

MODIS/CALIPSO Comparisons: Cloud Detection and Altitude

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What is a cloud?

“I know one when I see one.”



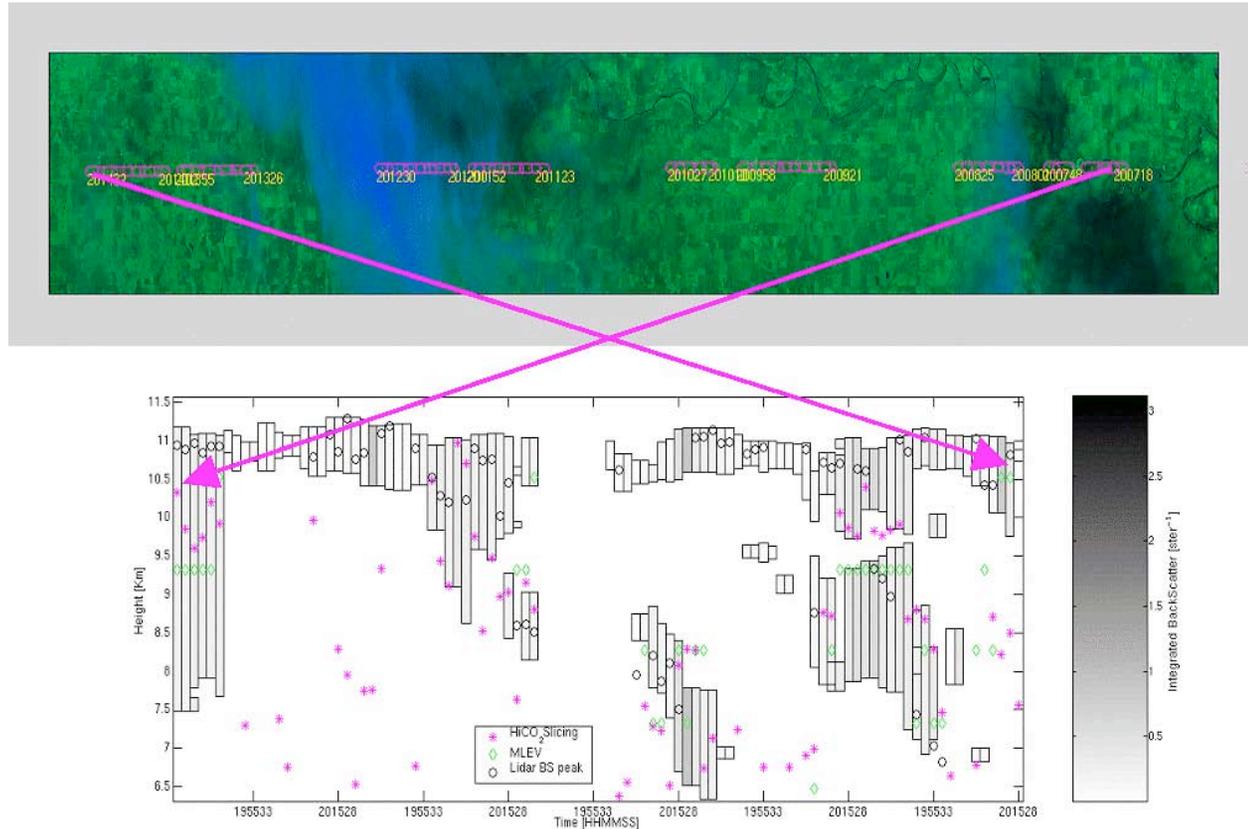
ARCL cloud fraction over a 30 minute time period, were ARCL cloud fraction of less than 5% is considered clear. MODIS confidences of greater than 0.95 are considered clear. Agreement between the two approaches is 84% agreement for Terra, 82% for Aqua.

	ARCL Clear	ARCL Cloud
MODIS Clear	146 (117)	45 (58)
MODIS Cloudy	38 (12)	298 (185)

	ARCL Clear	ARCL Cloud
MODIS Clear	27.9% (31.5)	8.5% (15.6)
MODIS Cloudy	7.2% (3.2)	56.5% (49.7)

Comparison of MODIS with 3 years of ARM site observations

MODIS/CALIPSO Collocation



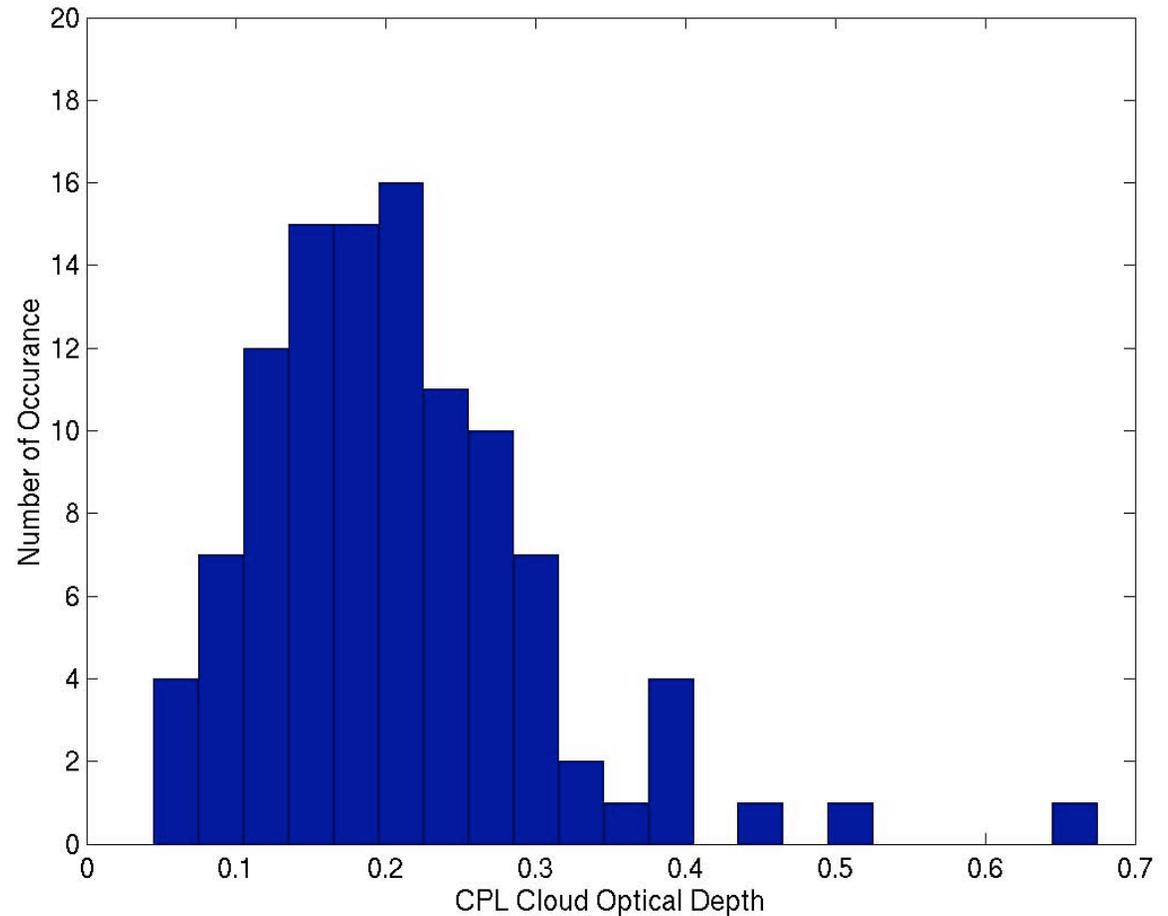
Collocation of MAS with CPL.

Build on this experience, but start simple

MODIS meeting 11/1/2006

What is a cloud?

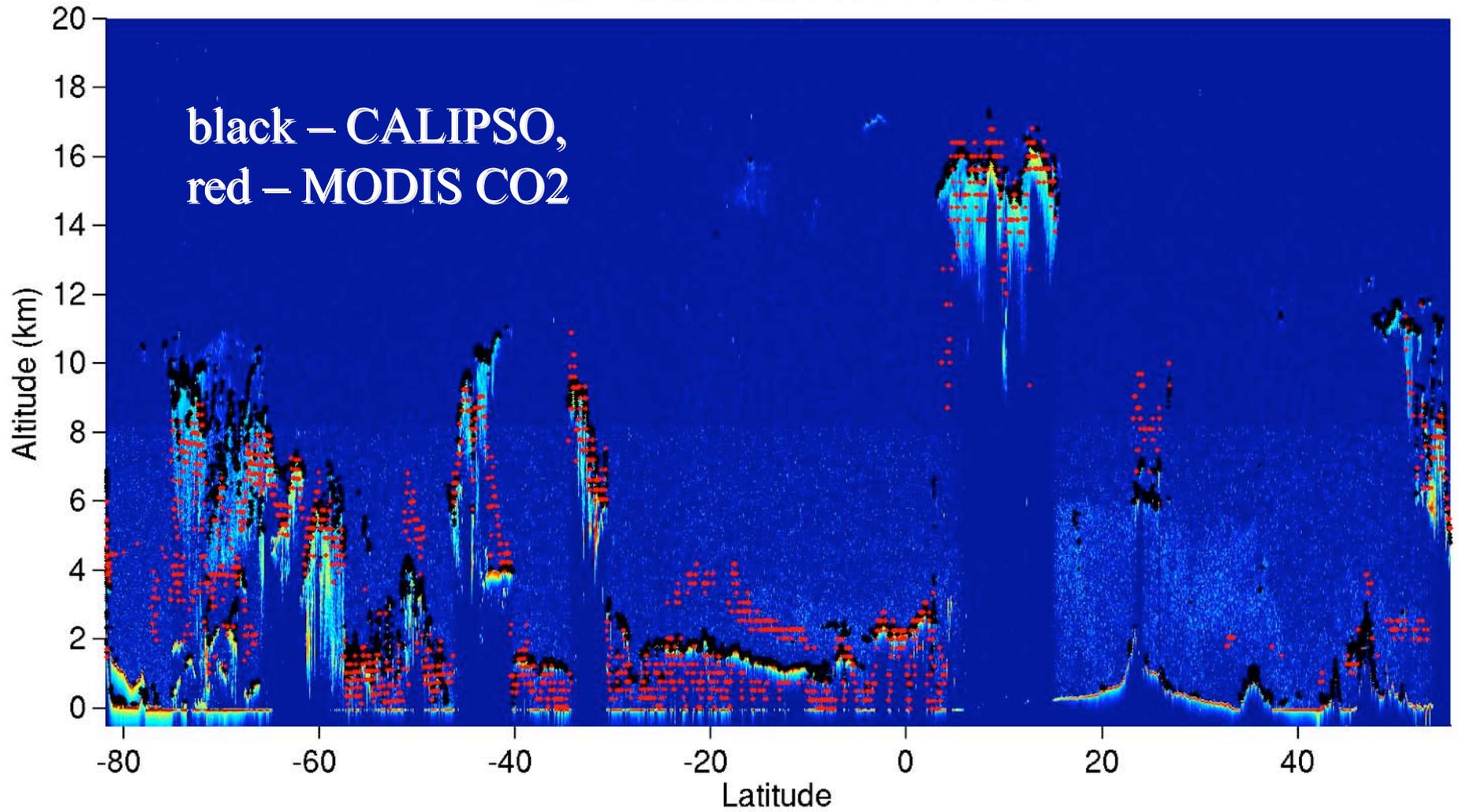
Preparing for CALIPSO and MODIS: CPL and MAS



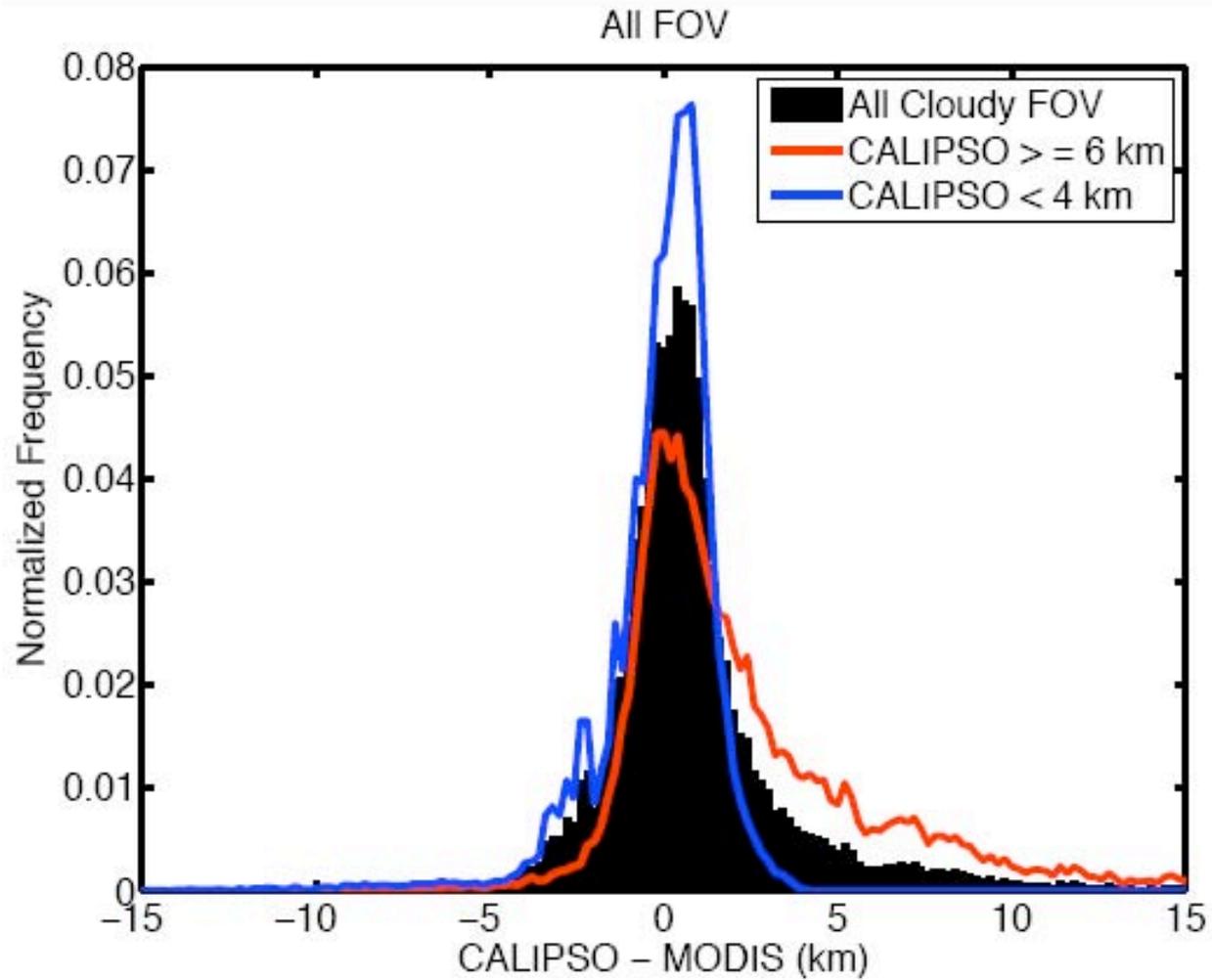
The number of occurrences that MAS scene was identified as clear and the cloud physics lidar (McGill, 2002) detected a cloud optical depths (visible wavelengths). This figure suggests that **the cloud limit is approximately optical depth 0.3**

CALIPSO Backscatter scene

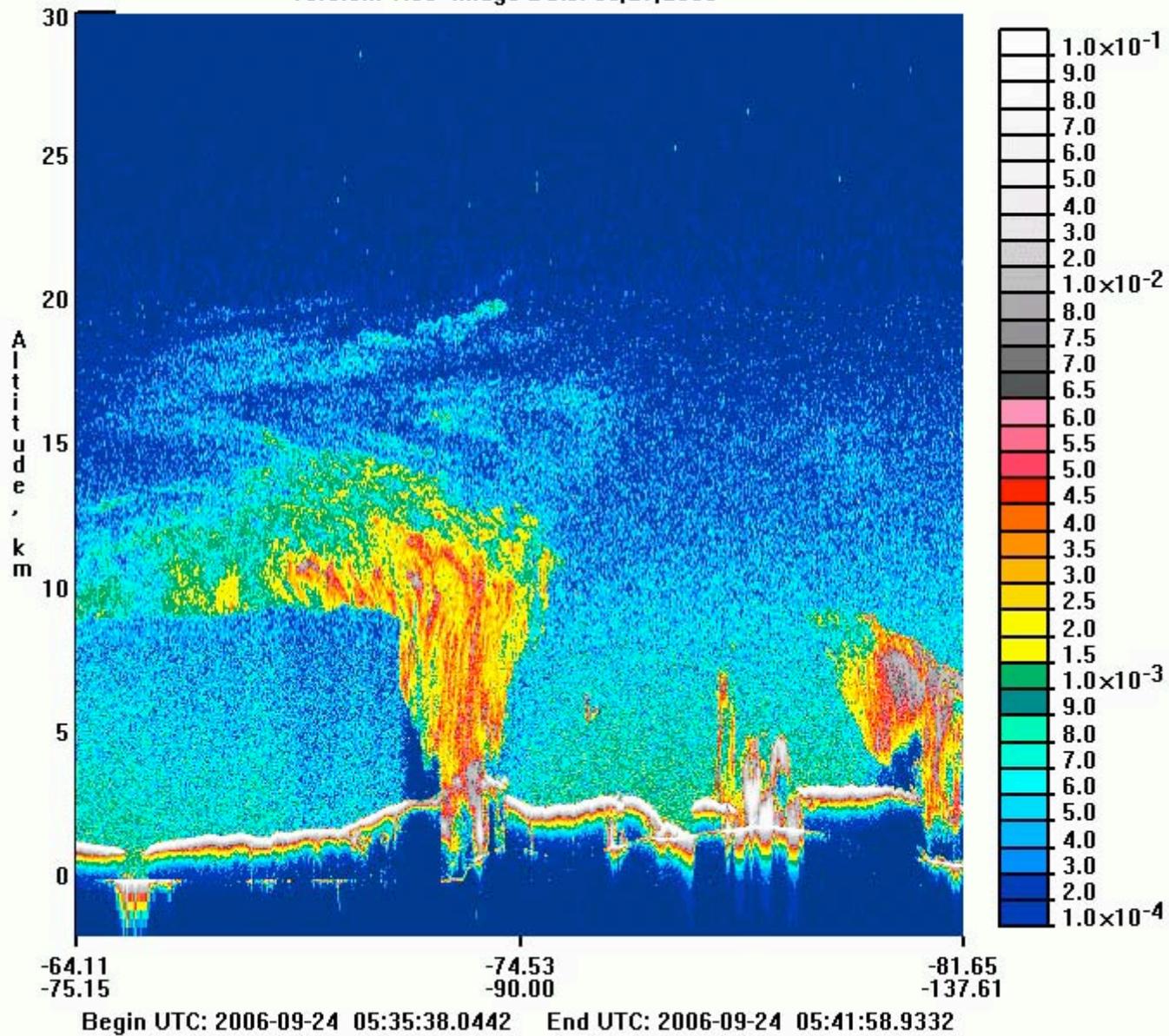
Total Attenuated Backscatter 532 nm

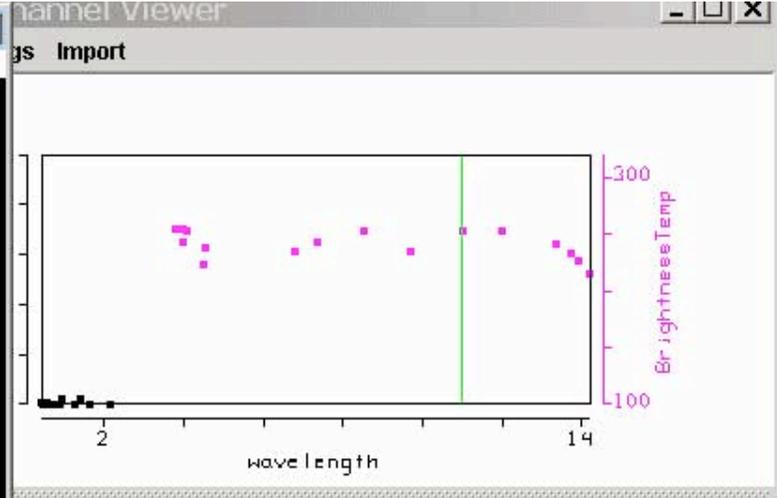
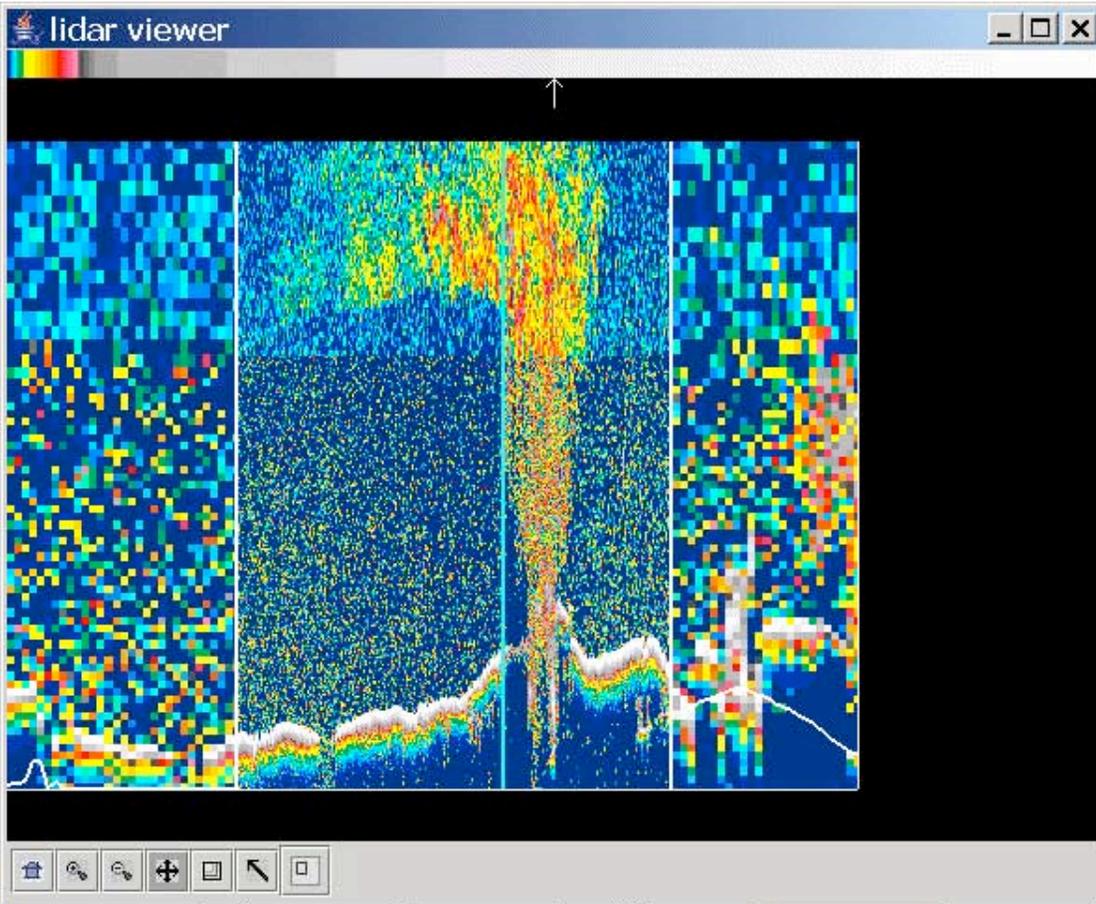


Derived cloud top altitude comparison

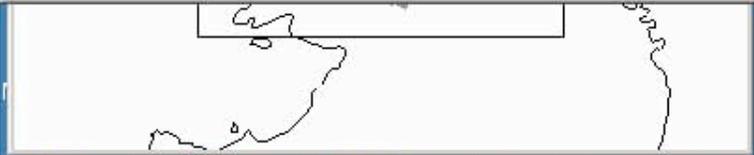
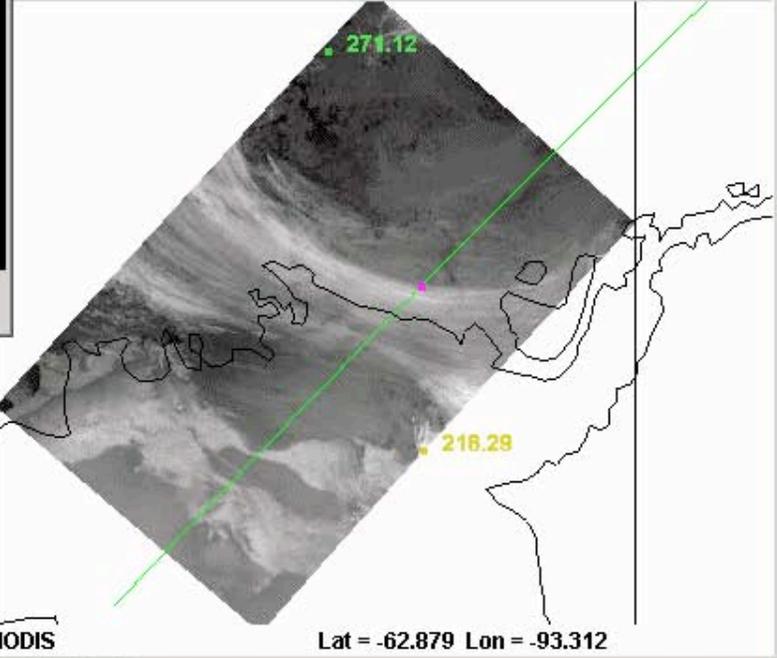


532 nm Total Attenuated Backscatter, /km /sr
Version: 1.08 Image Date: 09/27/2006



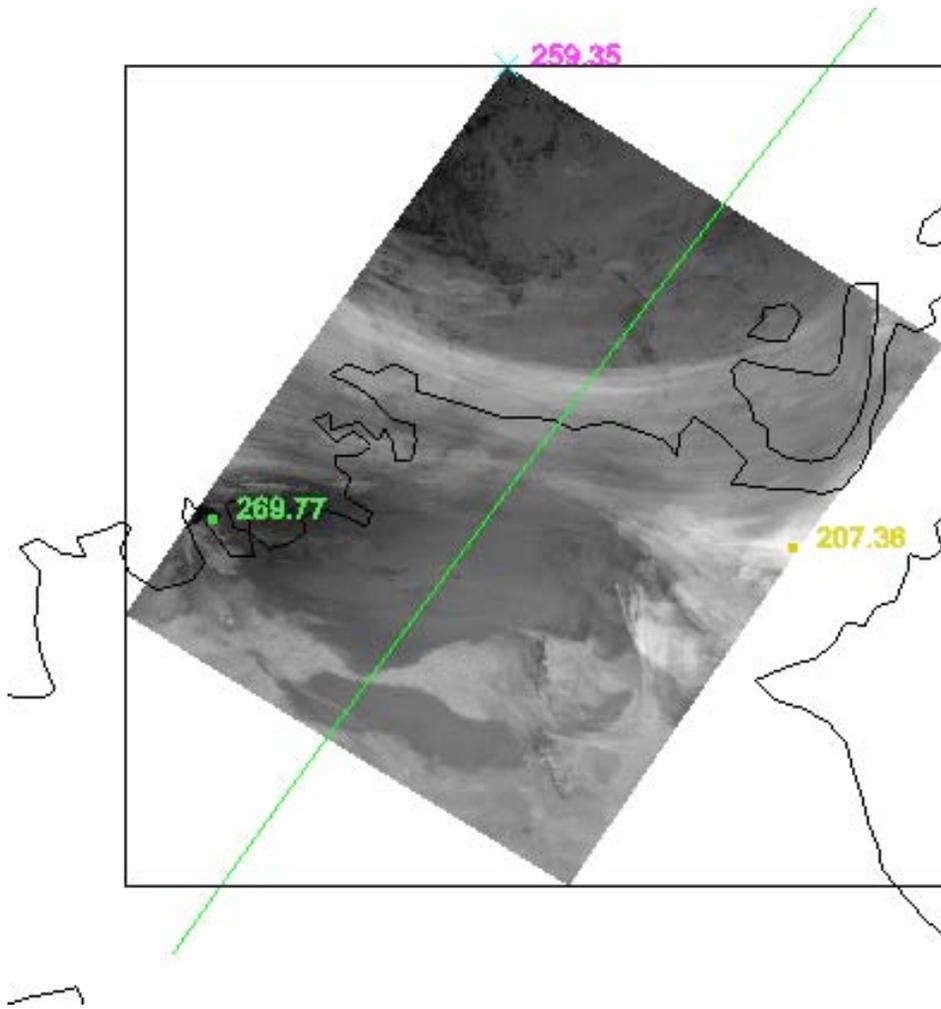


Band: 31 wavelength 11.00 μm



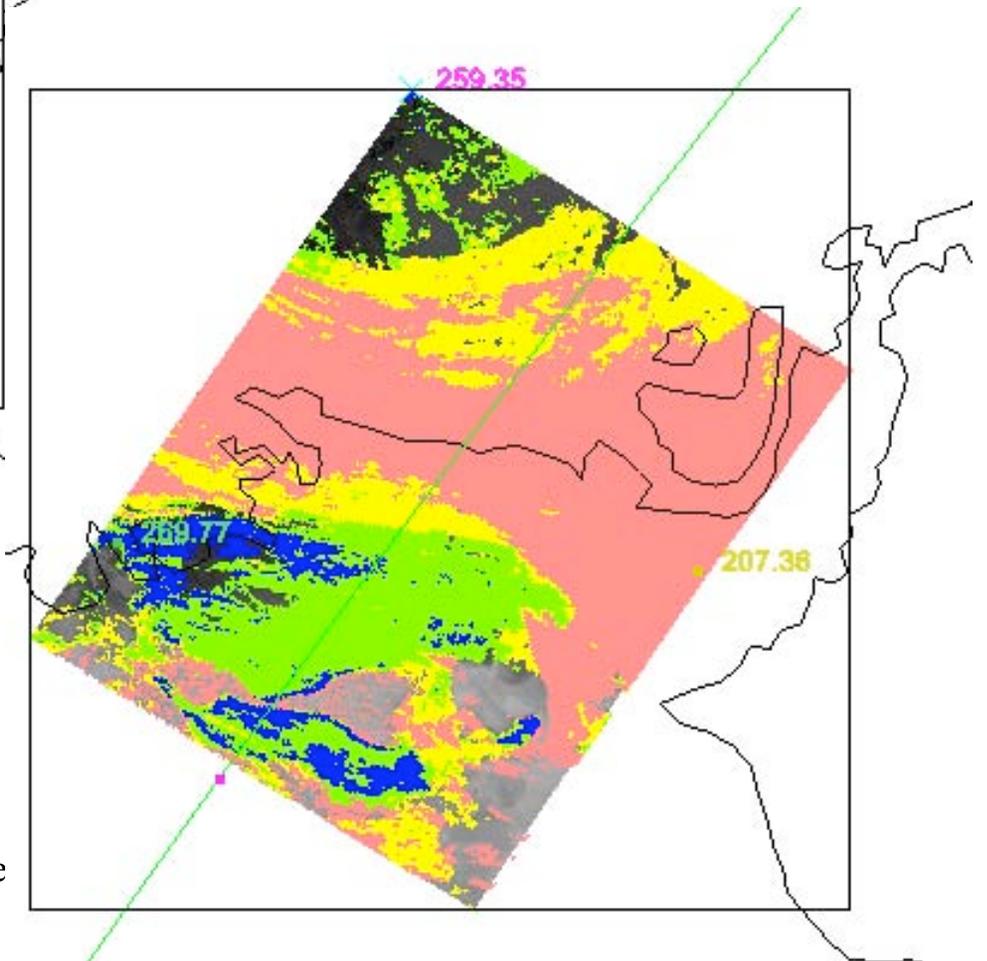
Desktop icons:

- rsync backups
- NoteTab Pro
- SecureCRT 4.0
- Mozilla Firefox
- Palm Desktop
- directions...
- wilma.mov



Cloud masking....

Better than I expected...



MODIS mee

June 15, 2006 day and night , CALISPO CA>0.95

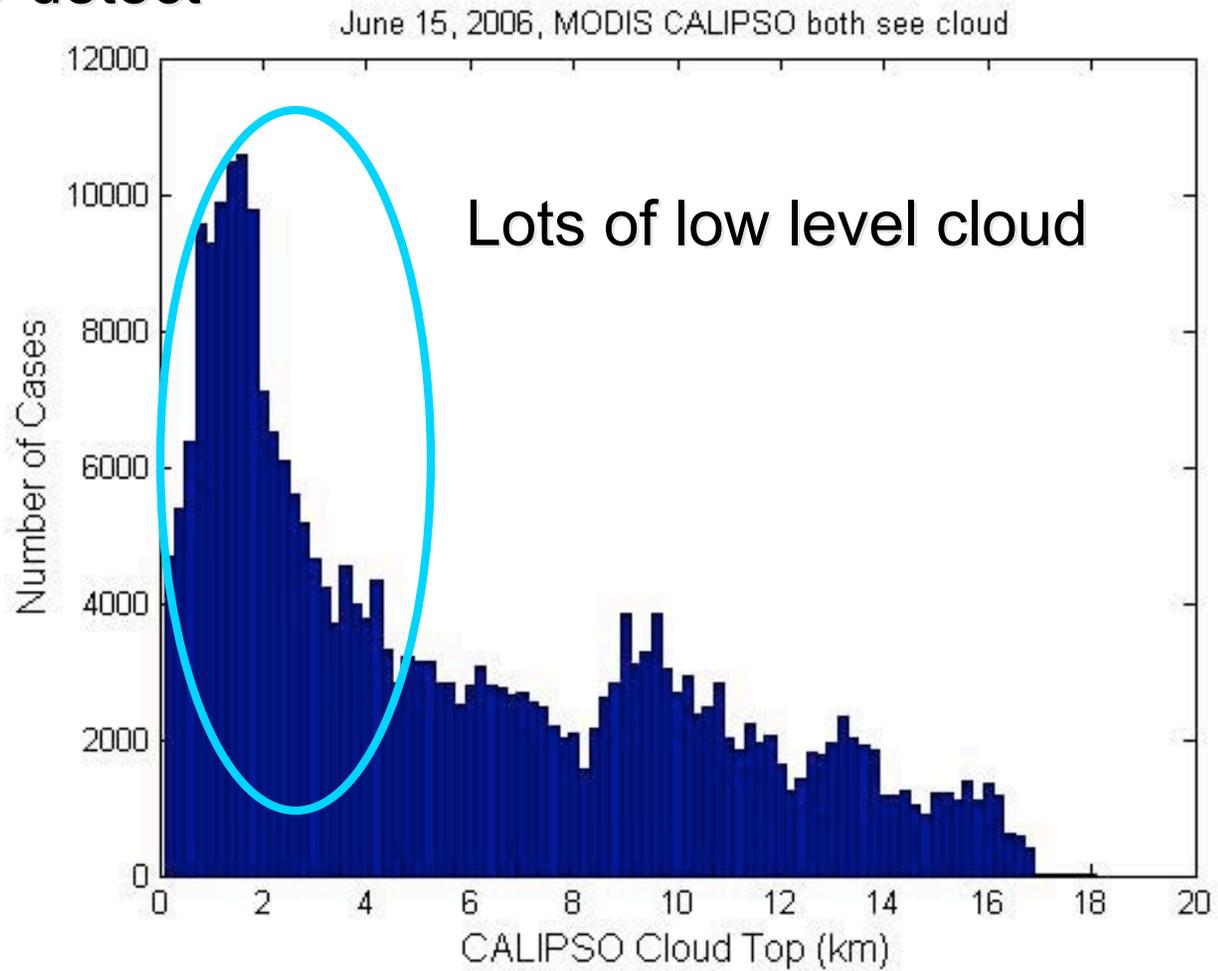
	MODIS CLEAR	MODIS CLOUDY
CALIPSO CLEAR	21.6%	5.3%
CALIPSO CLOUDY	12.8%	60.2%

June 15, 2006 **day only**, CALISPO CA>0.95

	MODIS CLEAR	MODIS CLOUDY
CALIPSO CLEAR	25.4%	7.4%
CALIPSO CLOUDY	10.5%	56.7%

Cloud top altitudes from CALIPSO of collocated scenes on June 15, 2006

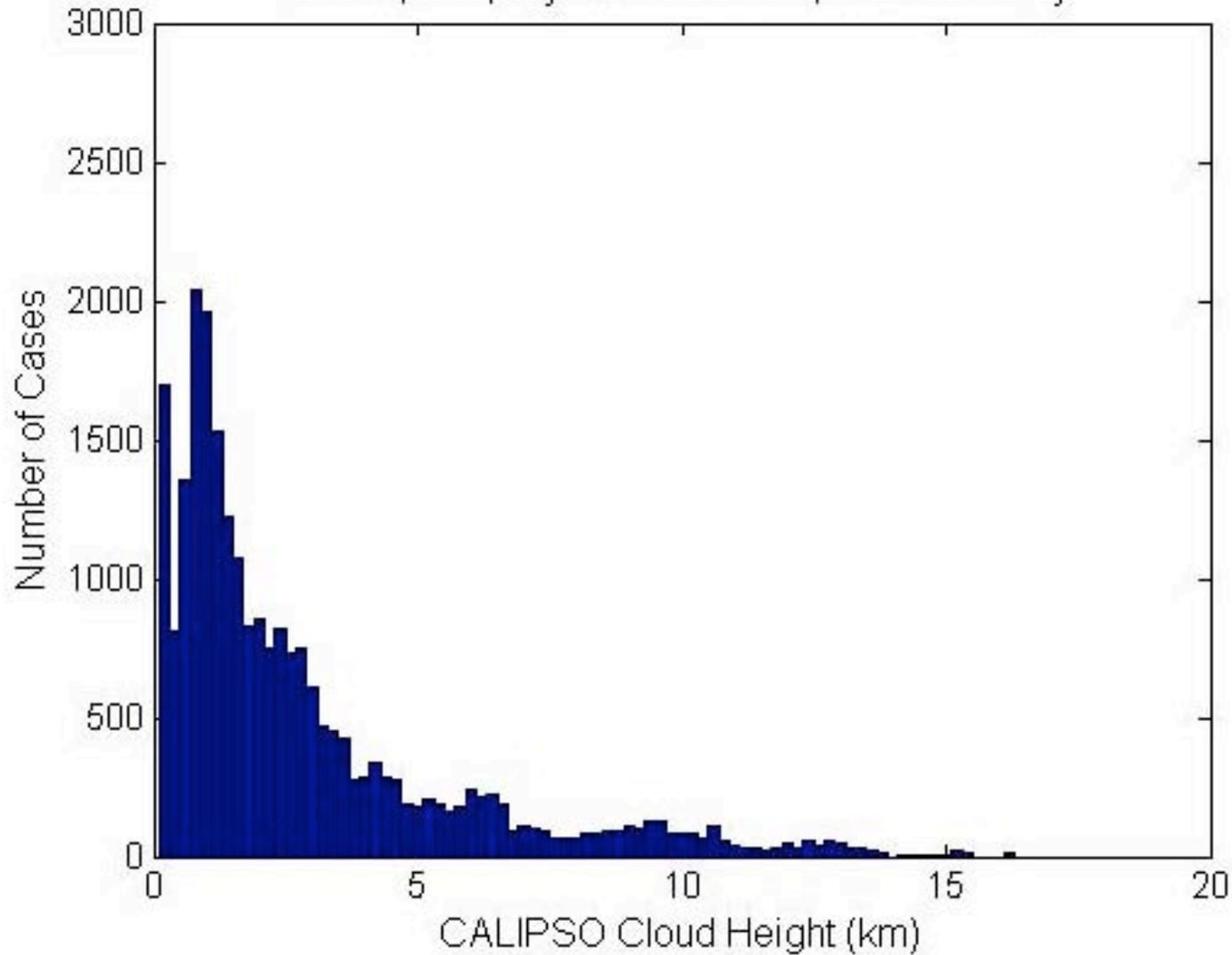
MODIS &
CALIPSO detect
cloud



MODIS clear, CALIPSO cloudy

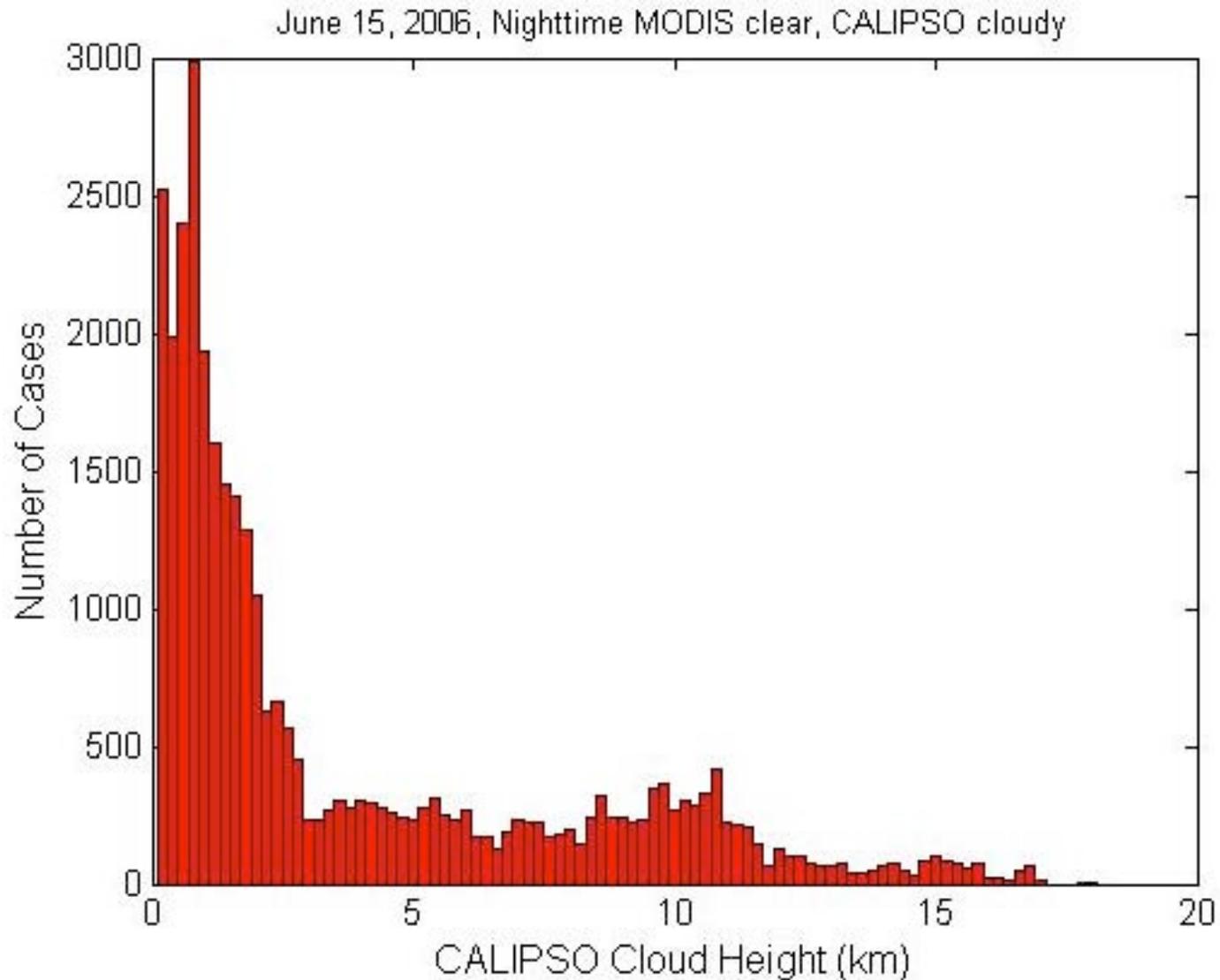
June 15, 2006 day only, CALISPO CA>0.95

June 15, 2006, Daytime MODIS clear, CALIPSO cloudy



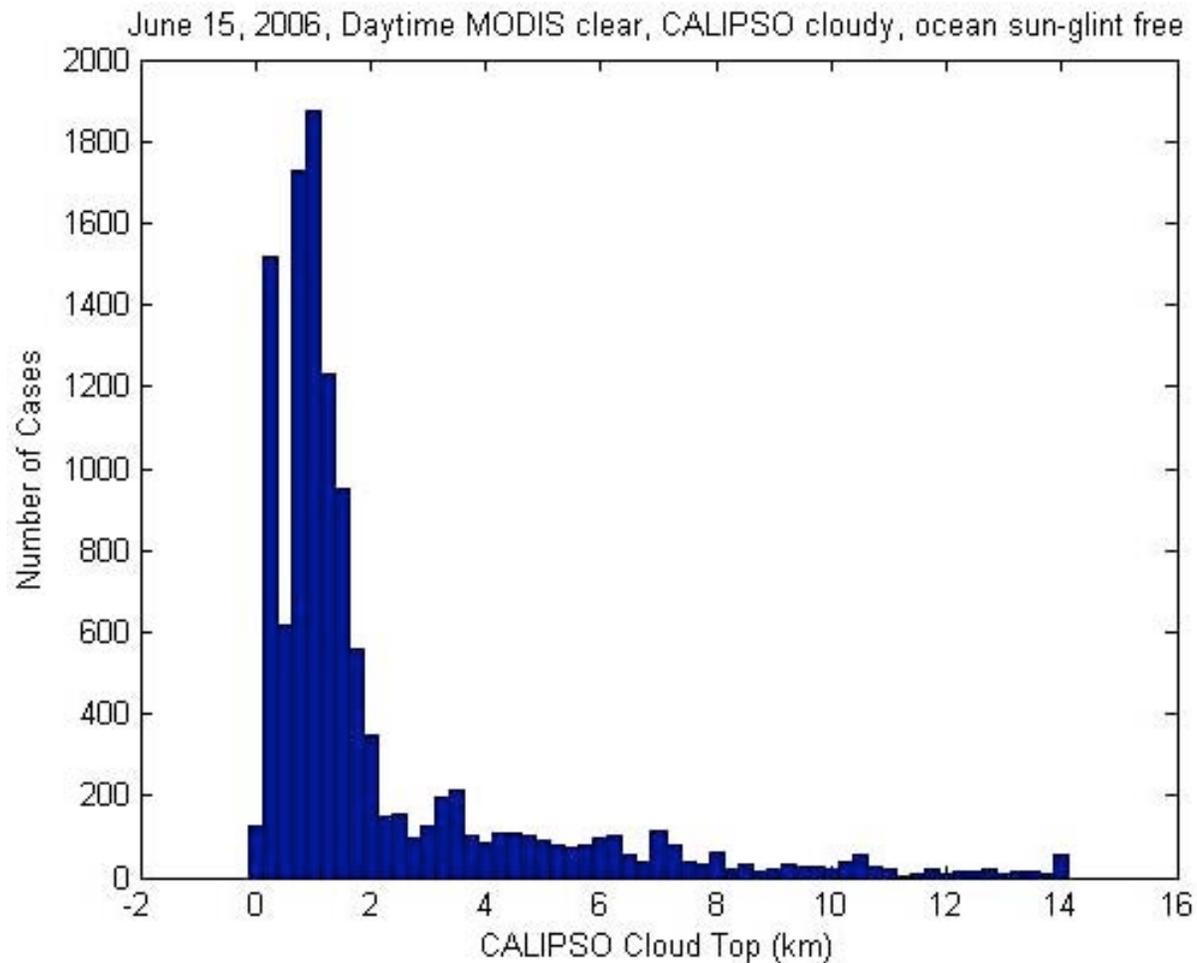
MODIS clear, CALIPSO cloudy

June 15, 2006 non-polar regions, **night only**, CALISPO CA>0.95



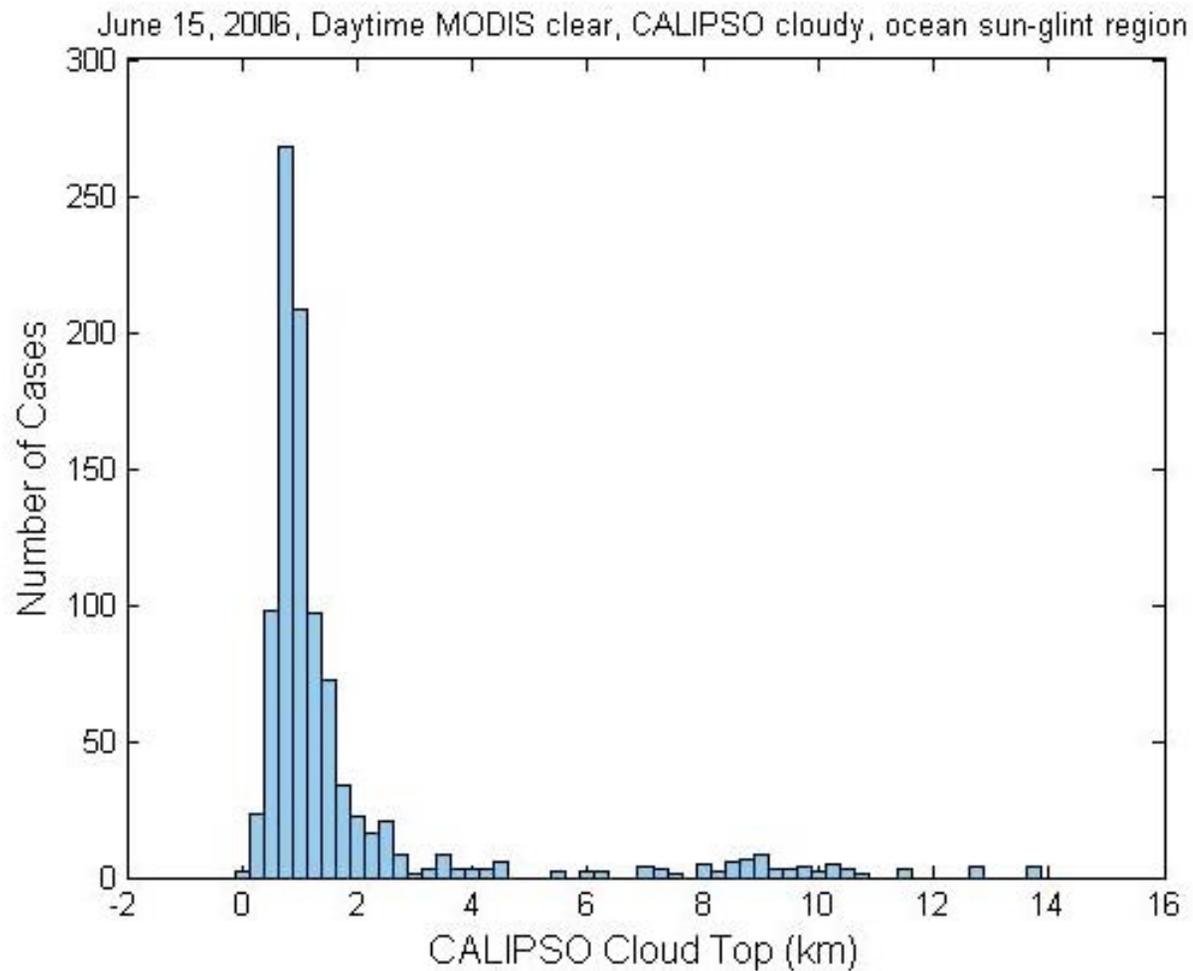
MODIS clear, CALIPSO cloudy

June 15, 2006 daytime, ocean sun-glint free



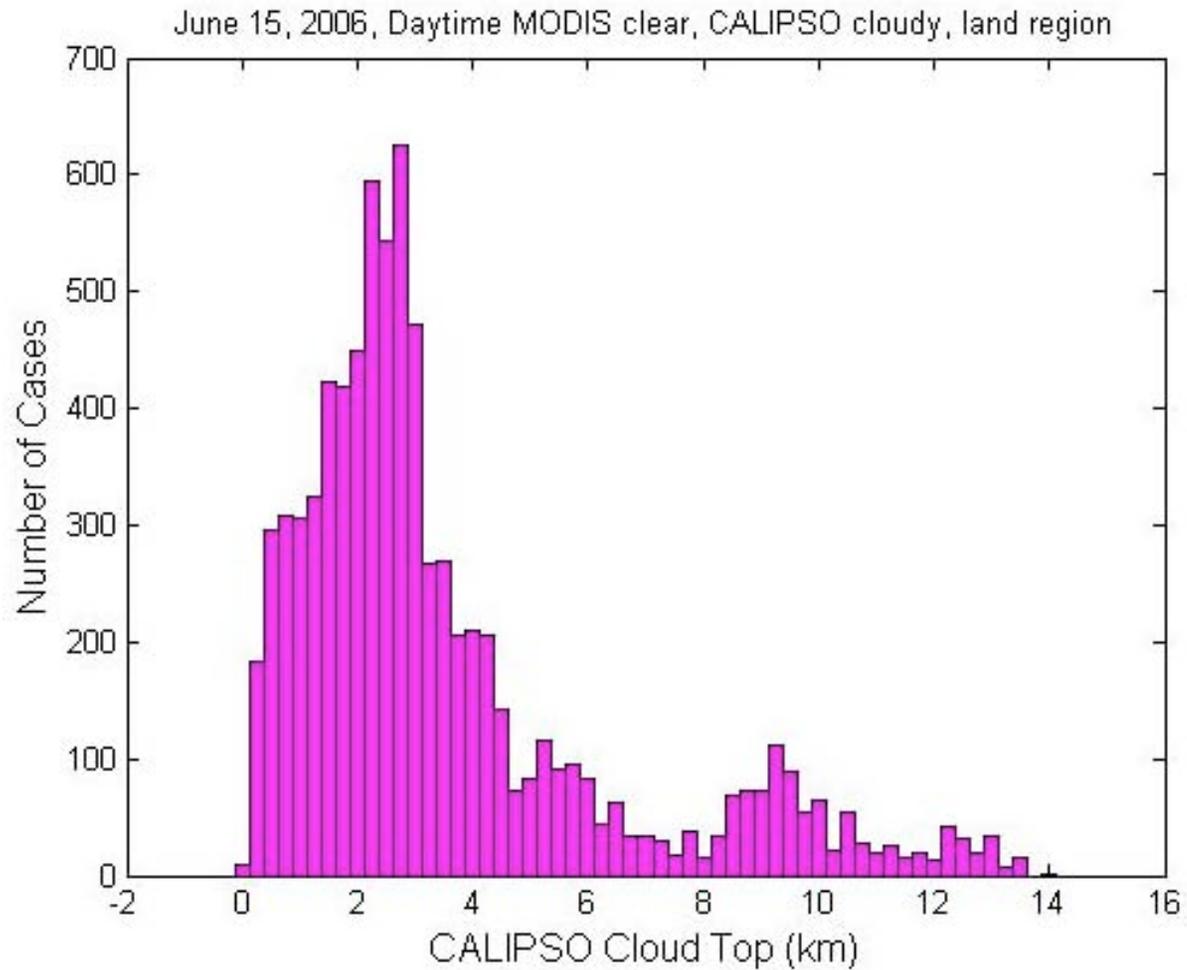
MODIS clear, CALIPSO cloudy

June 15, 2006 daytime, ocean sun-glint region



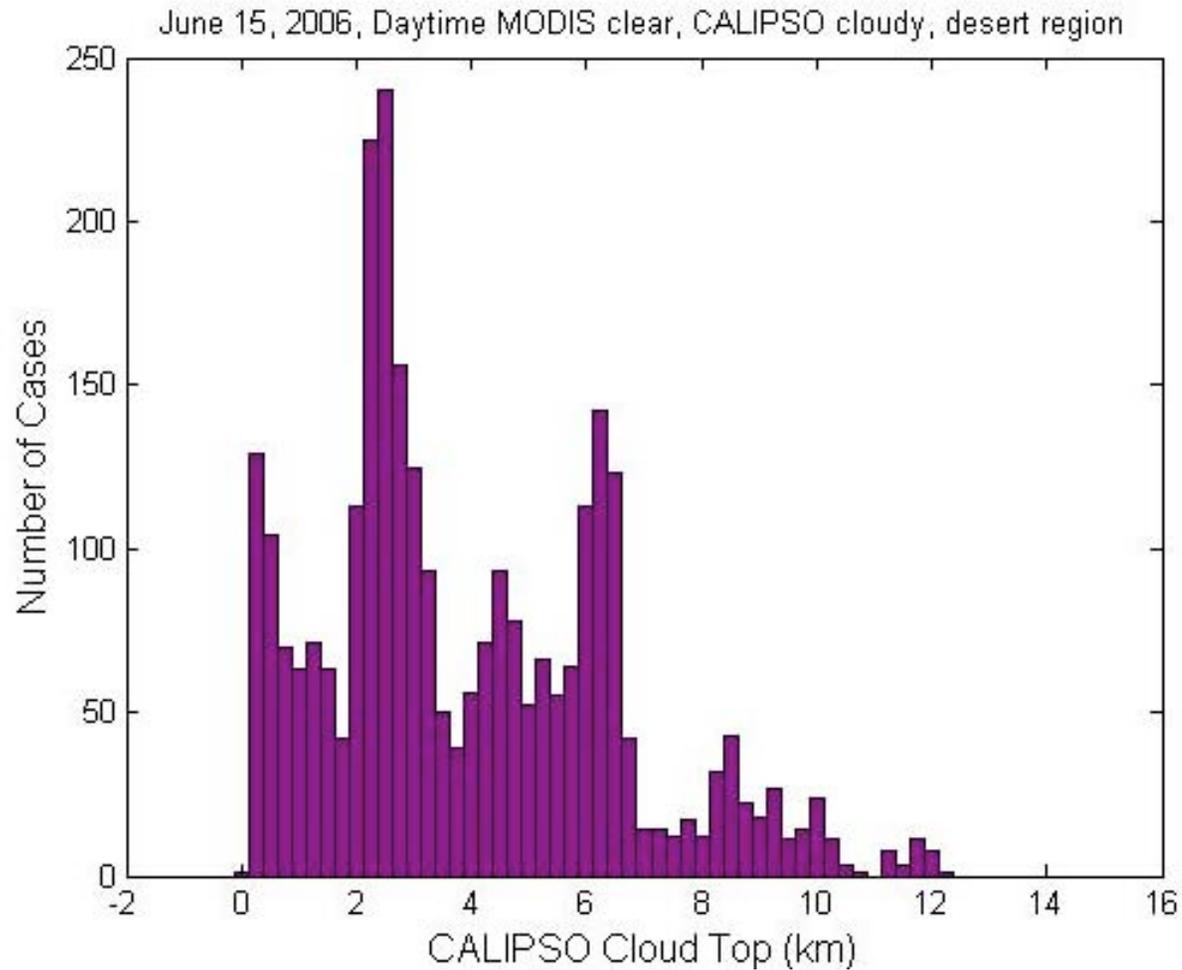
MODIS clear, CALIPSO cloudy

June 15, 2006 daytime, land scenes



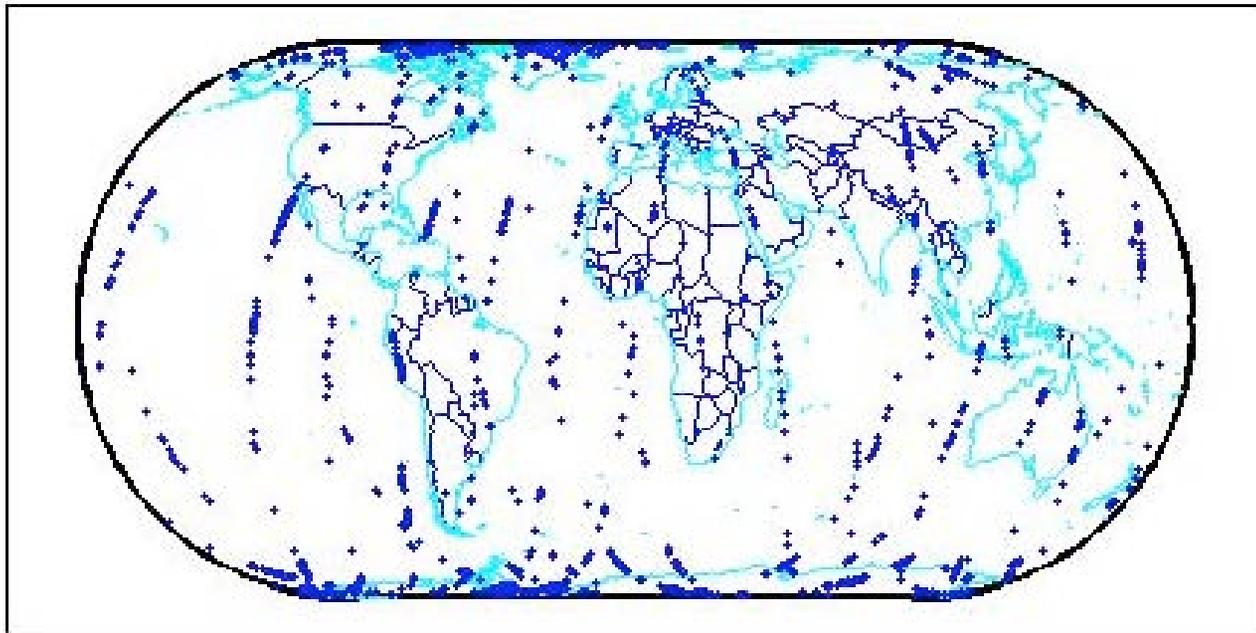
MODIS clear, CALIPSO cloudy

June 15, 2006 daytime, desert scenes



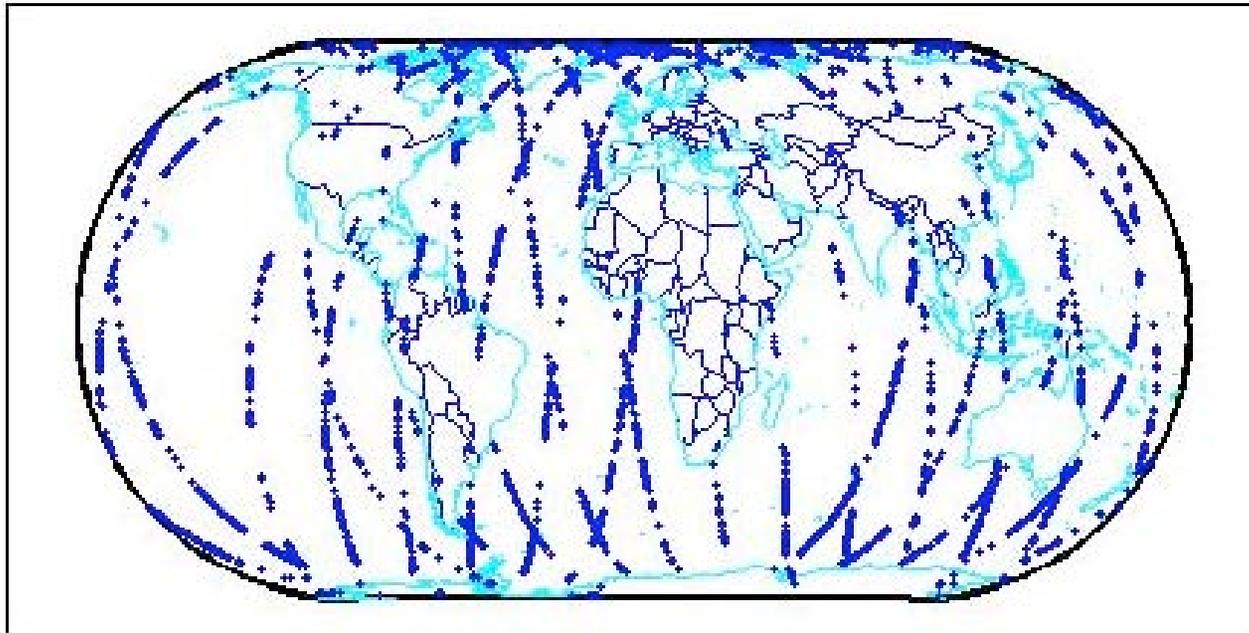
Where are these low clouds when MODIS clear, CALIPSO Cloud?

June 15, MODIS Clear, CALIPSO cloud top < 2 km



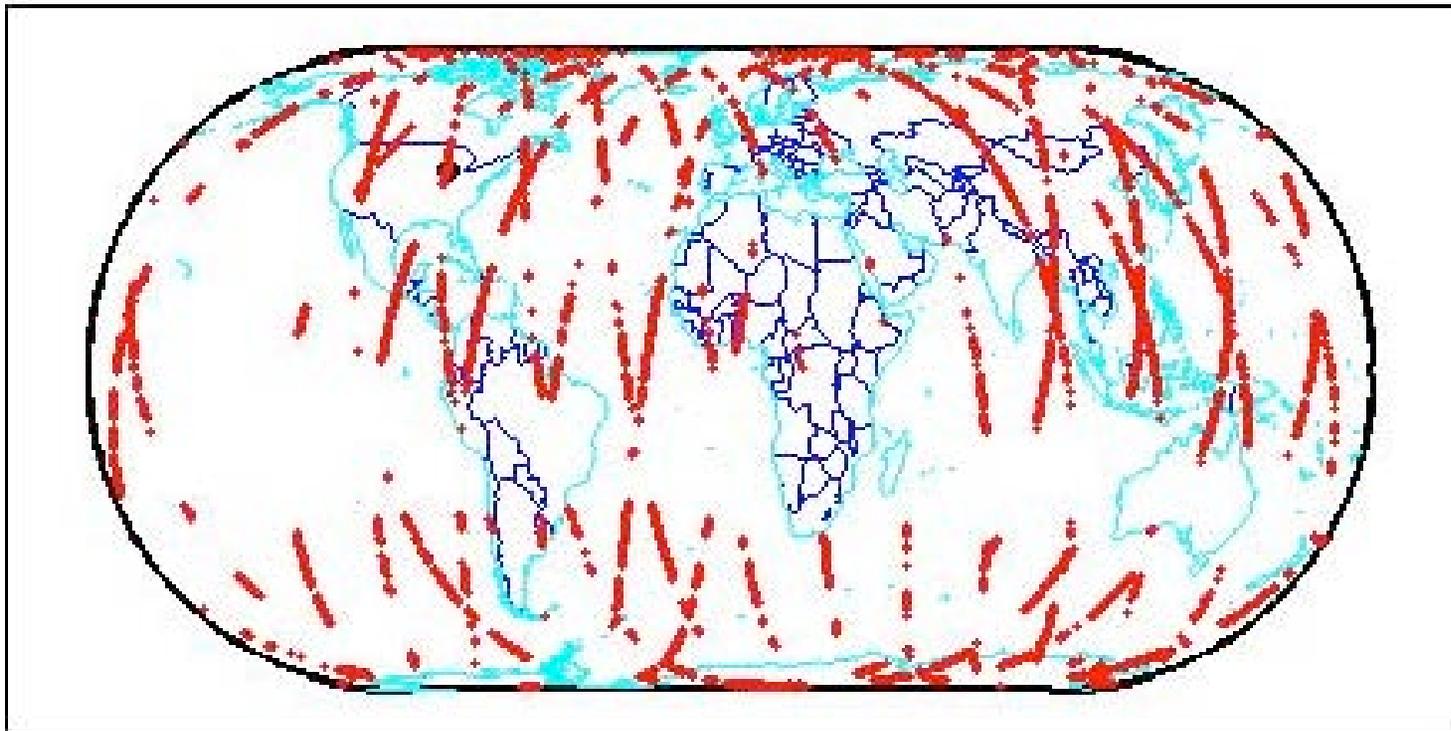
MODIS & CALIPSO see cloud Cloud Altitude Difference < 1.5 km

June 15, differences < 1.5



MODIS & CALIPSO see cloud Cloud Altitude Difference > 5 km

June 15, differences > 5



Summary

- In general, global comparison of CALIPSO and MODIS cloud detection consistent with expectations (~80% agreement).
- Consistency between comparisons ground based and surface based active systems.
- Lots of mis-matches with CALIPSO low-level cloud (MODIS clear, CALIPSO Cloudy).
- CO₂ cloud height biases of cirrus consistent with expectations.
- Preliminary comparisons, we continue to explore differences....