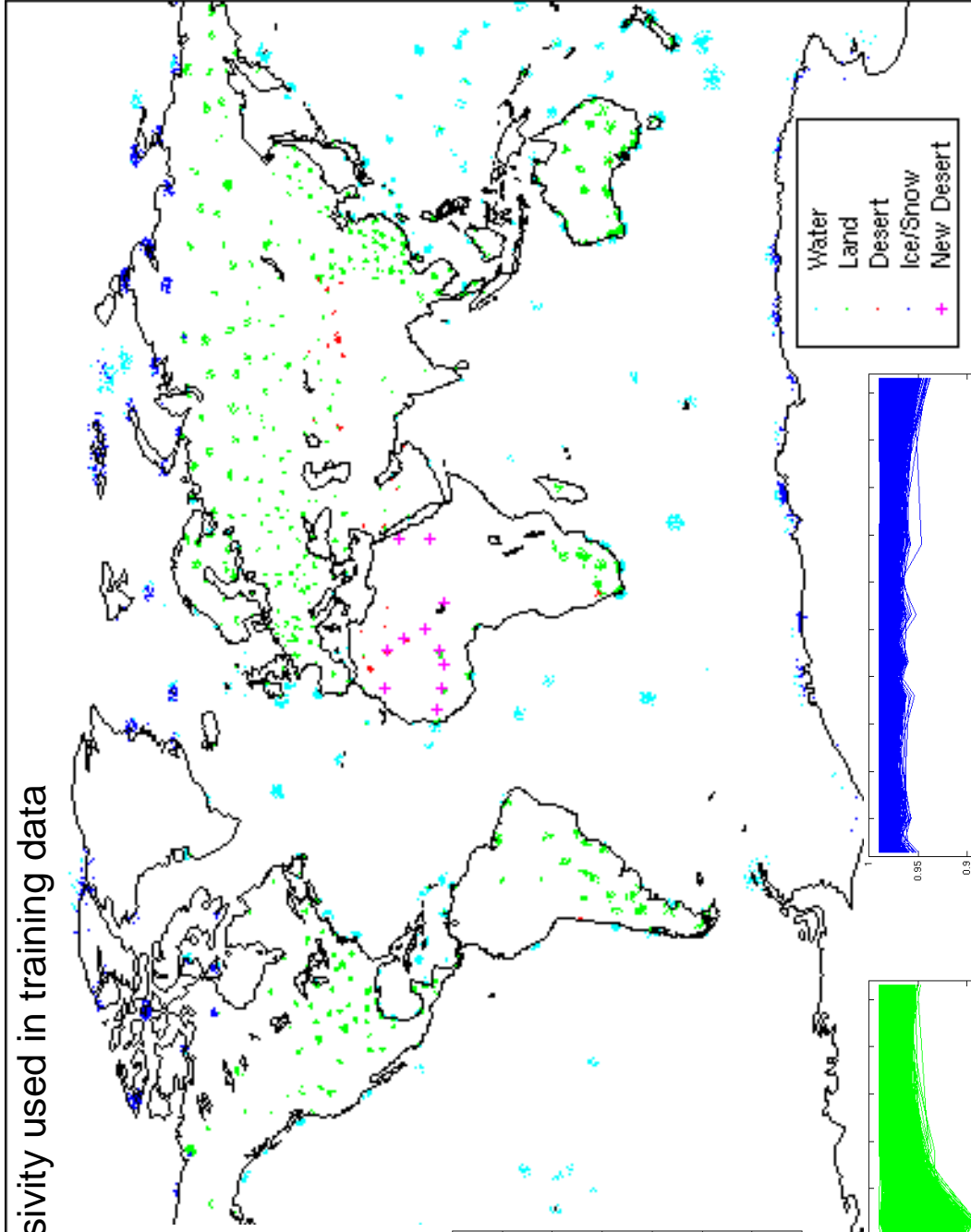
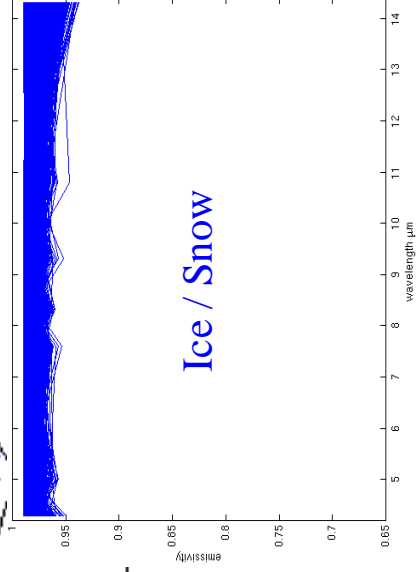
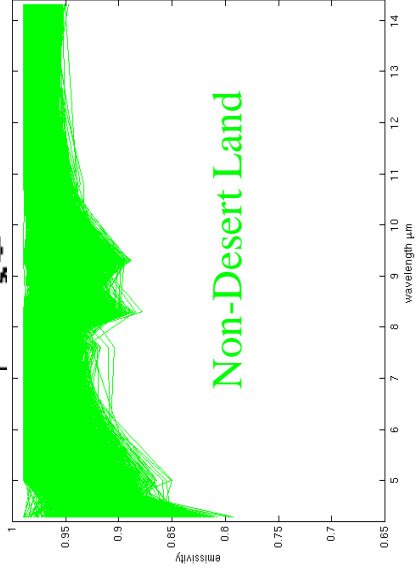
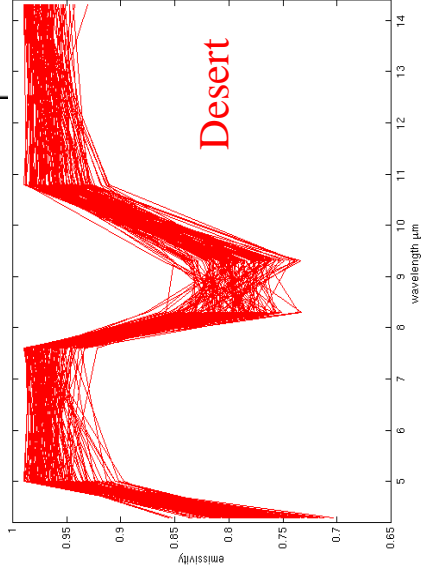
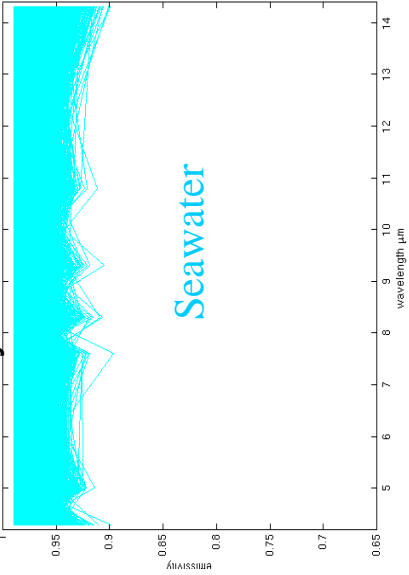
- Temperature and moisture information
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Measured emissivity from UCSB MODIS Land group's Emissivity Library



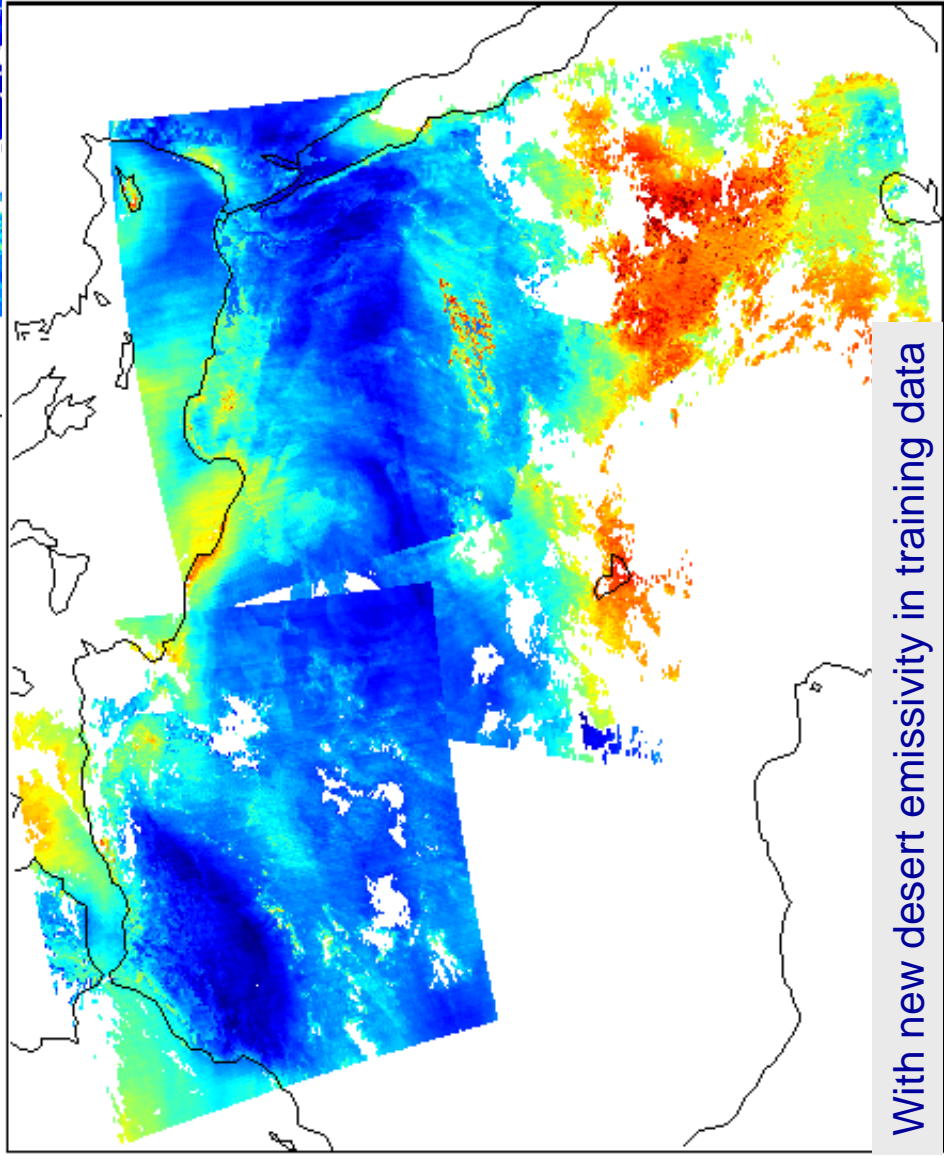
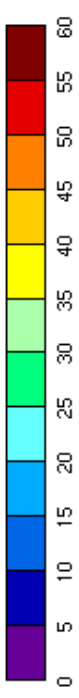
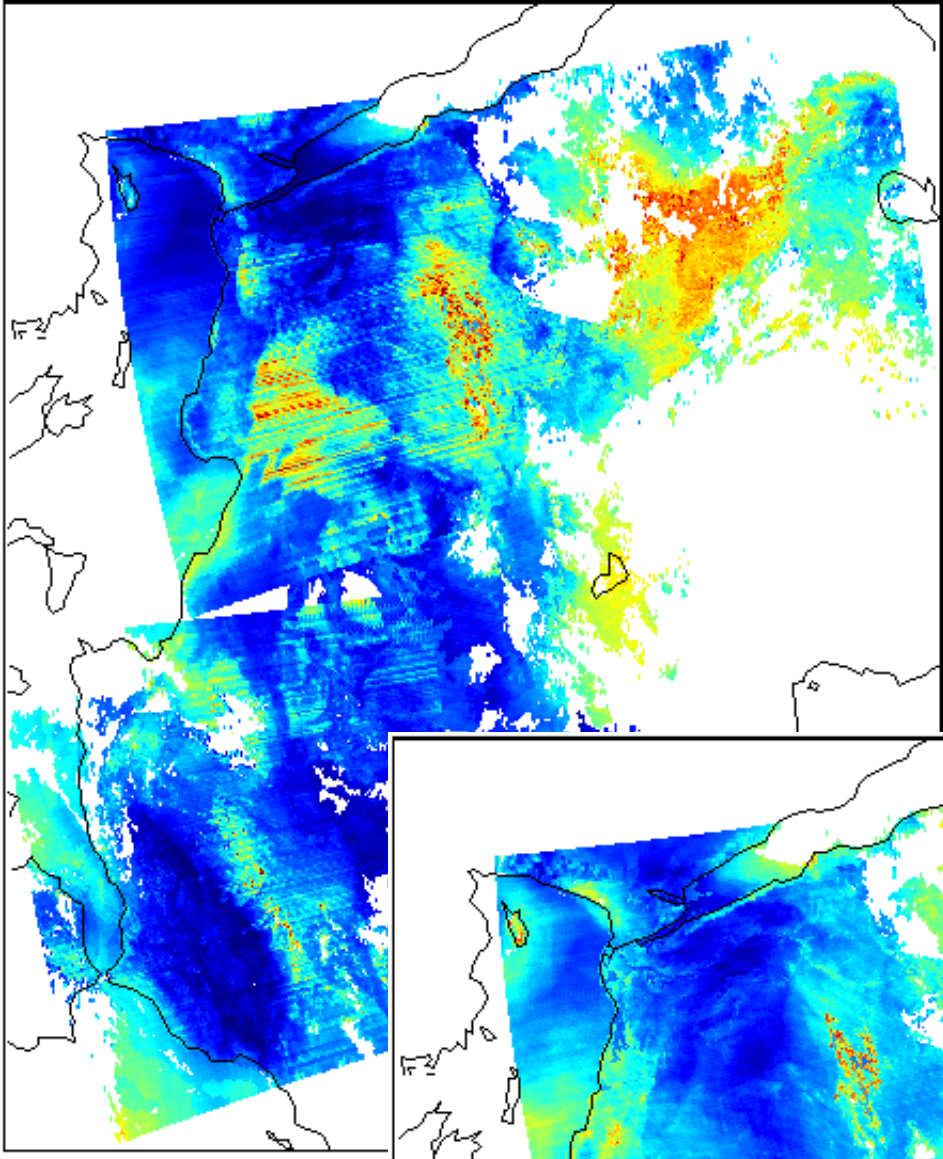
Original emissivity assigned to NOAA88b training profiles: two values 0.84 and 0.95 with std 0.15, 0.03. Linear interpolation for wavelengths in between.

New Ecosystem-based Emissivity used in training data



- Water
- Land
- Desert
- Ice/Snow
- New Desert

Aqua August 24, 2002

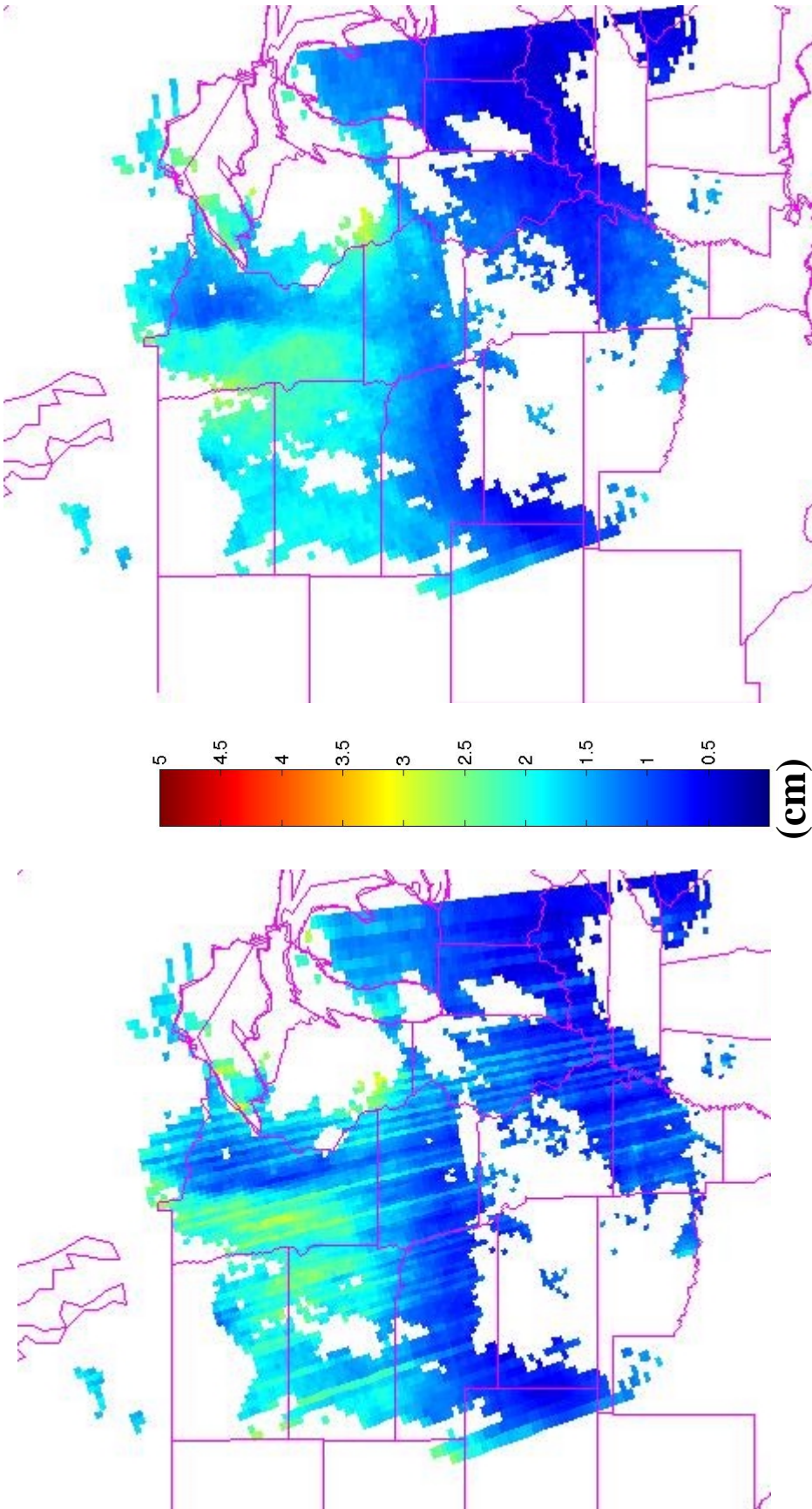


With new desert emissivity in training data

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1915 – 1920 UTC 06 September 2003

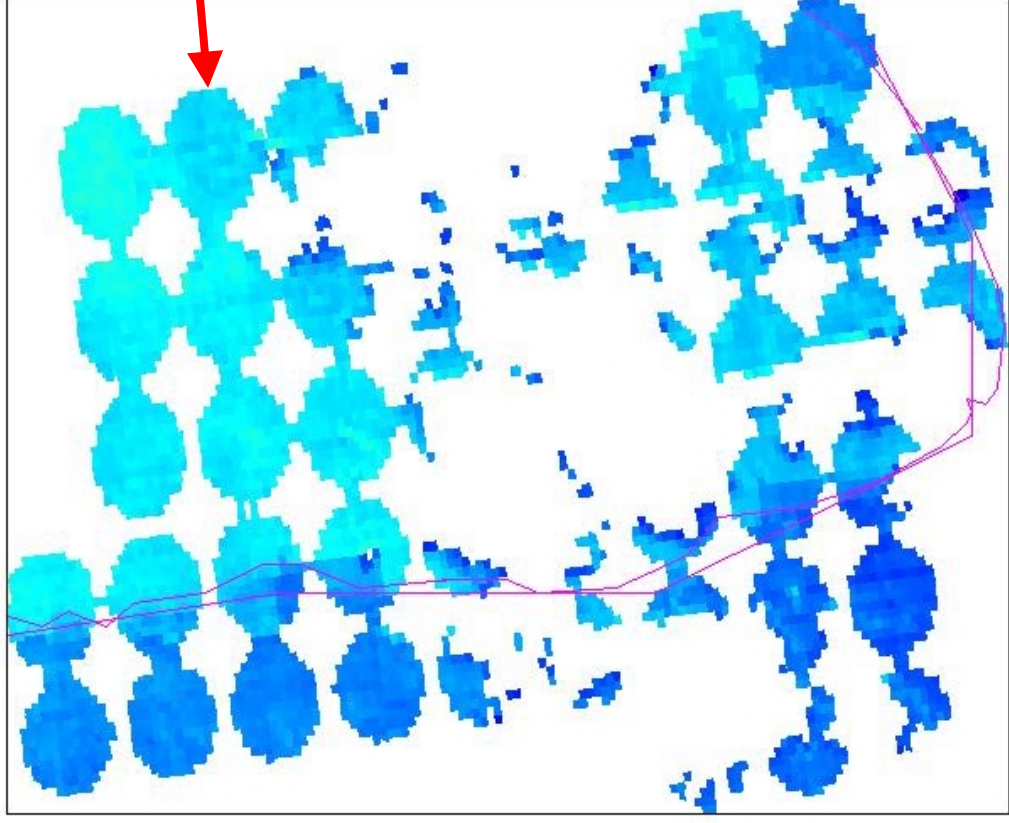


AIRS 14km TPW with 45 angles

AIRS 14km TPW with 450 angles

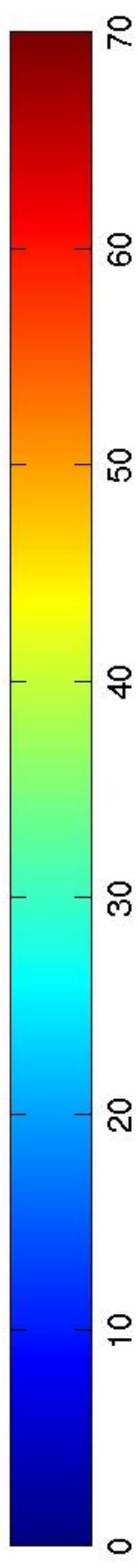
GIFTS Sounding Retrieval

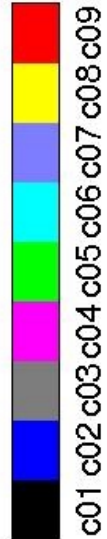
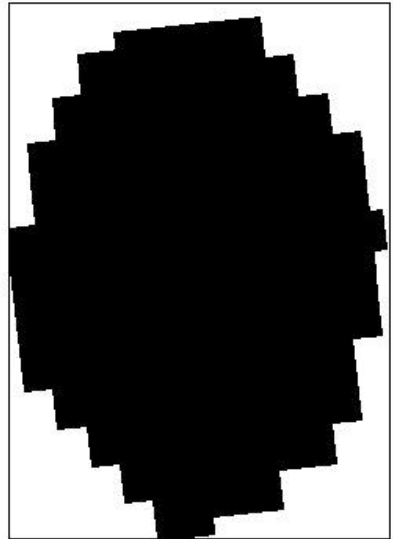
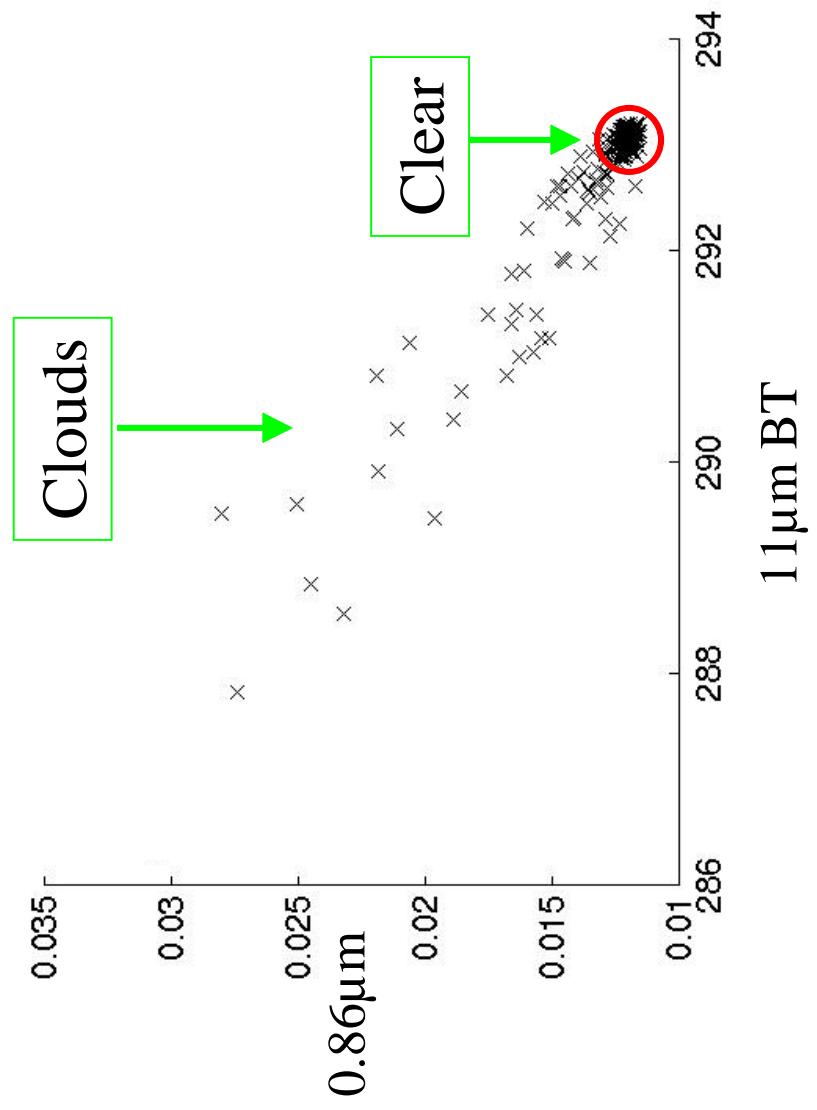
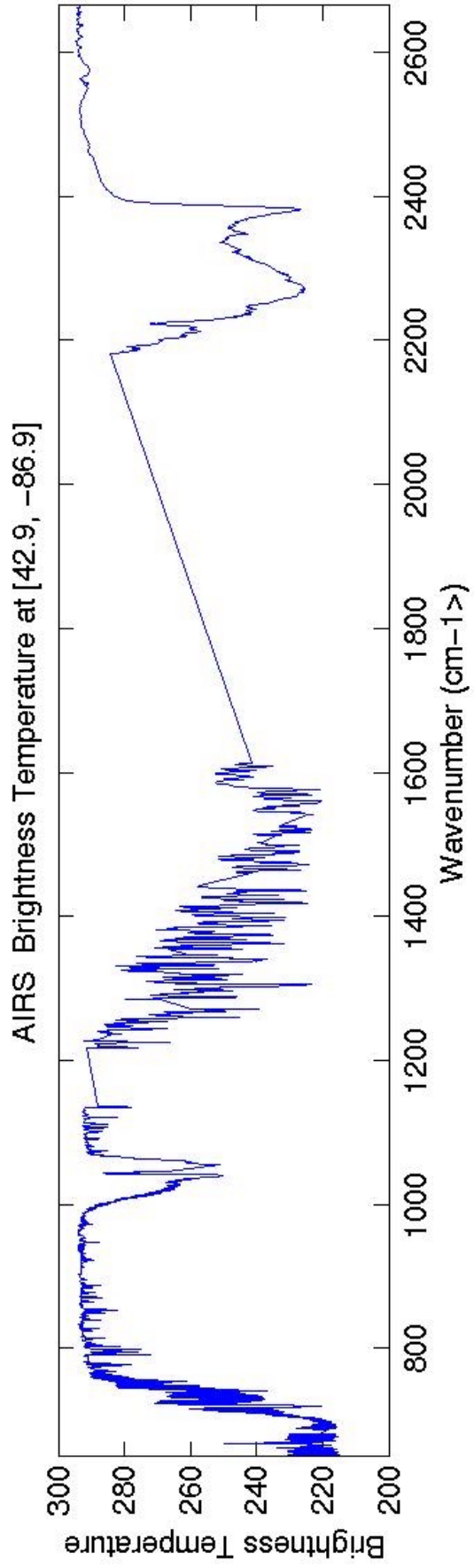
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**AIRS Clear
Footprint
from MODIS
Cloud mask**

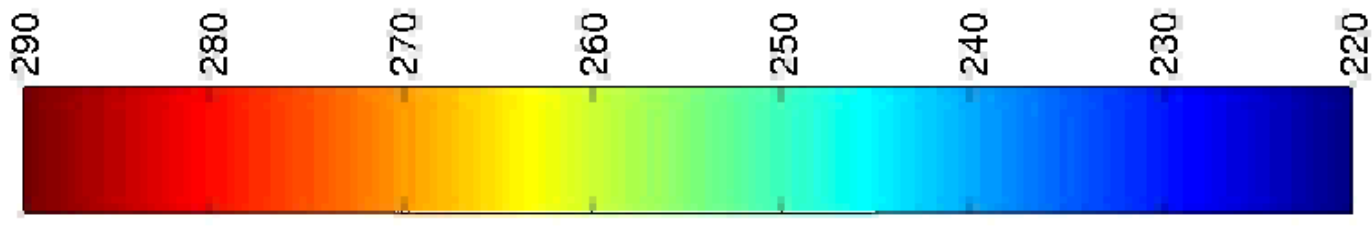
MODIS TPW at 1km resolution (mm)



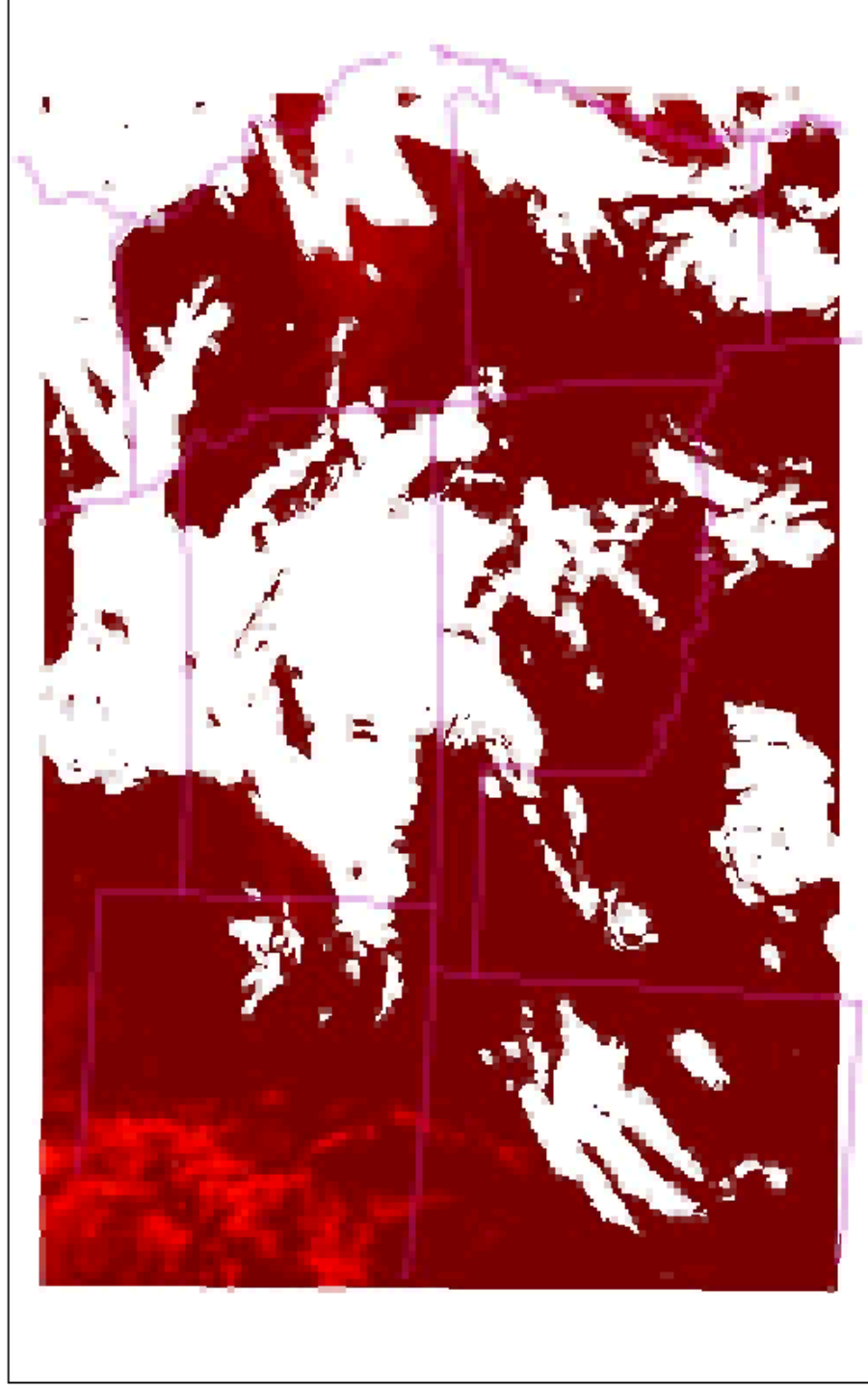


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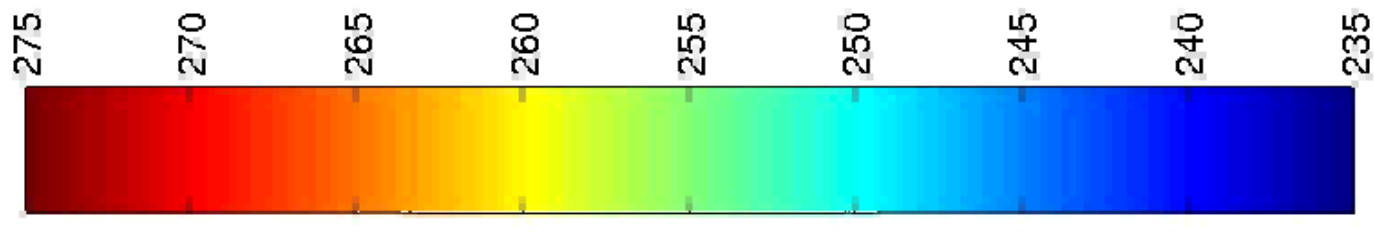
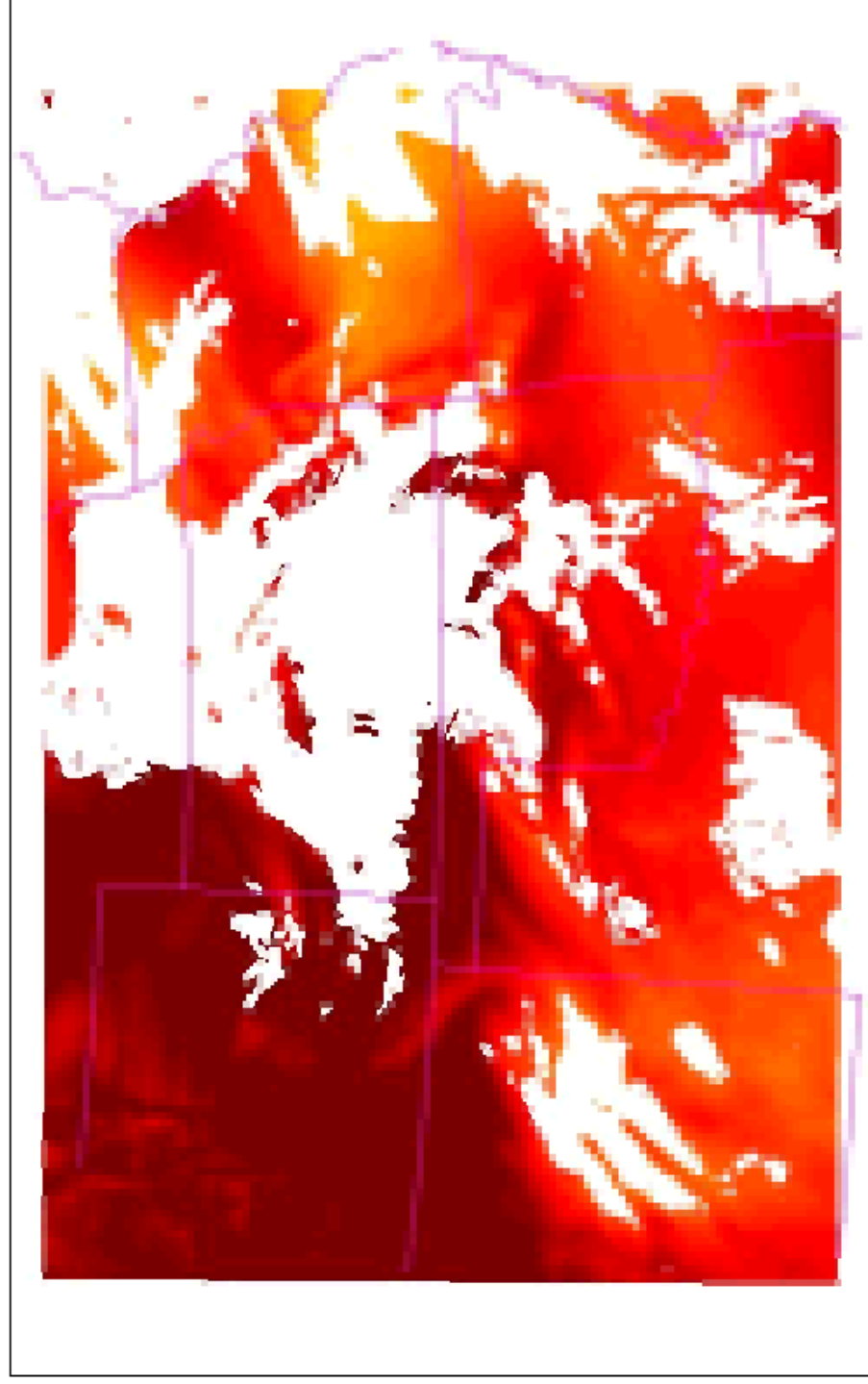


Brightness Temperature 840 38cm-1

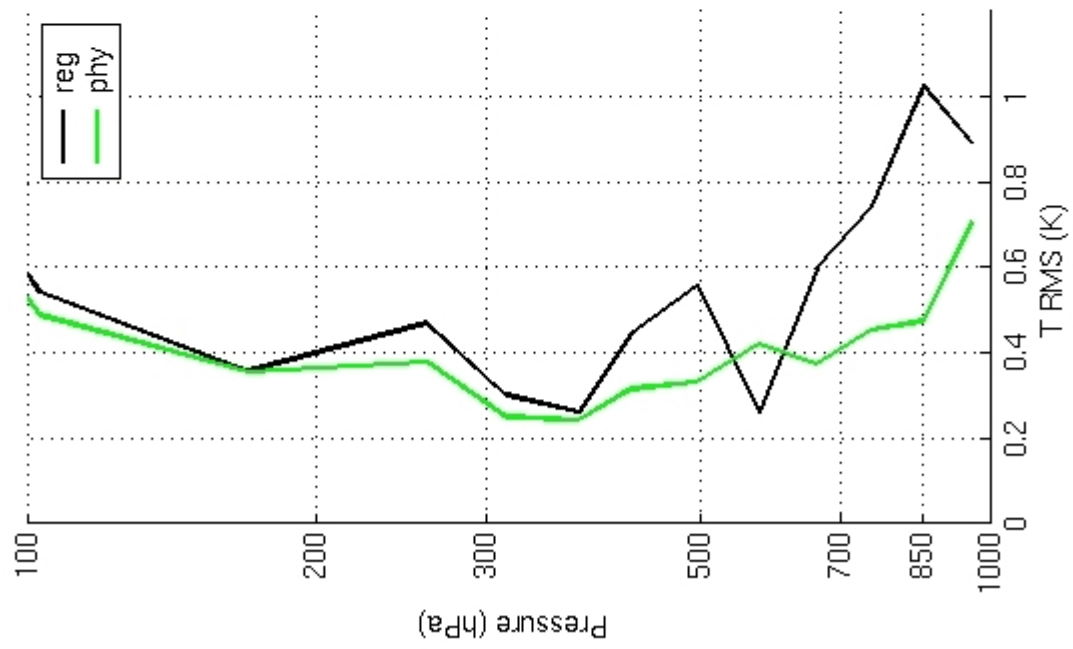
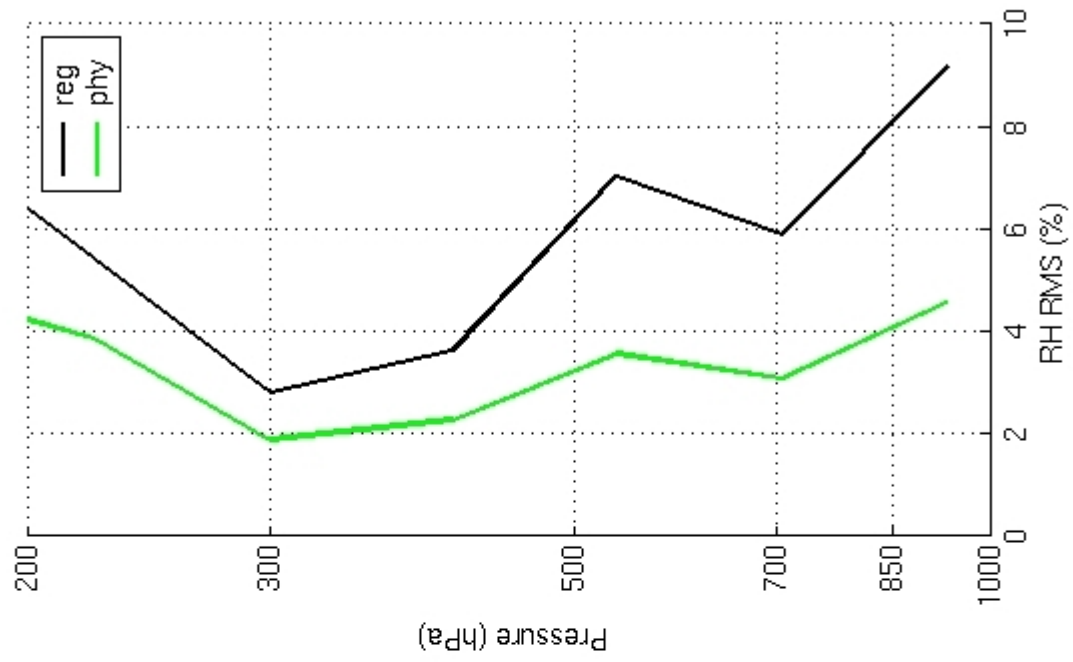


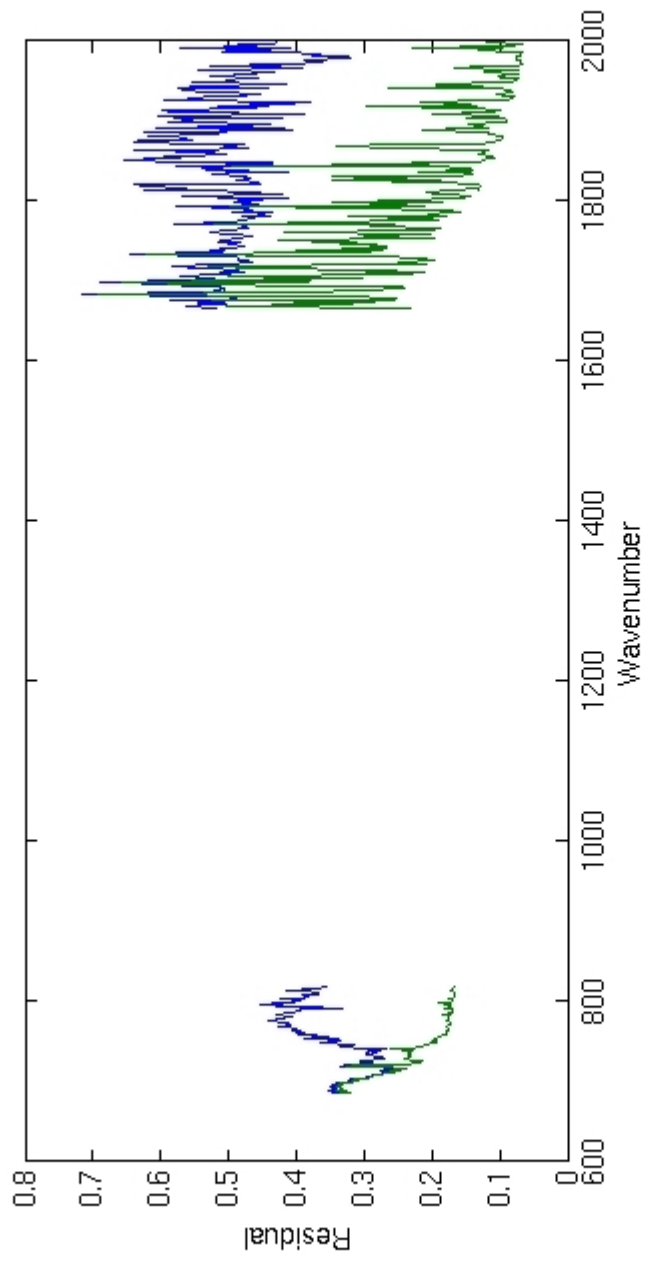
GIFTS Longwave Band

Brightness Temperature 1911 36cm-1

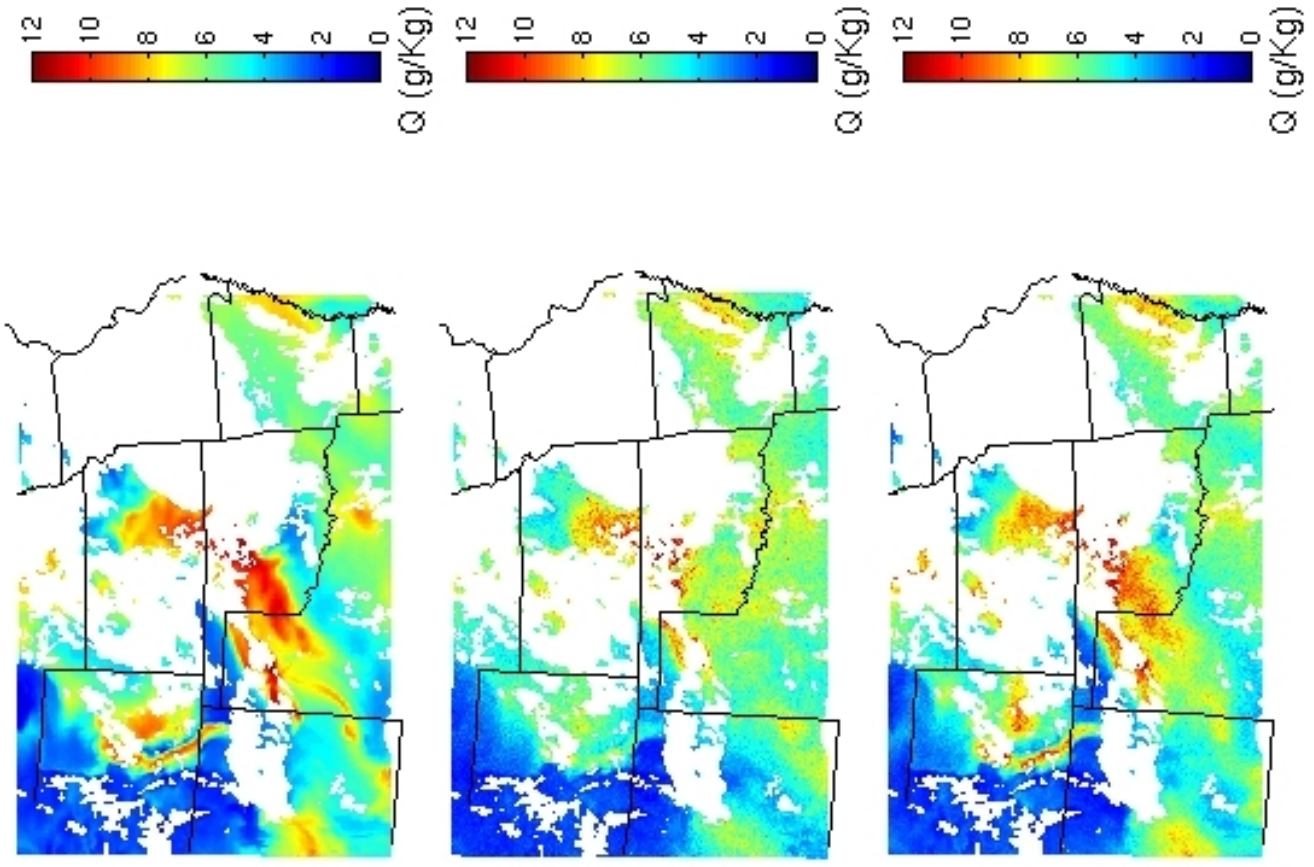


GIFTS Short Middlewave Band

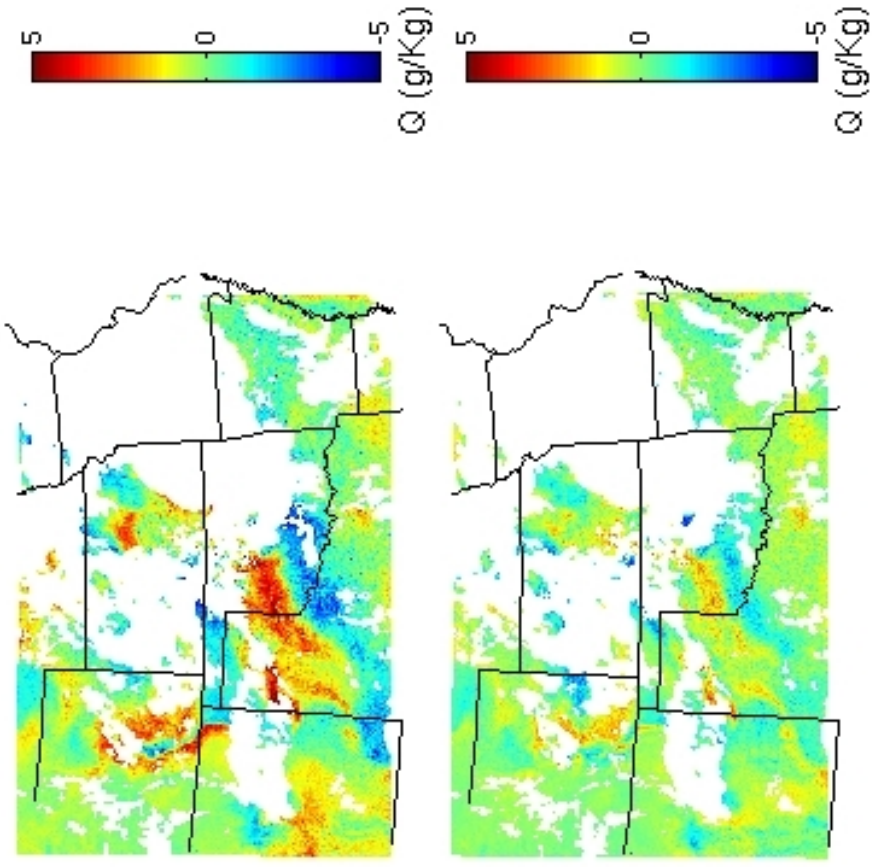




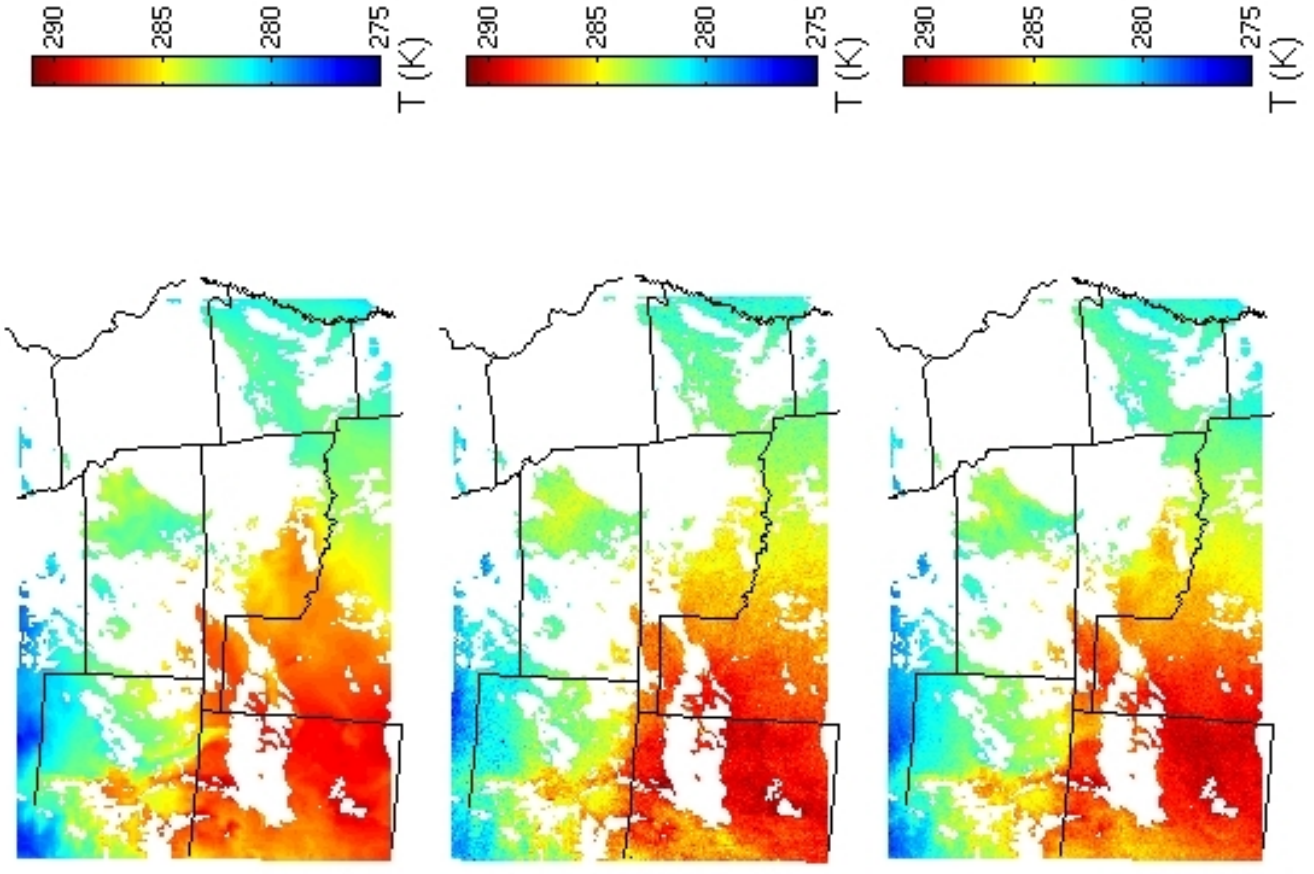
700mb Mixing Ratio June 12, 2002, 1900UTC



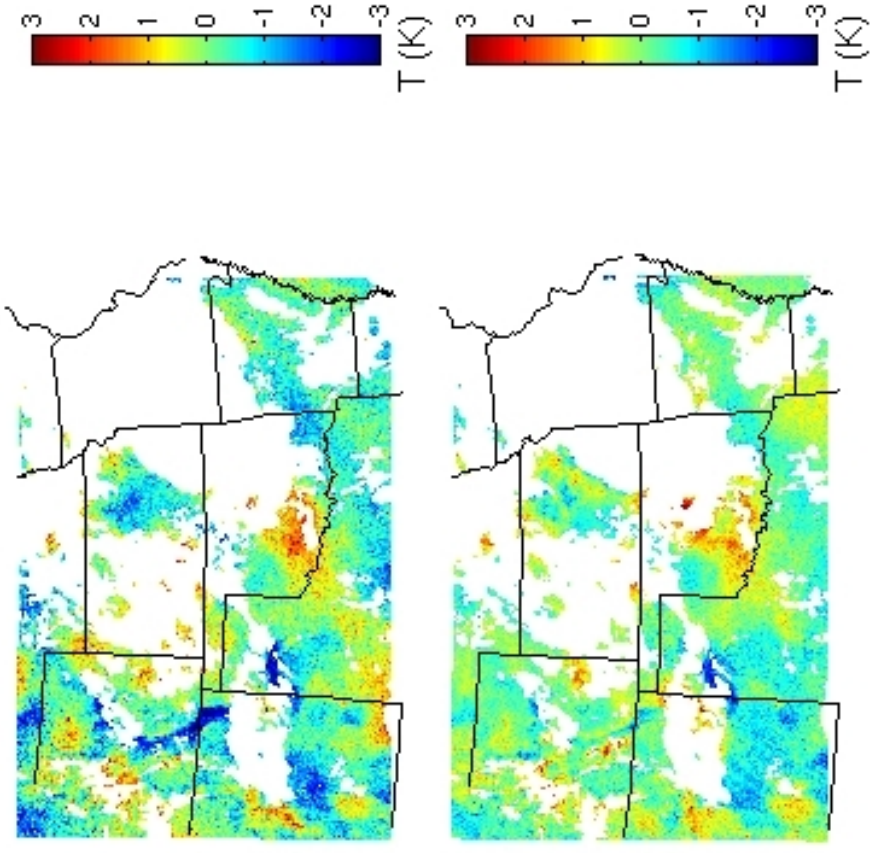
700mb Mixing Ratio June 12, 2002, 1900UTC



700mb Temperature June 12, 2002, 1900UTC

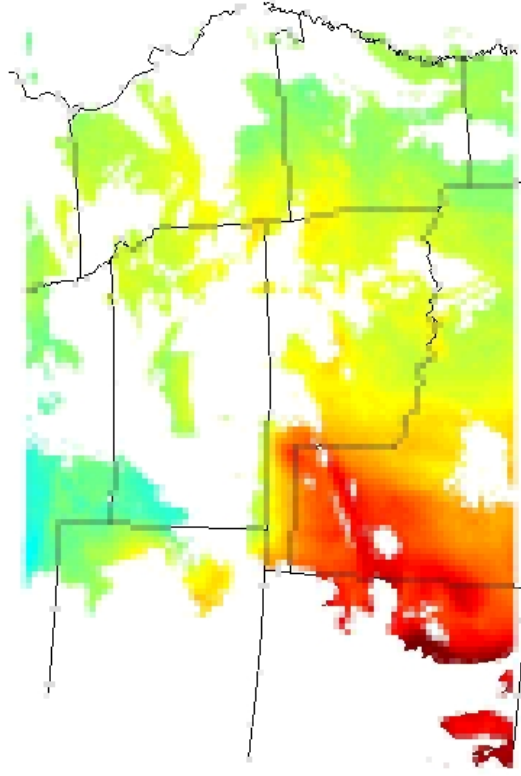


700mb Temperature June 12, 2002, 1900UTC

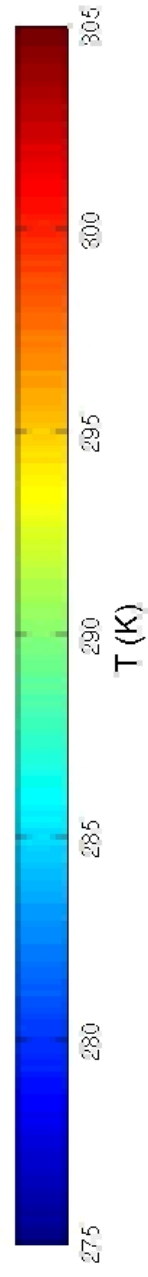
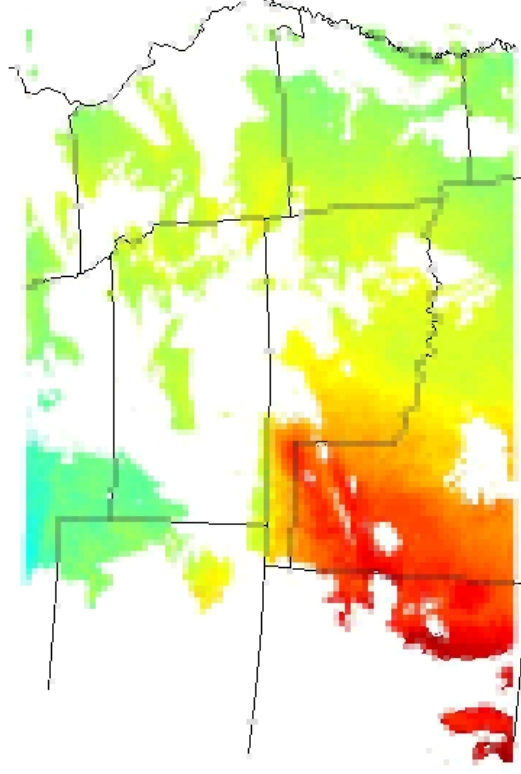


True

850mb Temperatur June 12, 2002, 1800UTC

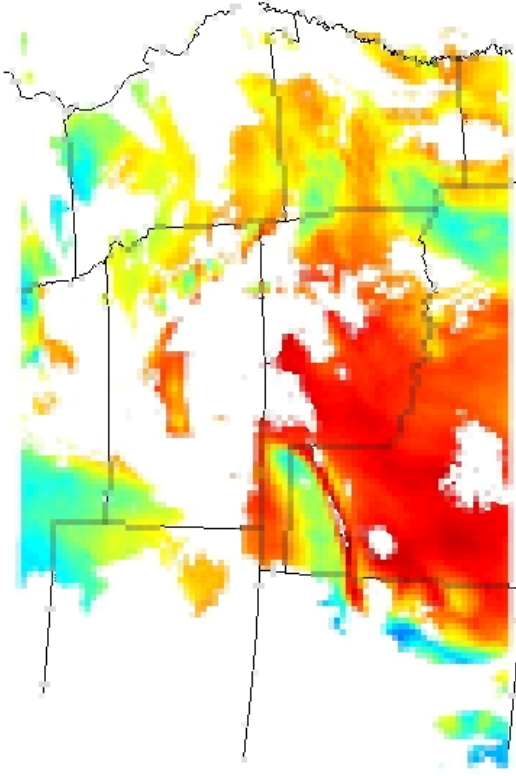


Retrieval

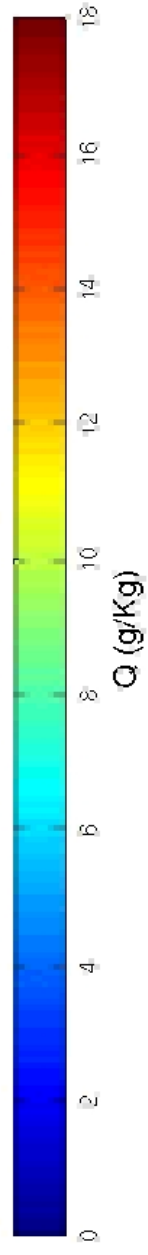
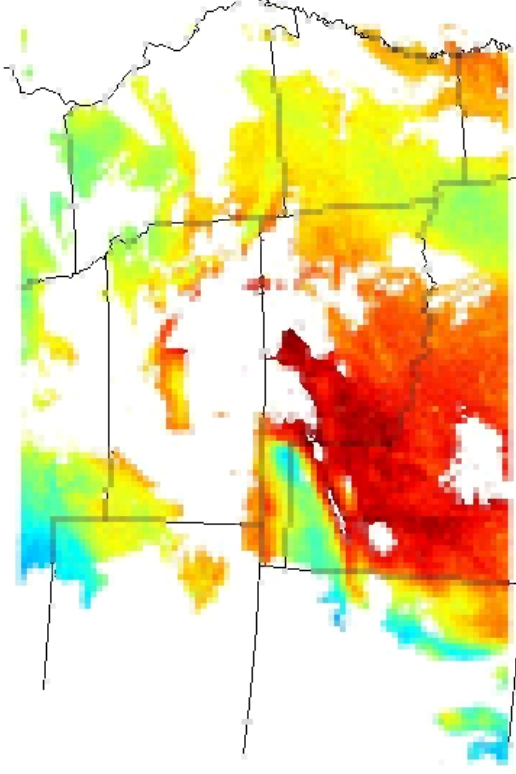


True

850mb Mixing Ratio June 12, 2002, 1800UTC



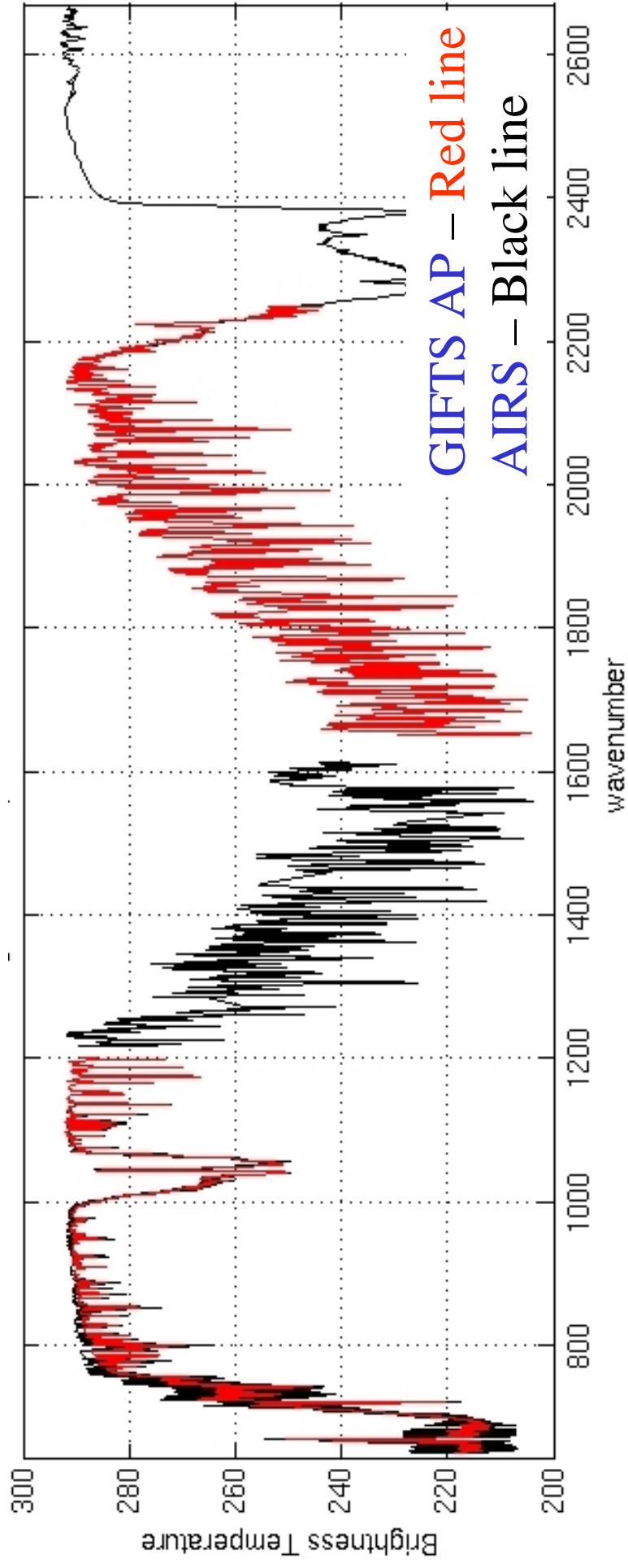
Retrieval



GIFTS Sounding Retrieval

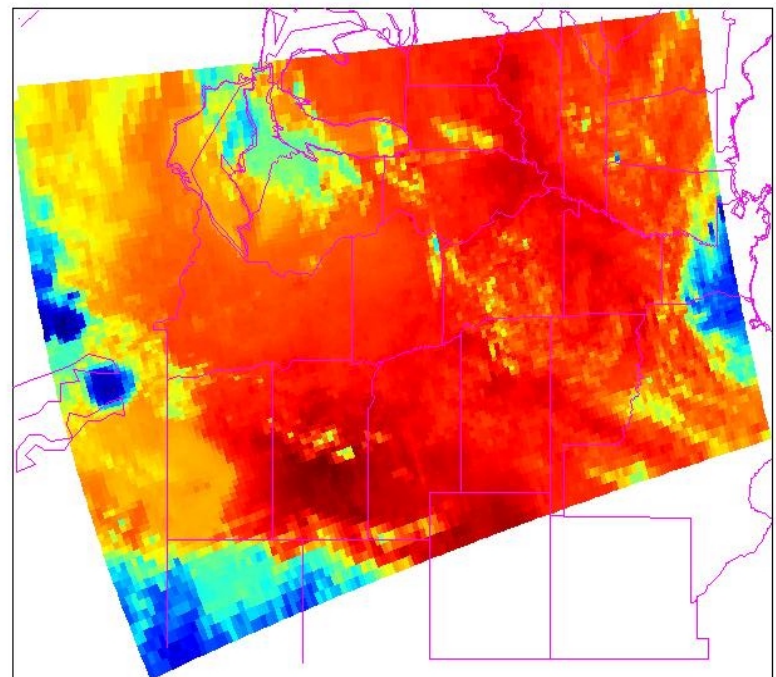
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BT spectra for GIFTS and AIRS

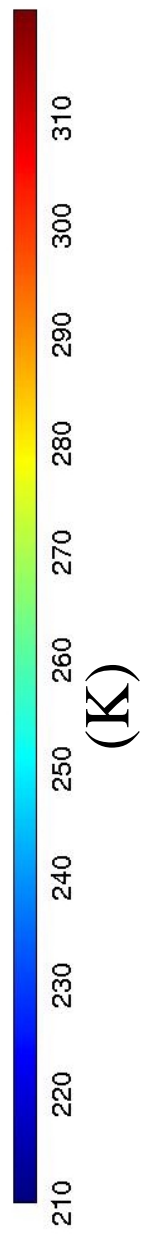
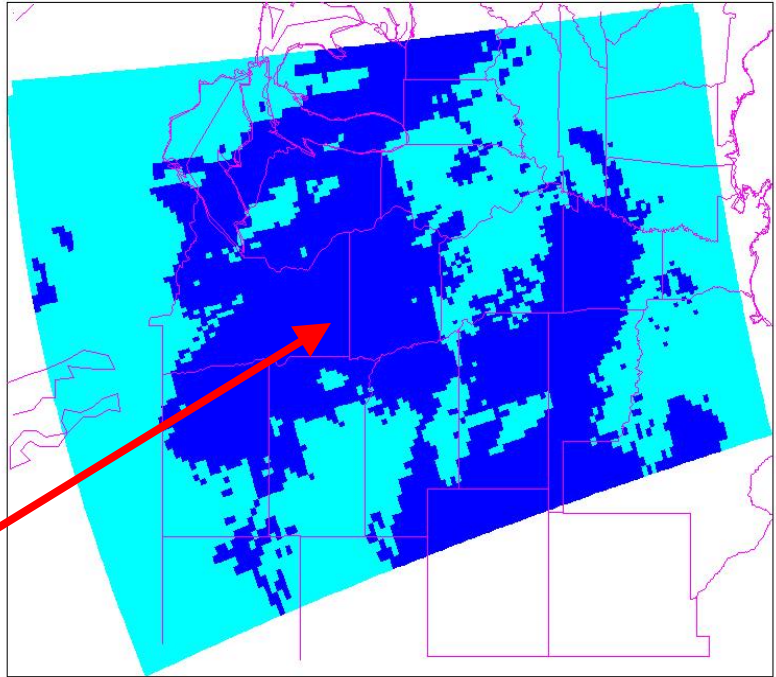


AIRS clear mask

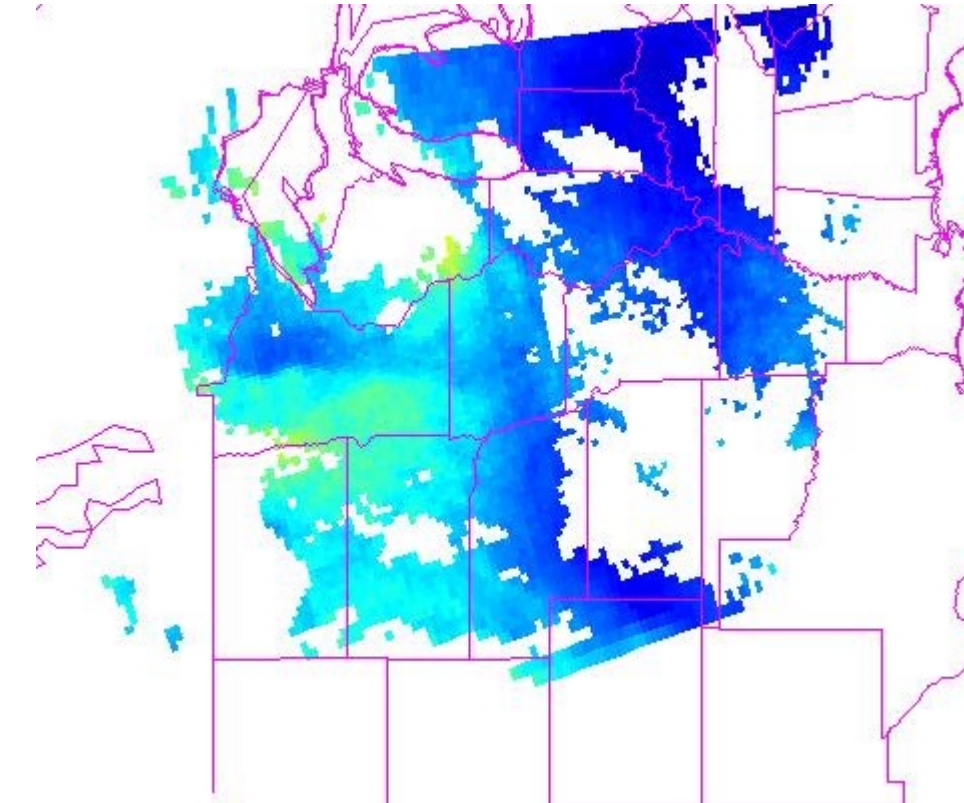
AIRS Channel 763 (901.5075 cm^{-1}) Brightness Temperature



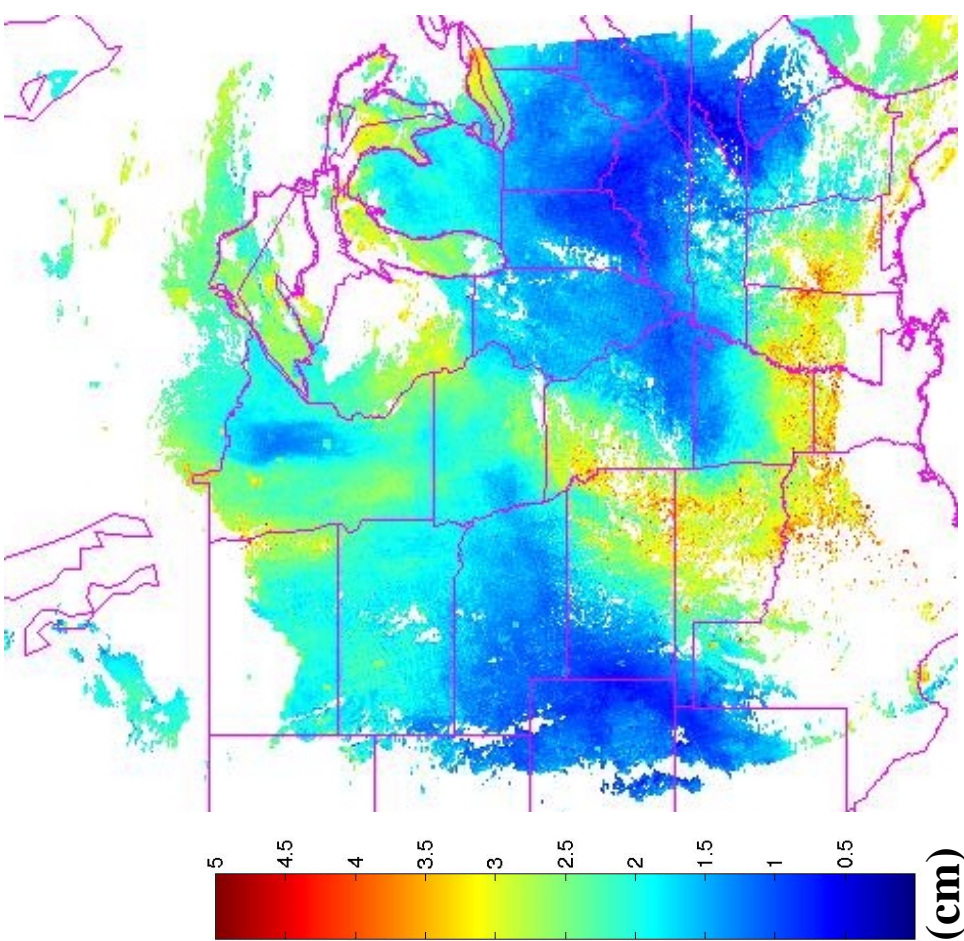
AIRS Cloud Mask



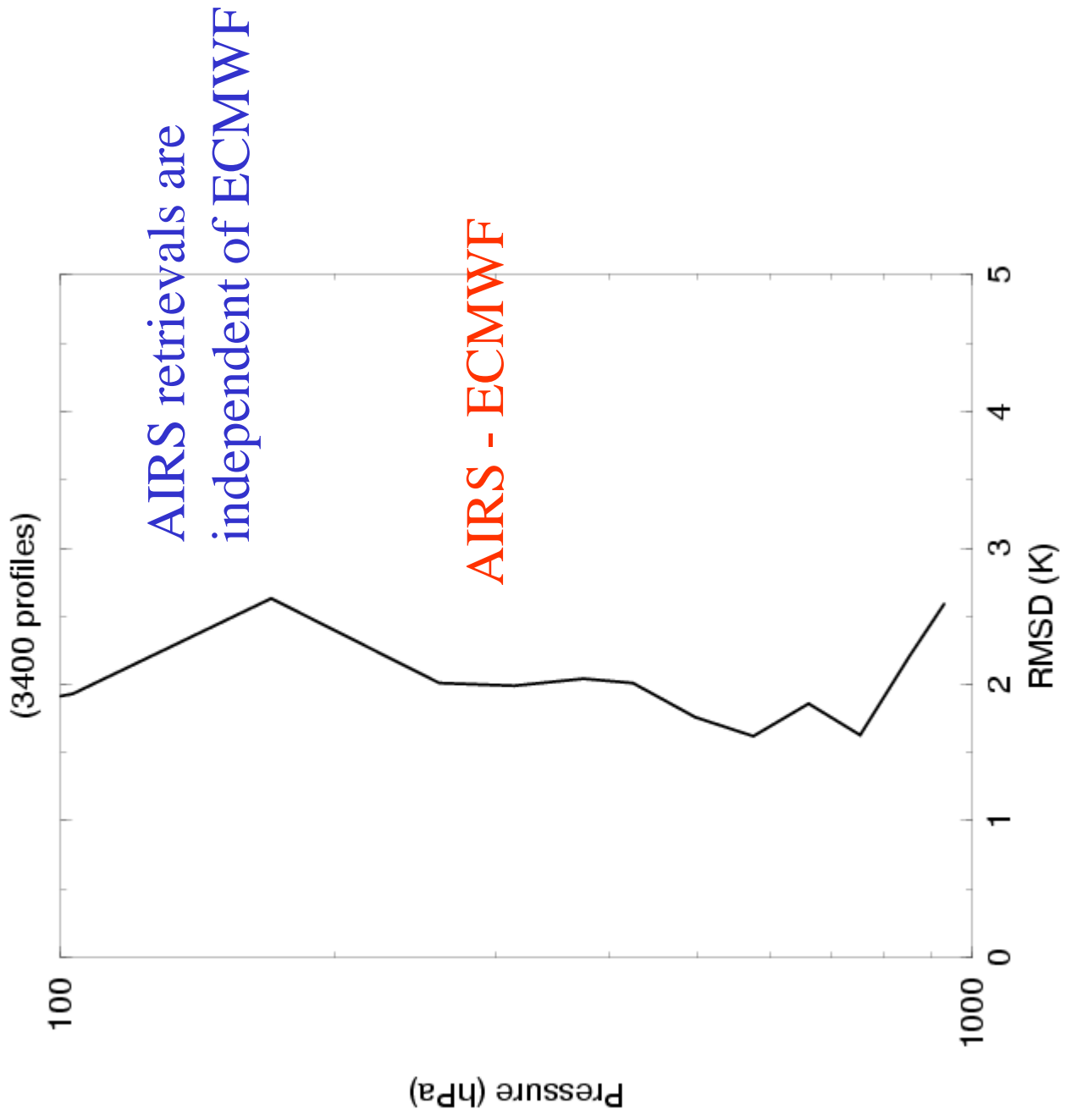
1915 – 1920 UTC 06 September 2003



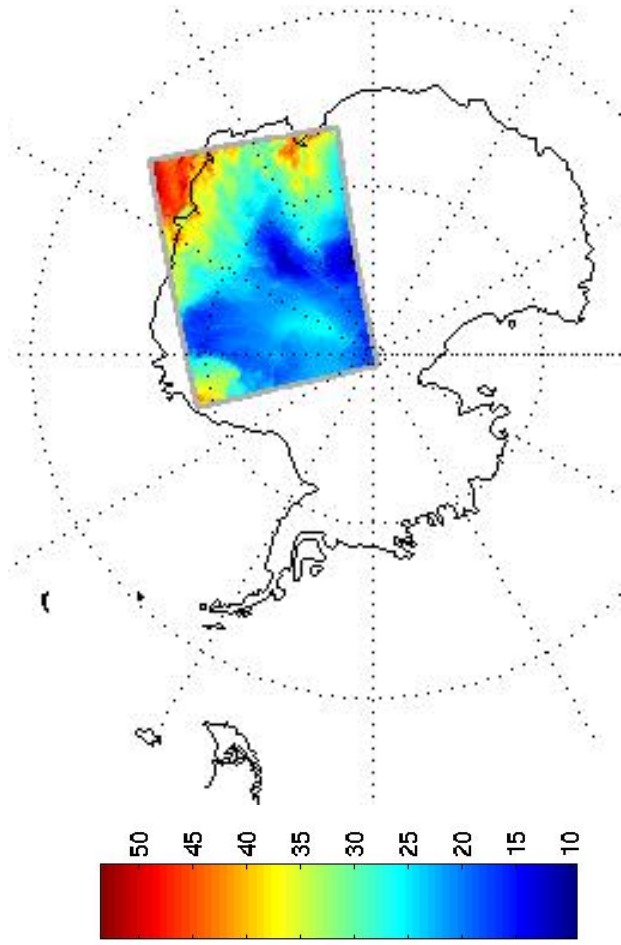
AIRS 14km TPW



MODIS 1km TPW

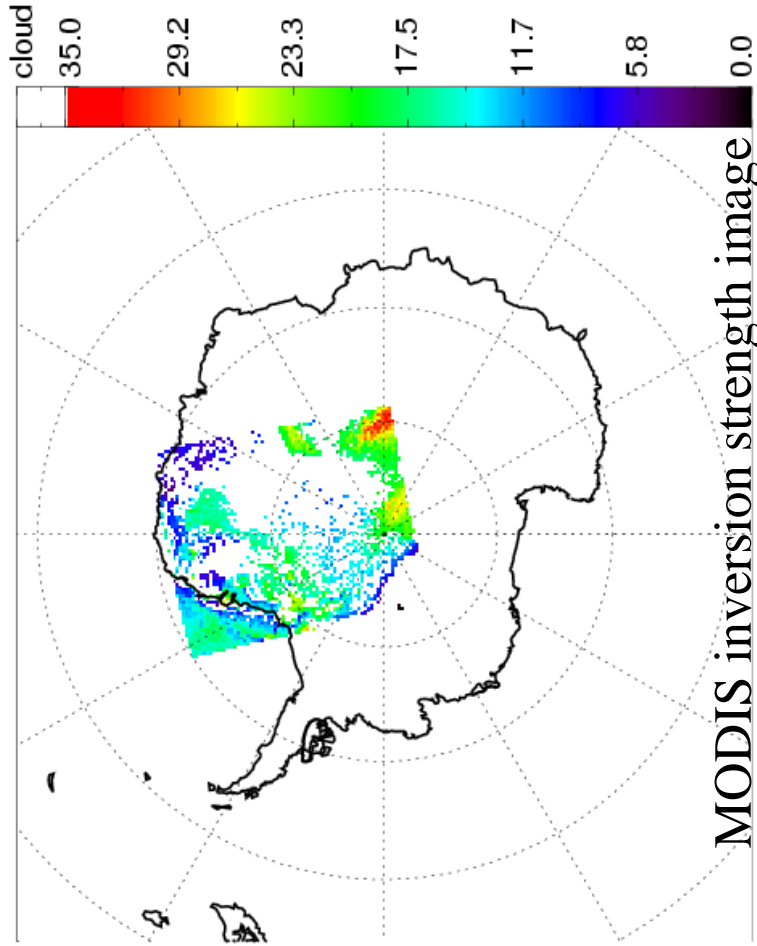


Radiance [$\text{mW}/\text{m}^2/\text{cm}^{-1}/\text{str}$] at 900.123 cm^{-1}



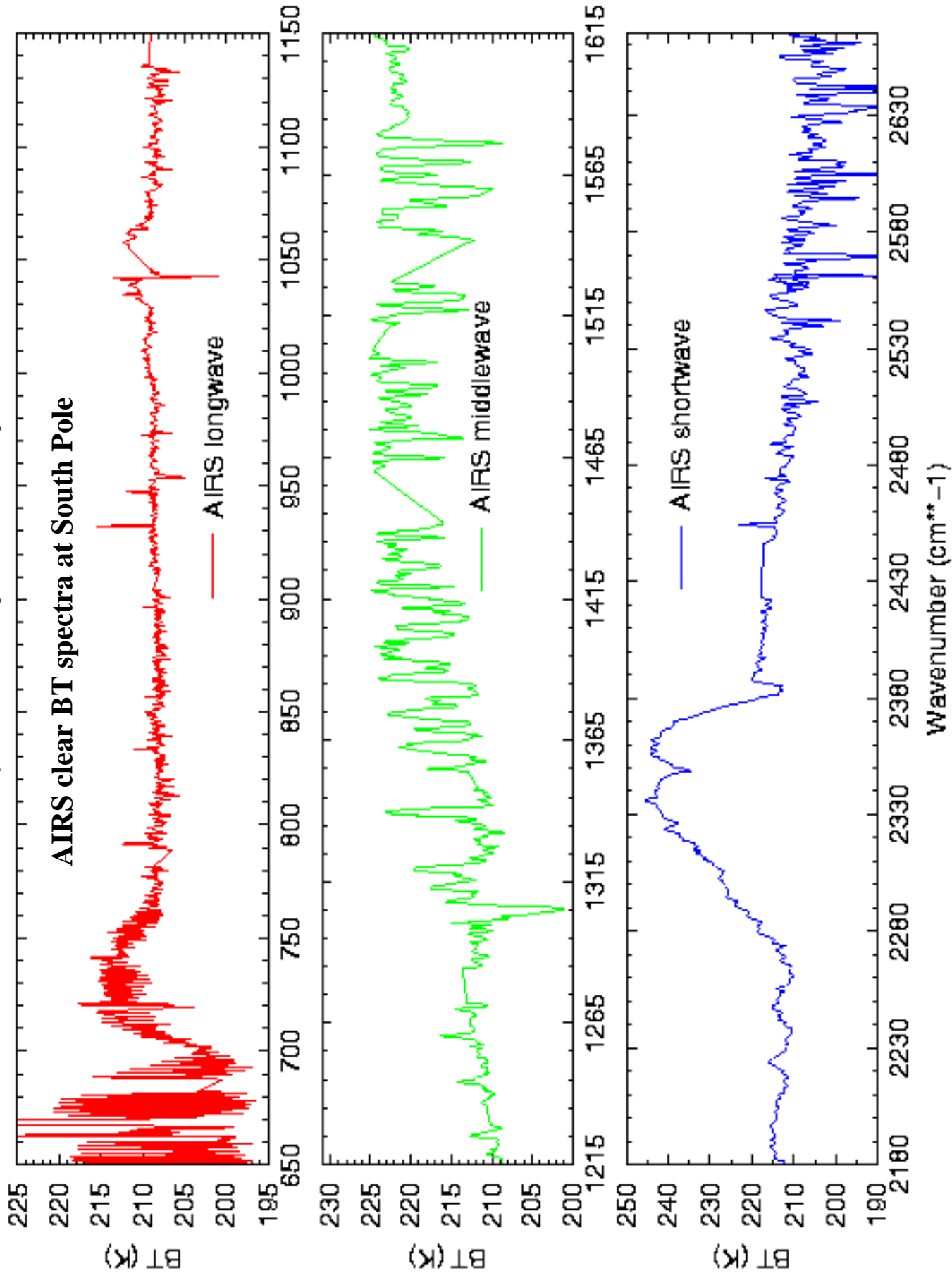
AIRS radiance image

IS from MODIS at 2020 on Sept/06/2002

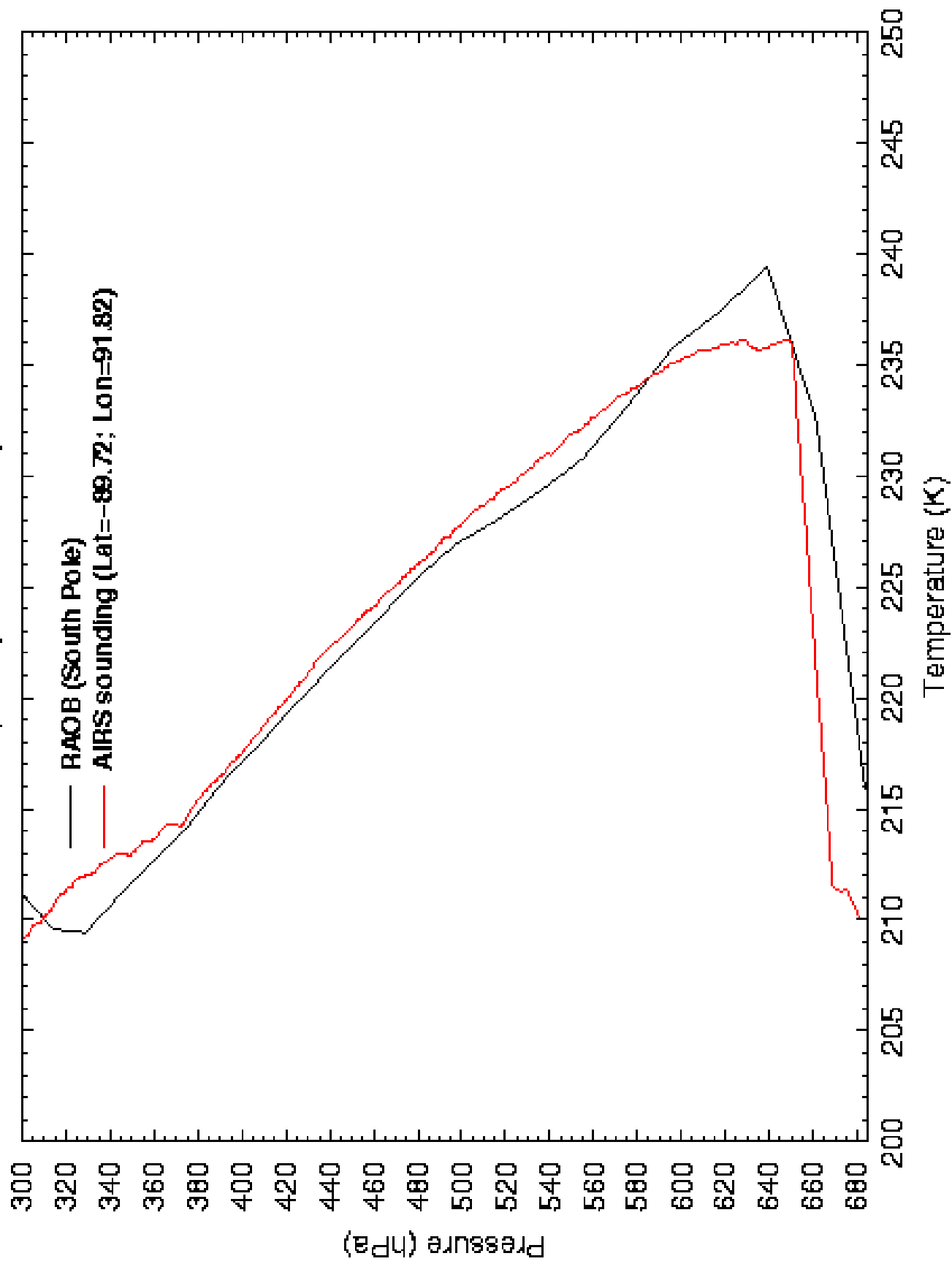


MODIS inversion strength image

(2030UTC; September 2002)



(06 September 2002)



Summary

- GIFTS provide much better temperature and moisture information than current GOES sounder
- It is important to handle surface emissivity , skin temperature, viewing angle, etc. in the training data set in a more physical manner.
- Cube data from MM5 are a good source for simulating the GIFTS retrieval processing.
- AIRS data can be used for GIFTS algorithm testing, we are making progress using the AIRS data.

Future work

- More algorithm testing using AIRS data
- A more complete and representative training data set
- Other algorithm such as Neural Network