



Comparisons of Cloudy Radiative Transfer Using LBLRTM and SARTA

By

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Outline

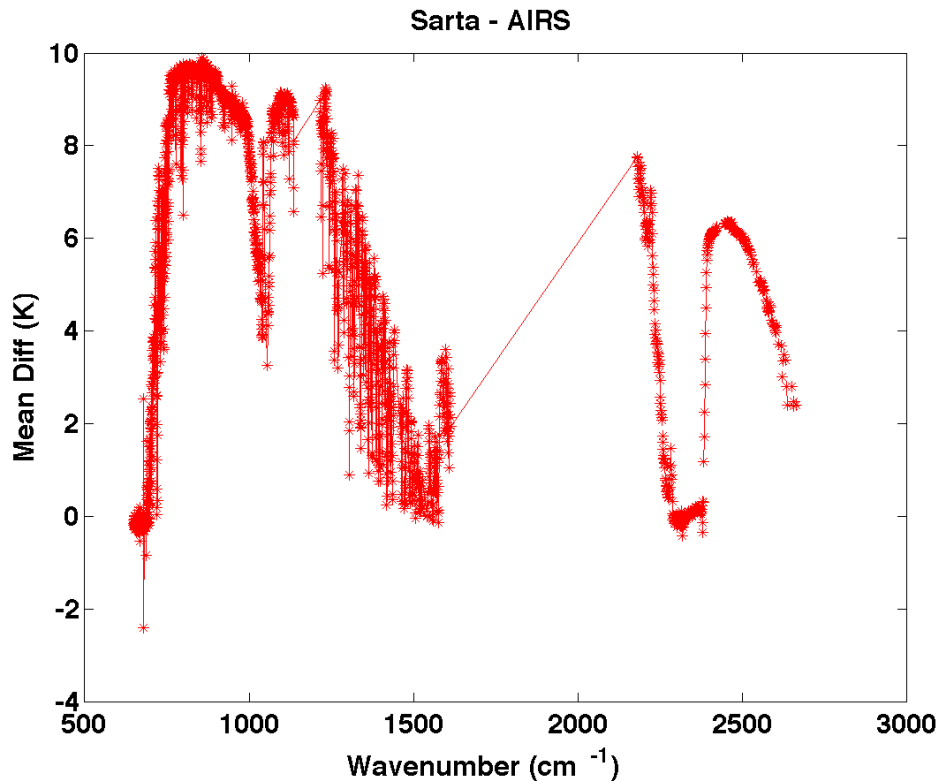
- Motivation
- Models and data
- Experimental setup and cloud parameterizations
- AIRS 900 cm^{-1} vs. LBLRTM and SARTA

MODELS and DATA

- 7377 ECMWF profiles interpolated in time and space to match AIRS
- SARTA 2-stream : UMBC's fast RTA at AIRS resolution coupled to a 2-stream scattering code
- LBLRTM: the line by line radiative transfer model developed by AER. Very
- LBLDIS: a DISORT package developed specifically for LBLRTM.

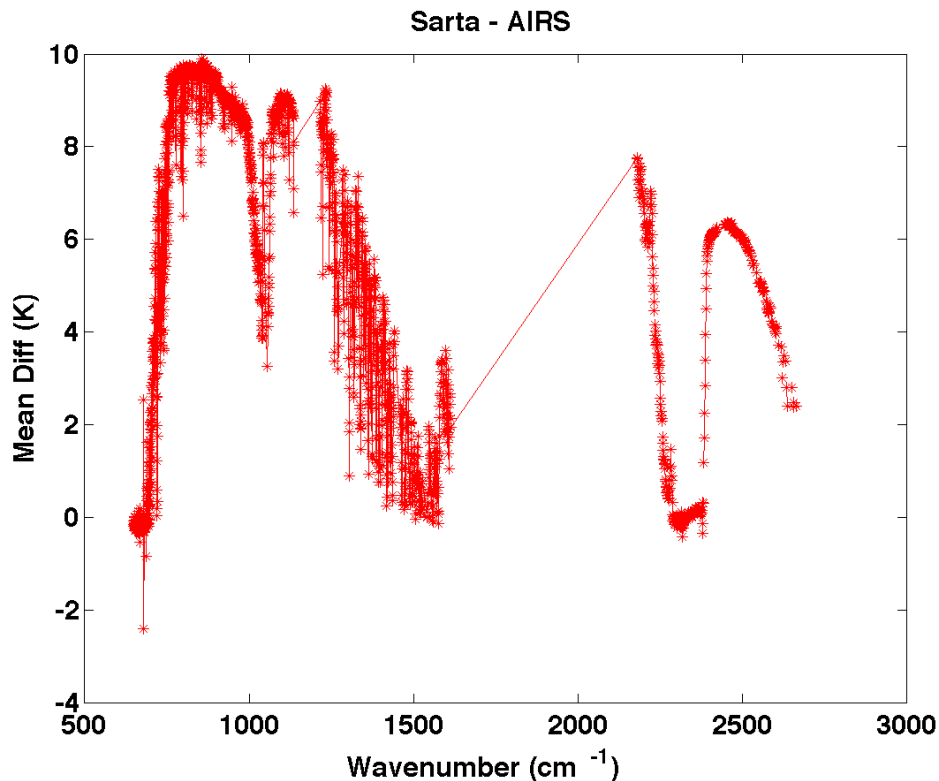
Motivation

- Single Footprint Cloudy Retrievals
- Principal Component Reconstruction of Radiances to
- Increased understanding of current RTAs



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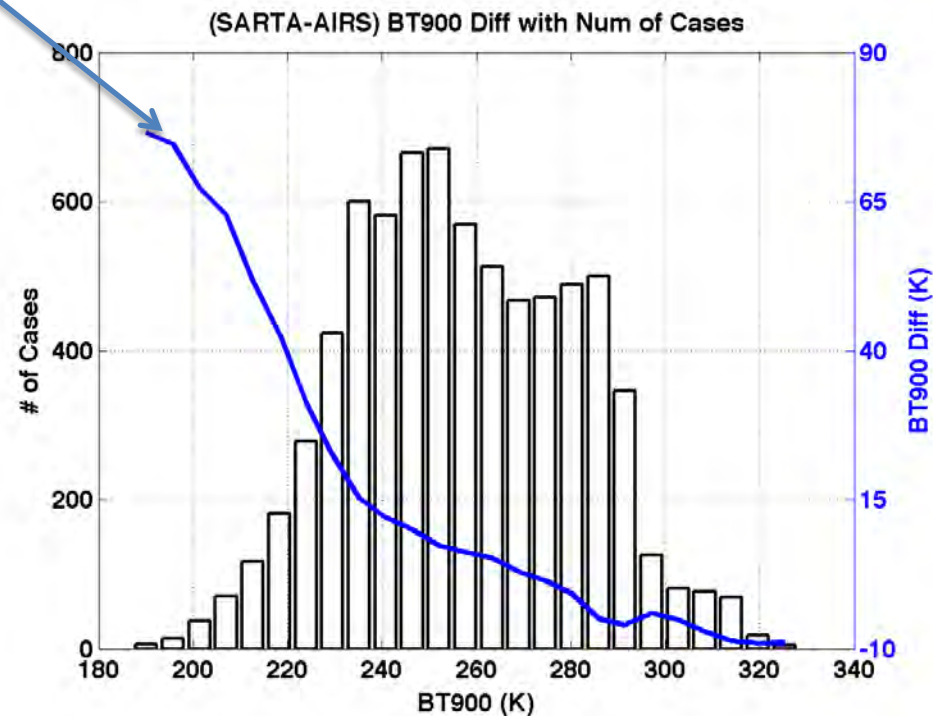
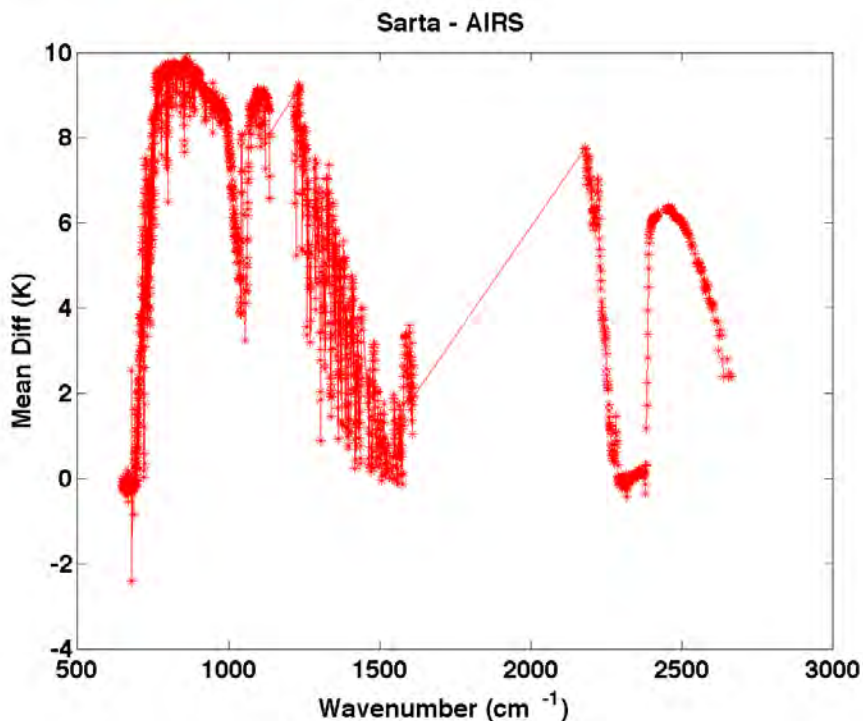
JPLs RTAs Group Goals

1. How good does a cloudy and clear RTA have to be?
2. Where are we now?

Motivation

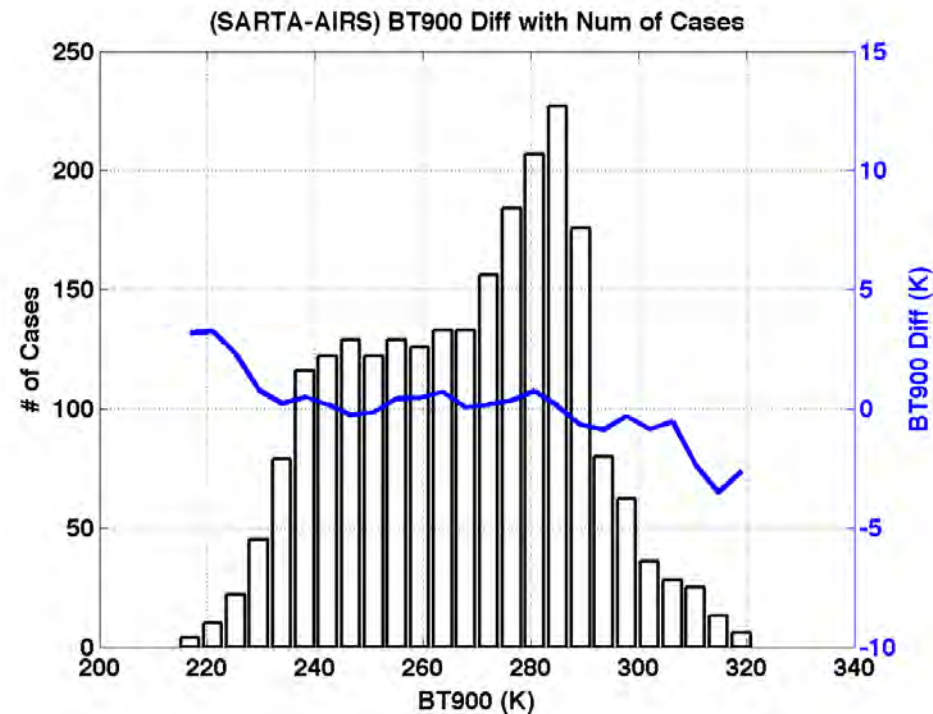
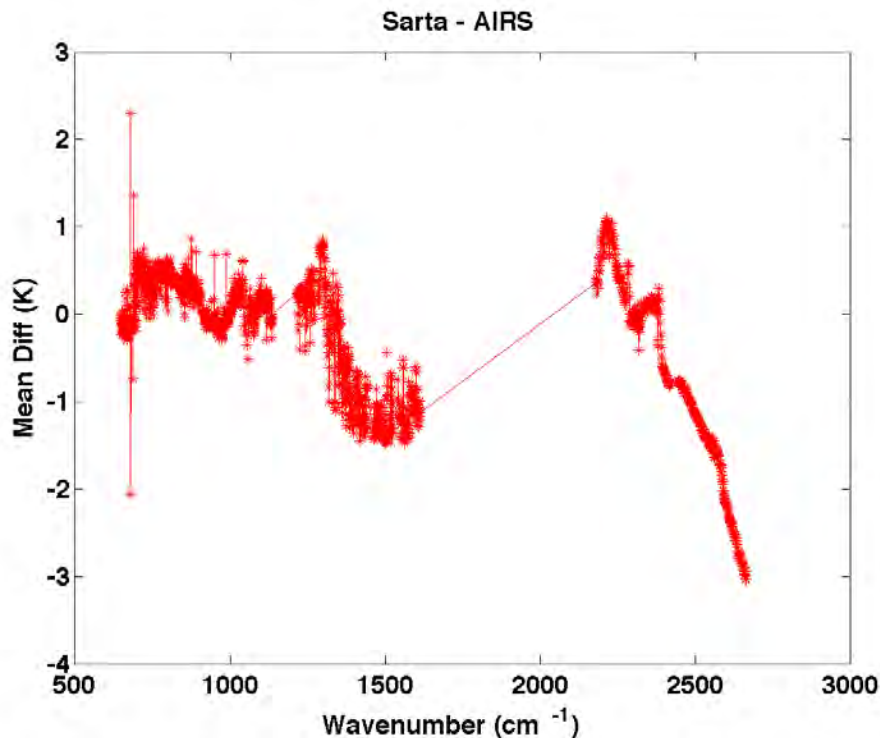
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AIRS & ECMWF
Mismatch



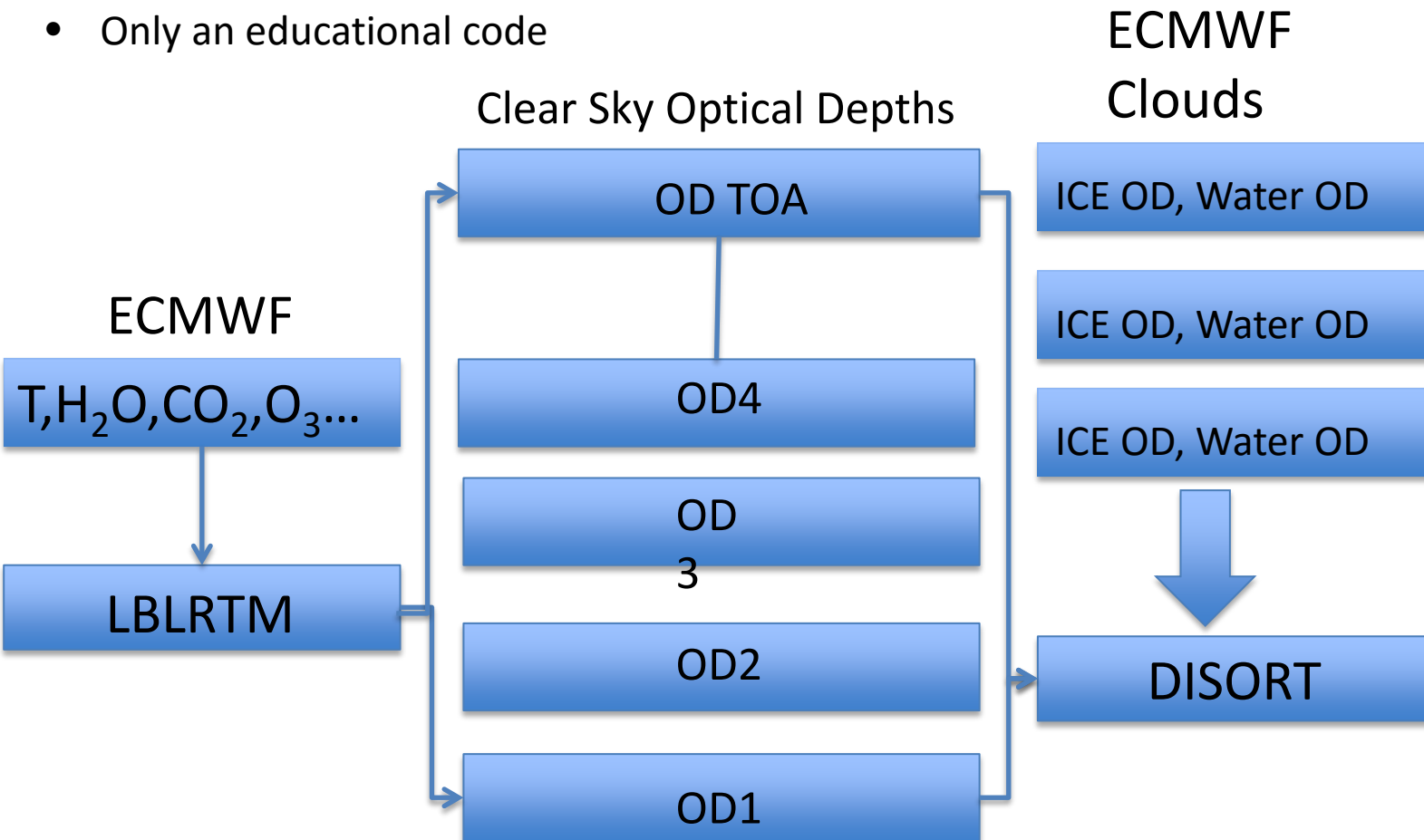
Motivation

- 900 cm^{-1} BT Diff $< 5\text{K}$ to deal with mismatch errors
- SARTA 2-Stream performs well in the longwave
- Shortwave has issues (more complex scattering phase function?)



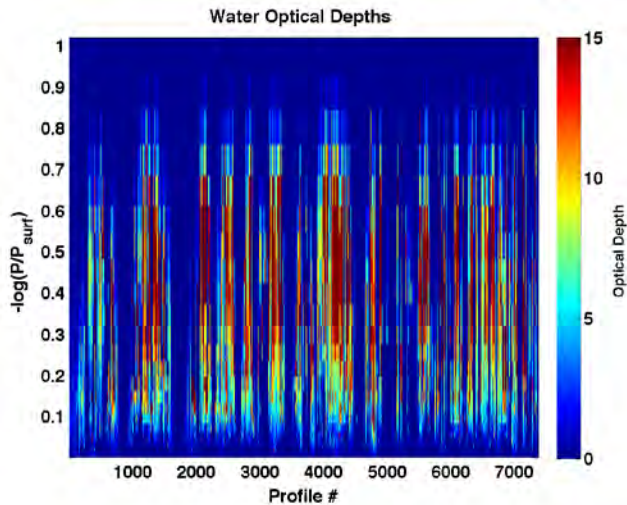
A typical Cloudy LBLRTM Run

- Run time is a function of spectral location, spectral range, and cloud ODs (especially ice)
- Only an educational code

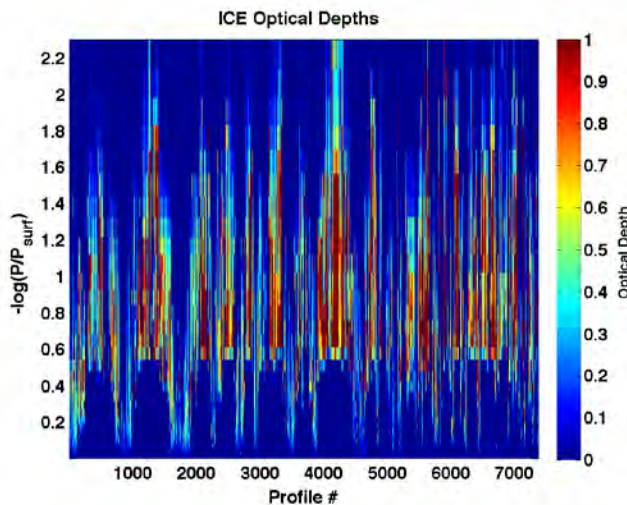
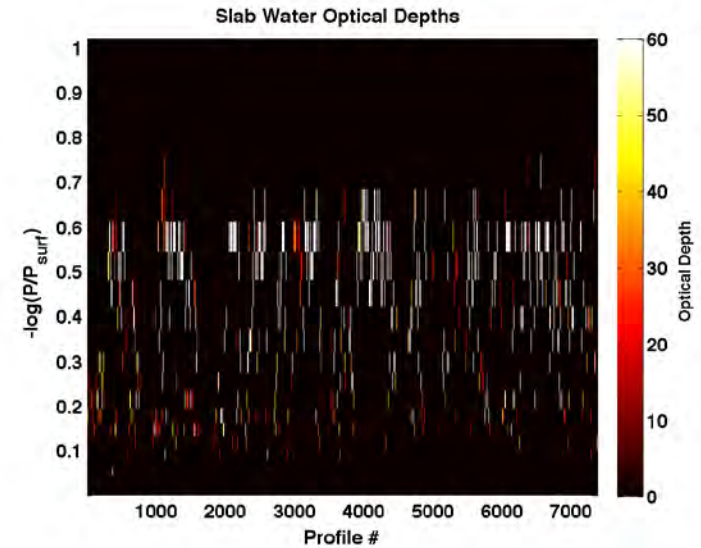


Experimental Setup

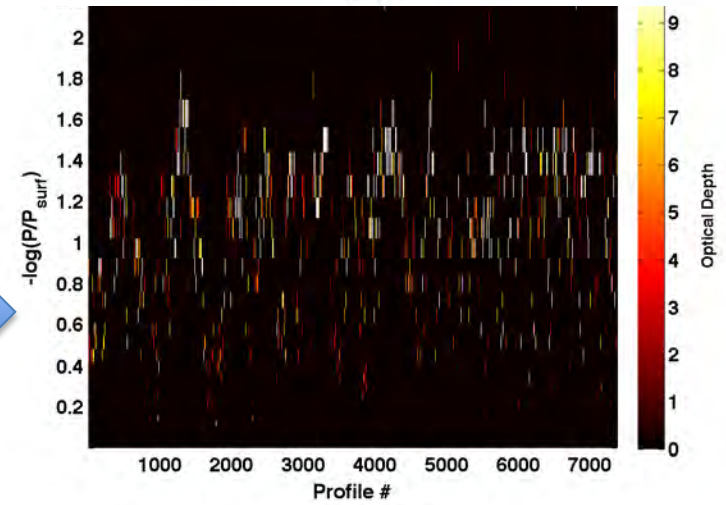
- Non slab cloud representation yielded results to warm
- Identified separate cloud structures in the ice and water OD profiles
- Cloud height at layer where above layers sum to 20% of total
- Effective radius as a function height (Similar to ECMWF)
- Nighttime, non frozen ocean (~400 cases)



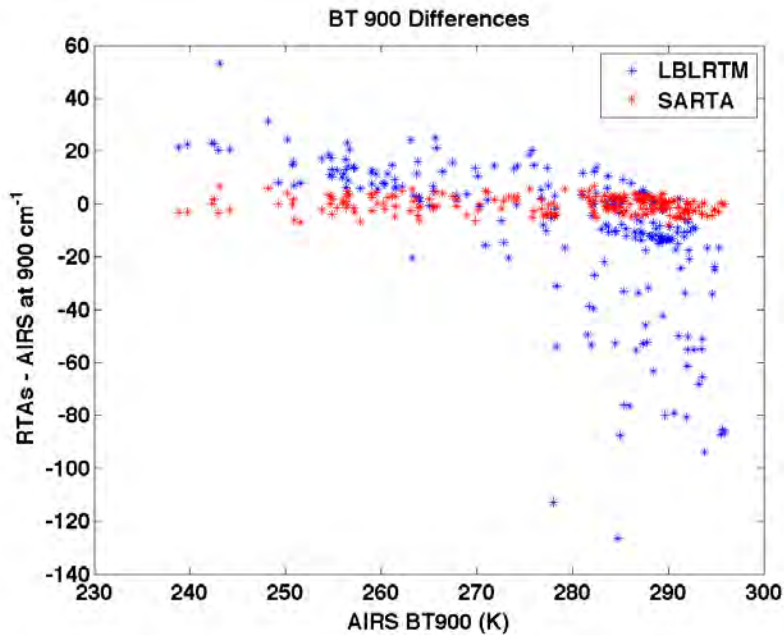
Slabbing



Slabbing

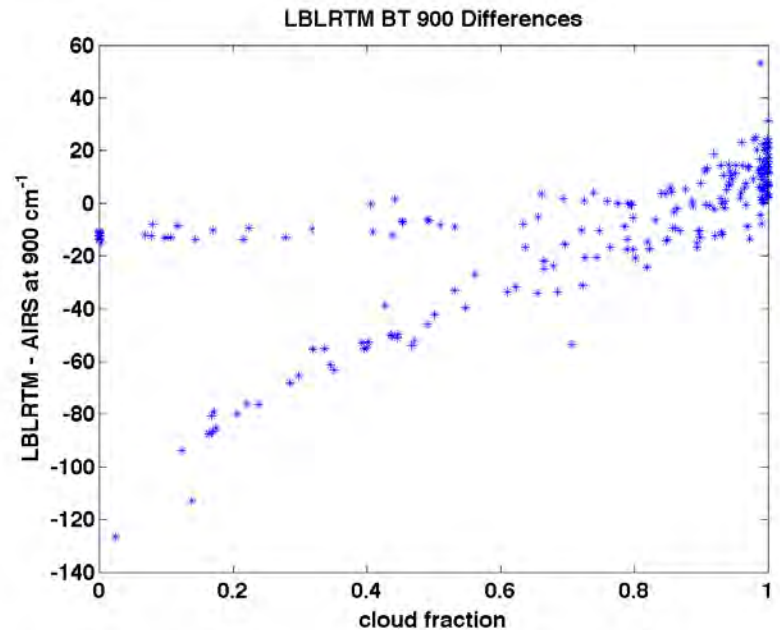


900 cm⁻¹ Results



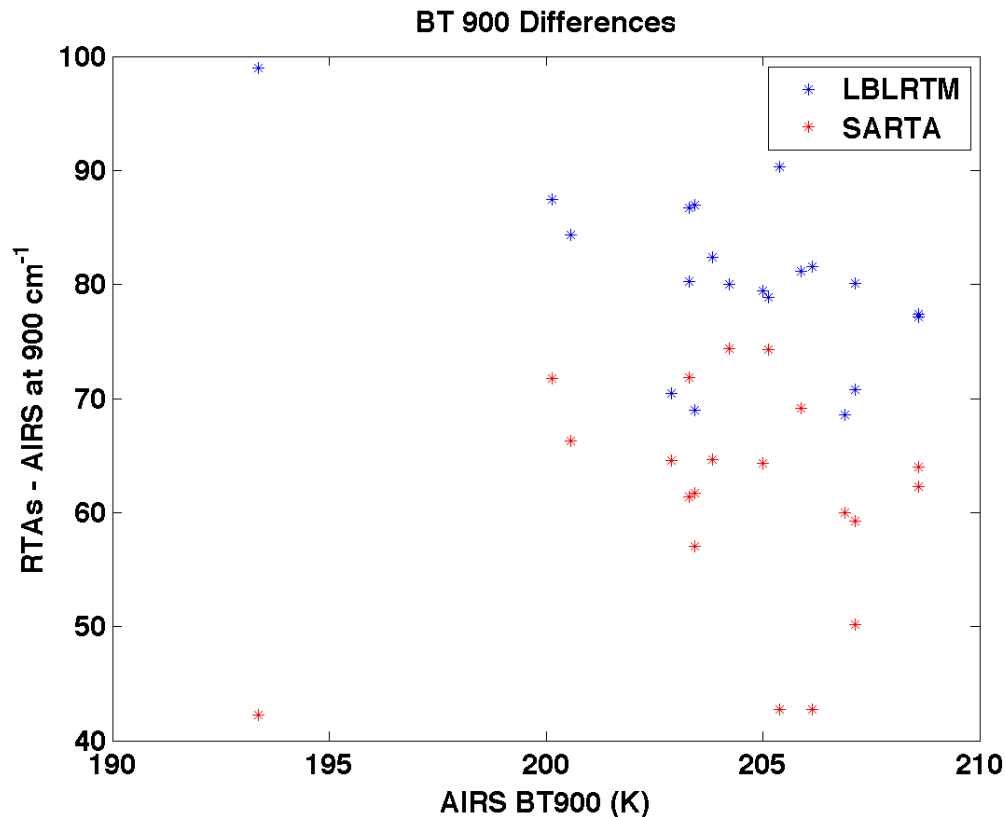
- SARTA bias near zero with a 3K std.
- LBLRTM gets noisier with warmer scenes
- LBLDIS is very sensitive to cloud representation
- Mostly clear sky from LBLDIS has issues (non physical measurements)

	LBLRTM	Sarta
900 cm ⁻¹ Bias (K)	-9.77	-0.26
900 cm ⁻¹ Std (K)	28.02	2.99



Deep Convective Clouds

- 20 nighttime Ocean DCCs
- DCCs are defined as BT900 < 210
- Magnitude of error from SARTA suggests either mismatch or large difficulty with DCCs



Summary

- More work on cloud parameterization needs done for LBLRTM (Still trial and error phase)
- This Study showed SARTA 2-stream works for all clouds other than DCCs in longwave
- Scattering Phase function becomes more complex in the shortwave. Scattering package a function of wavelength?
- Include the delta 4 stream at JPL and extend to shortwave
- A better test bed data set is needed to eliminate mismatch errors in time and space