Surface-layer and boundary-layer observations from the VOCALS-REX field program: Preliminary look at observations from the NOAA Ship Ronald H. Brown

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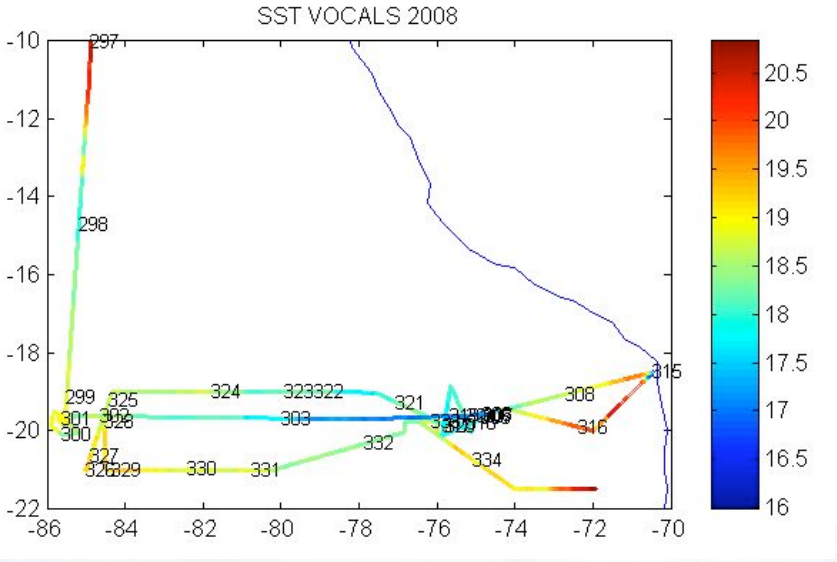
For this study, the Brown fielded one of the most comprehensive sets of observing systems ever assembled on a research vessel. The ship is festooned with 6 seatainer laboratories and all manner of instruments including five meteorological radars, a Doppler Lidar, four different ocean profiling systems, and a variety of chemical, aerosol, and biological measurements. Some 40 scientists have participated in two deployment legs. The science party includes representatives from three NOAA labs, 13 Universities, and three research laboratories in Chile and Peru.

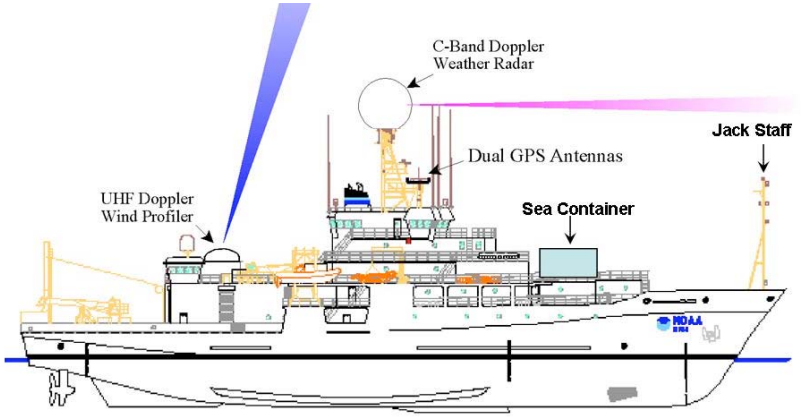
***Two cruise legs, 24 days each.**

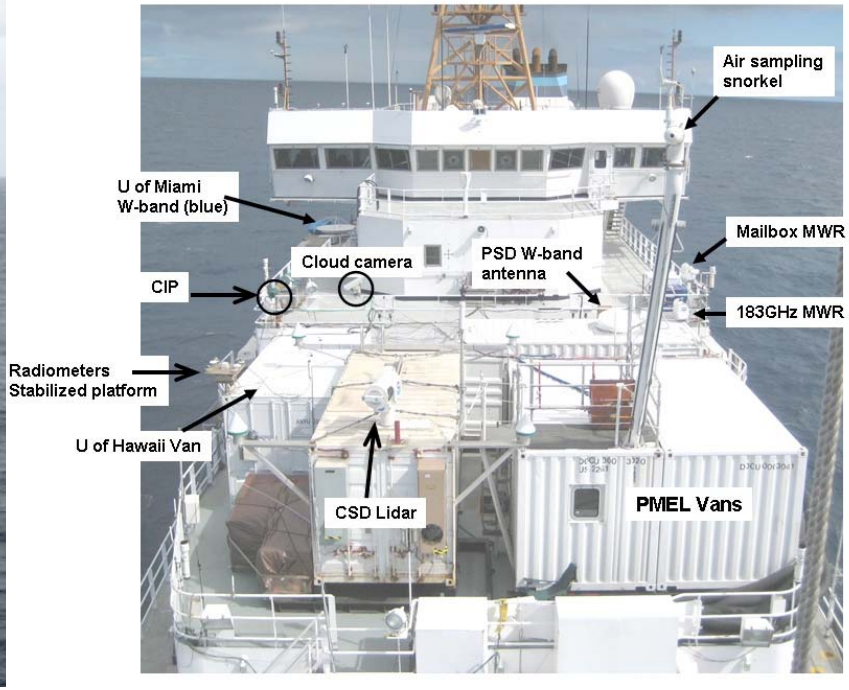
***Operated mostly West of the Chile-Peru border**

***Stratocumulus clouds, coastal upwelling, steady trade winds**

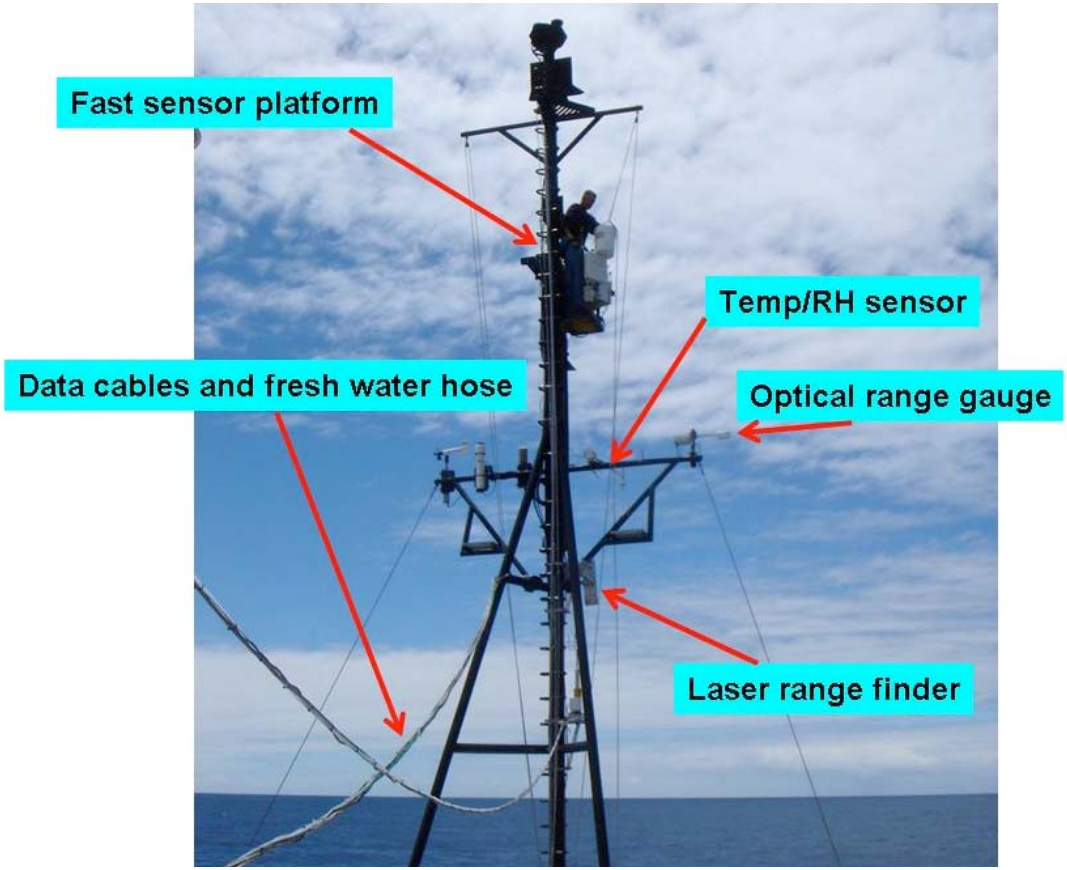
VOCALS2008 Cruise: NOAA Ship Ronald H. Brown

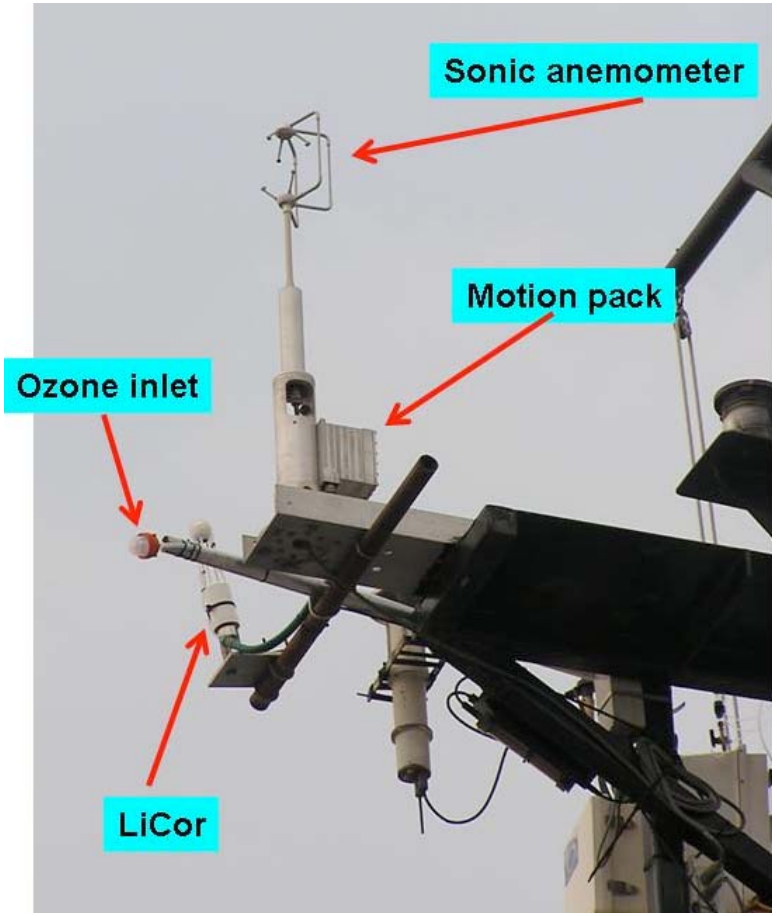




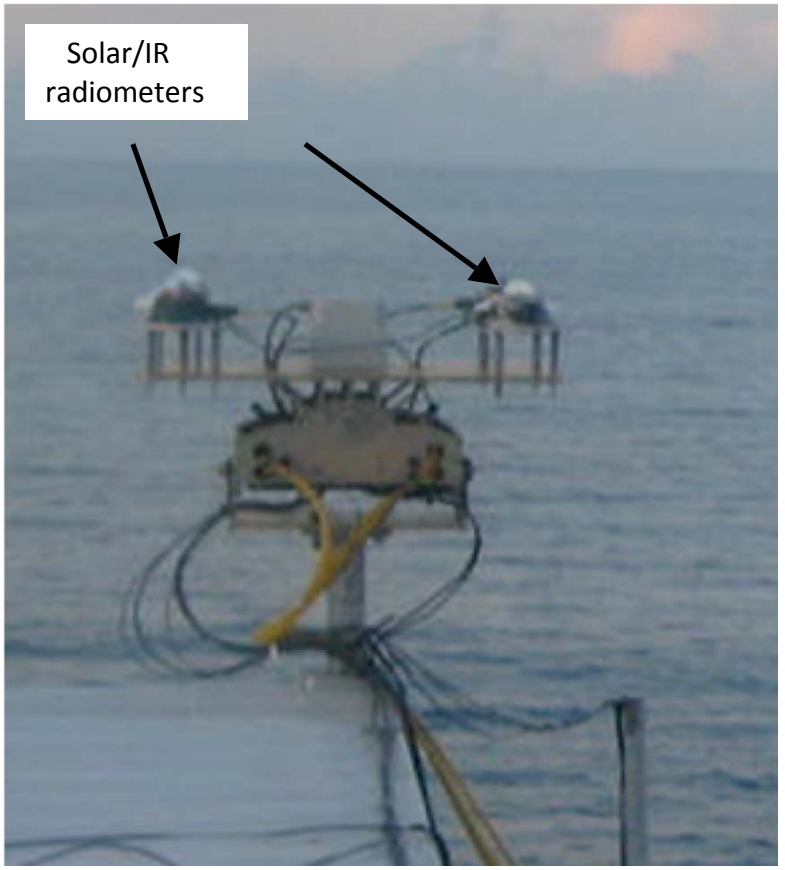


Flux Sensors on the Jackstaff

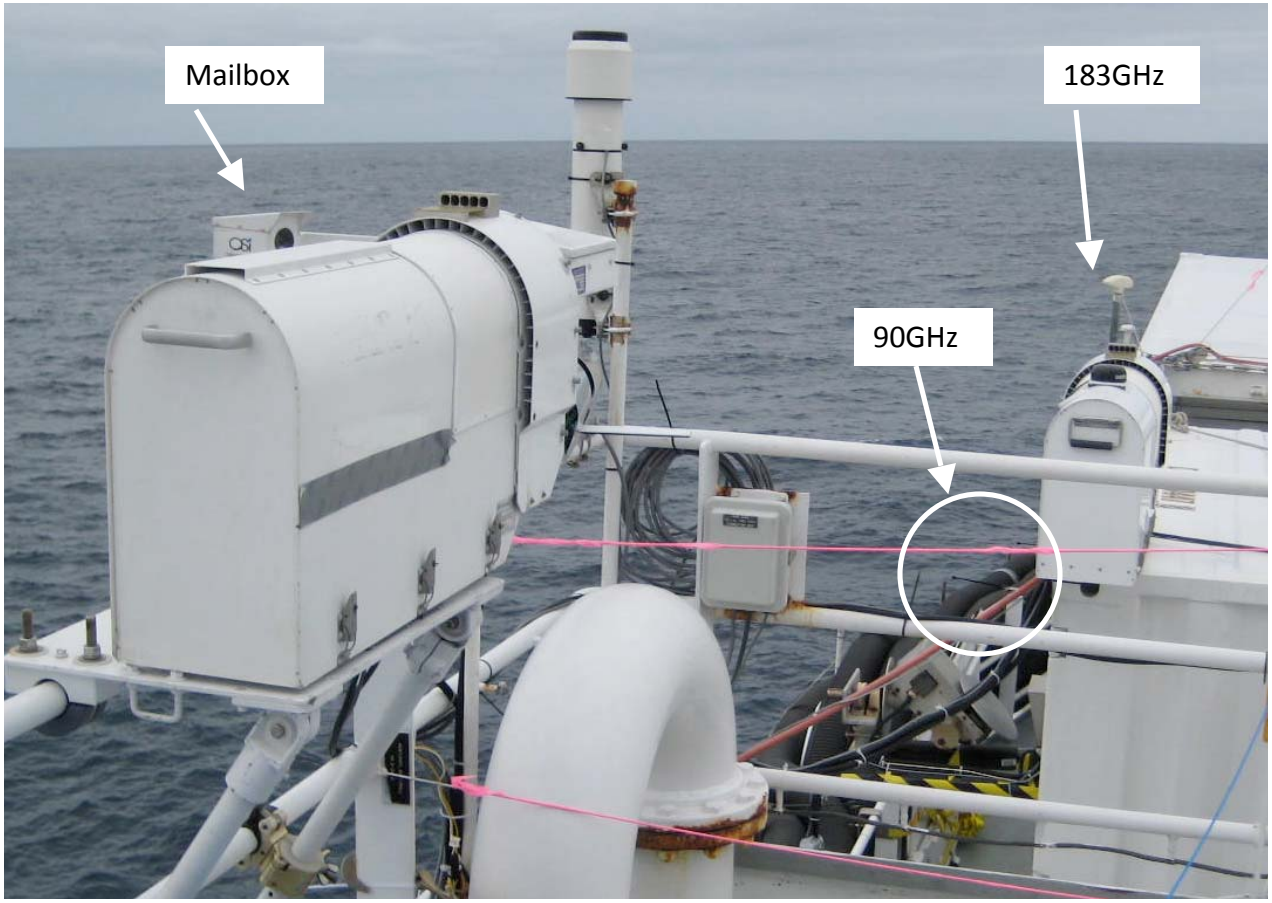




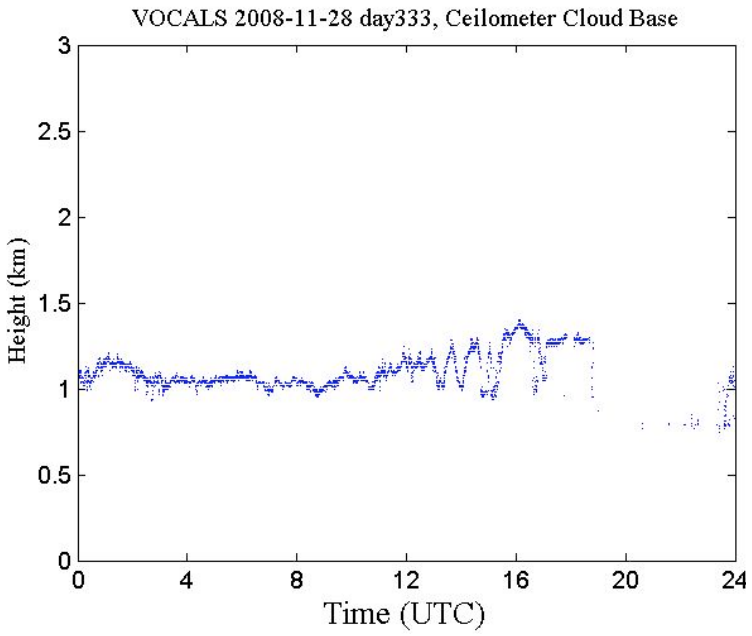
Motion Stabilized Sensors



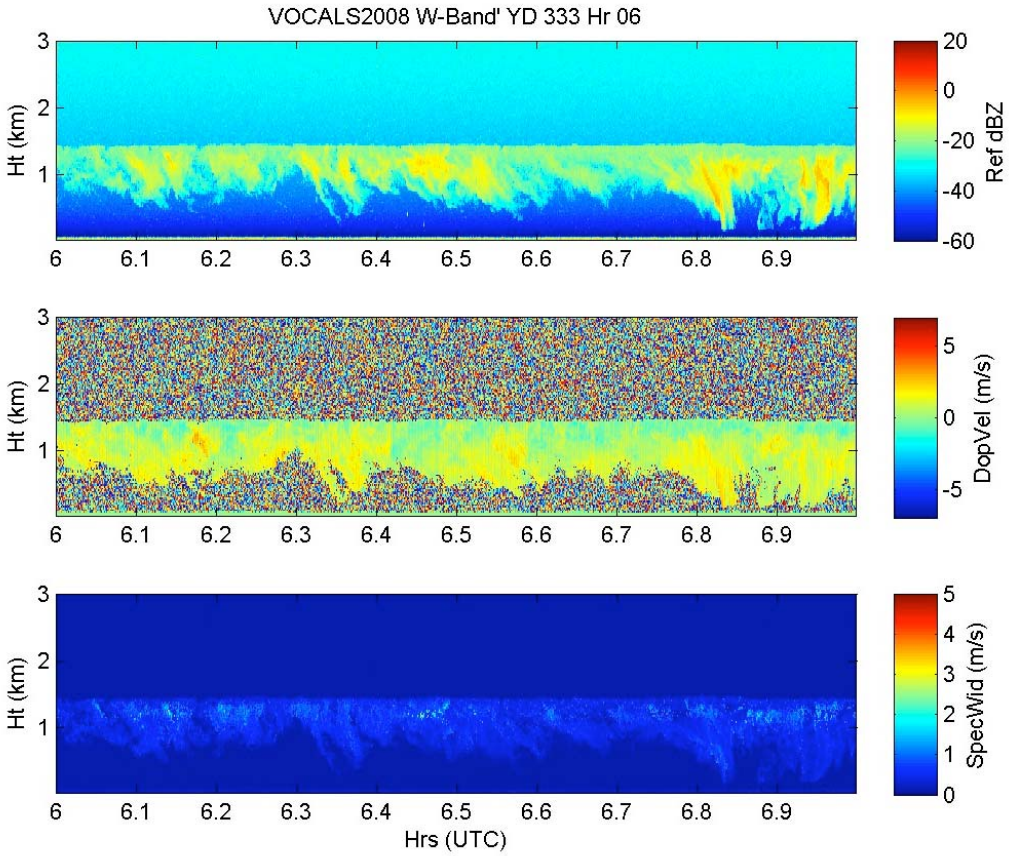
Microwave Radiometers for Water Vapor/Liquid and Temperature
University Miami and NOAA/ESRL/PSD



Cloud Views

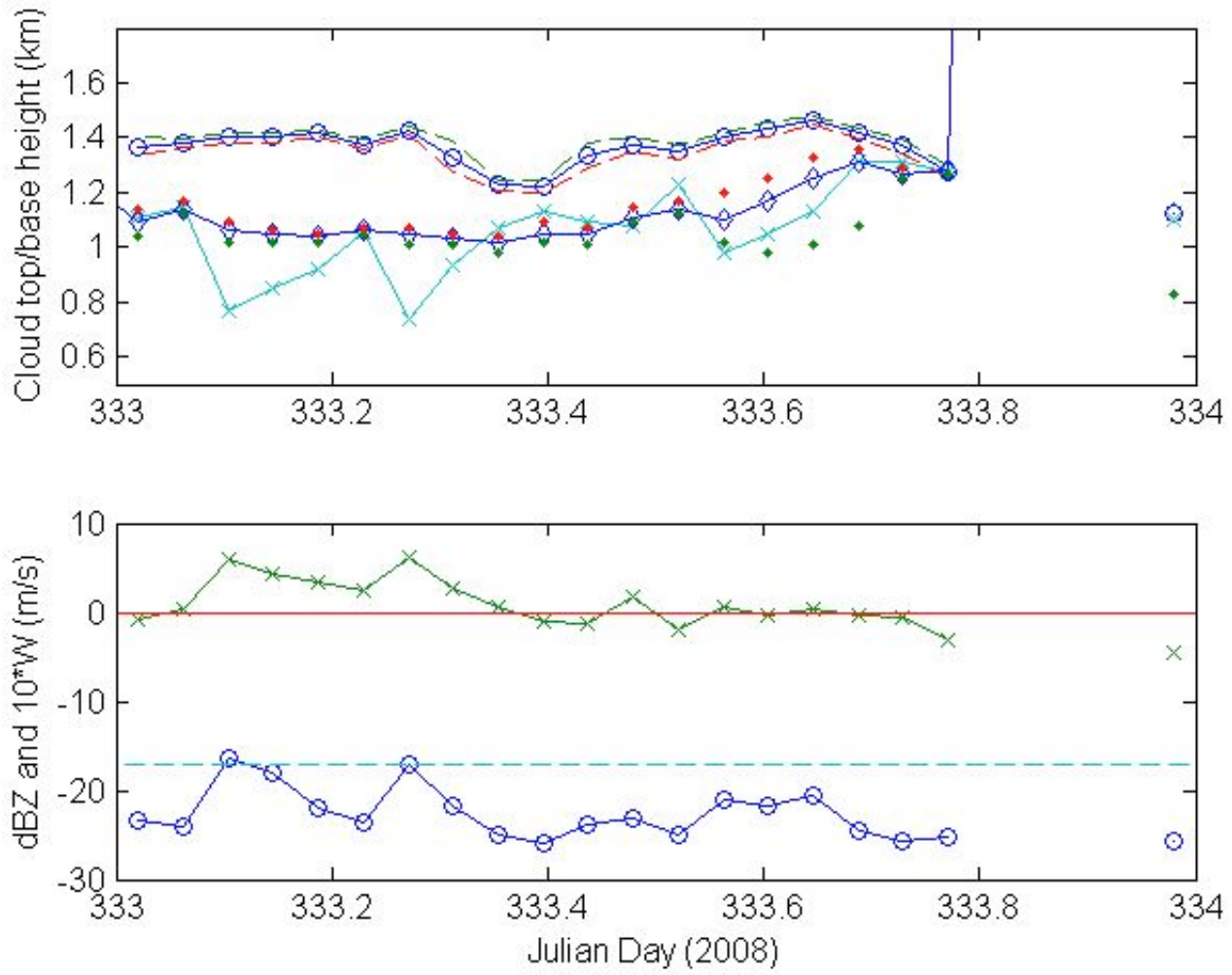


Time series of ceilometer cloudbase height for November 28.



Time-height cross section from **1 hour** of data beginning at 0500 on Nov. 28 from ESRL/PSD W-band cloud radar. The top panel is the radar reflectivity (dBZ); the middle panel is the mean Doppler velocity (m/s, positive down); the bottom panel is the Doppler width (m/s) of the return.

Combined Ceilometer – Cloud Radar



Time series of cloud properties for November 28, 2008. Upper panel: cloud top height (circle with solid line; ±1 standard deviation, dashed line) and cloud base height (diamonds with solid line; 1 standard deviation, dots). Lower panel: mean radar backscatter for the cloud/drizzle layer (circle with solid line) and mean droplet fall speed (x's with solid line) multiplied by 10 (in m/s).

Short Term Processing

- Compute direct covariance turbulent fluxes
  - Second pass on all variable corrections
- W-band radar ship motion corrections
- Reprocesses Microwave LWP retrievals (PZ)
- W-band radar microphysical retrievals
- Combined radar, ceilometer, microwave set

VOCALS data to soon appear at **ftp://ftp.etl.noaa.gov/et6/cruises/**

Direct/bulk fluxes from the 2008 VOCALS Cruise – Version 1

PSD Air-Sea Interaction Group
C. Fairall and Ludovic Bariteau
June 27, 2009

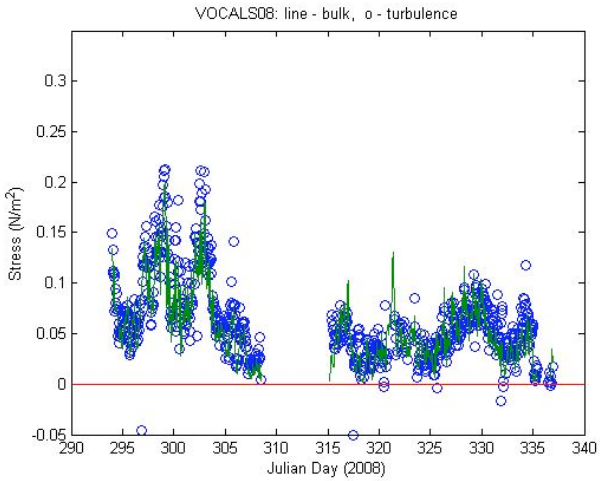
This document is the Readme for *VOCALS08flux_hr.txt* and *VOCALS08flux_10.txt* files. The files contain observations of mean meteorology, turbulent and radiative fluxes, and navigational information. The *_hr* refers to hourly averages and the *_10* to 10-minute averages. There is a version with a '*_nodh*' designator which has no headings to allow simple loading in MATLAB. Bulk, direct (covariance) and inertial-dissipation (ID) turbulent flux calculations are included in this present data. The period covered is JD 294 (20 Oct 2008) through JD 336 (1 Dec 2008). The graph below gives the flux time series for the data period.

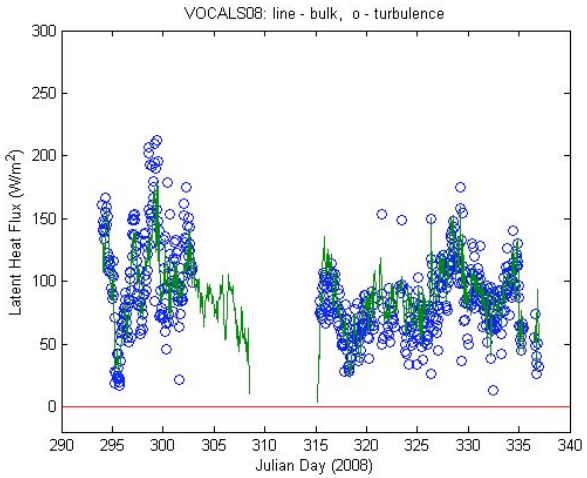
*Calibration checks for PSD air temperature, humidity, wind speed, and direction

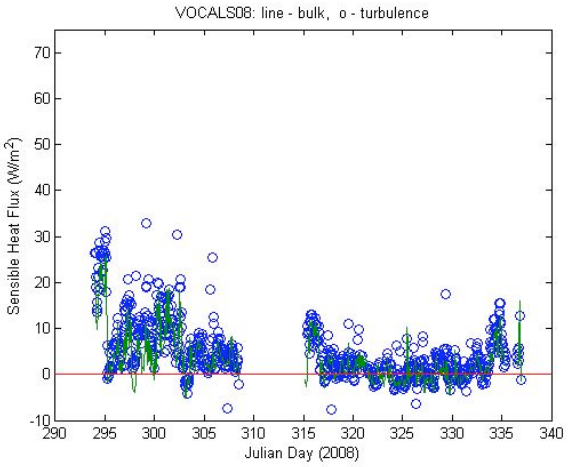
*Some accuracy issues with Ron Brown (SCS) met data.

*Quality control criteria applied to turbulent fluxes (1-hr cleanest)

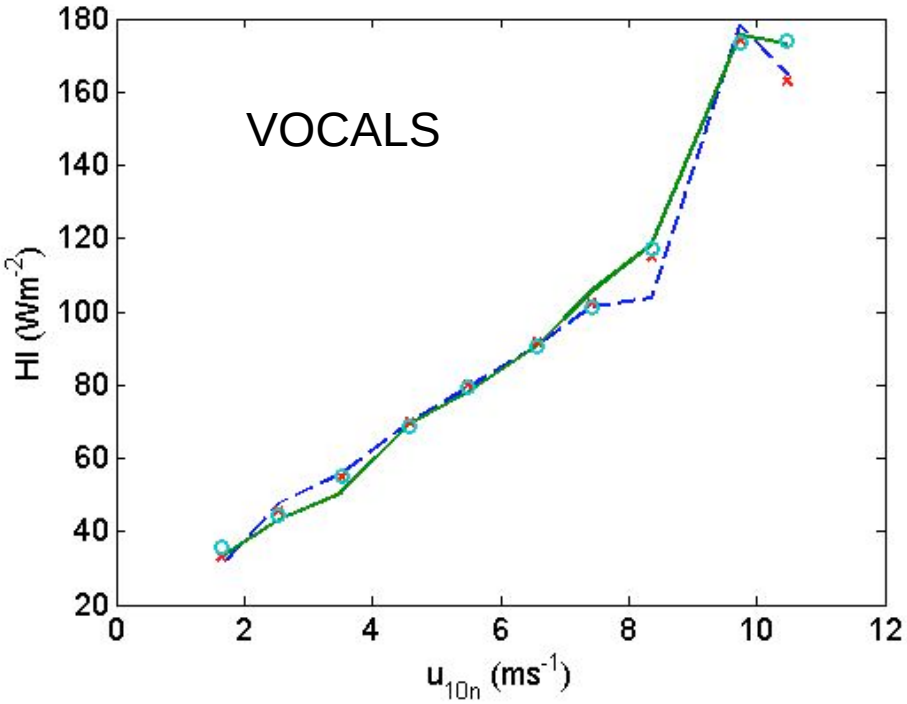
*ftp://ftp.etl.noaa.gov/et6/cruises/VOCALS_2008/RHB/flux/Processed/Post-processed_flux_files_1Jul09/

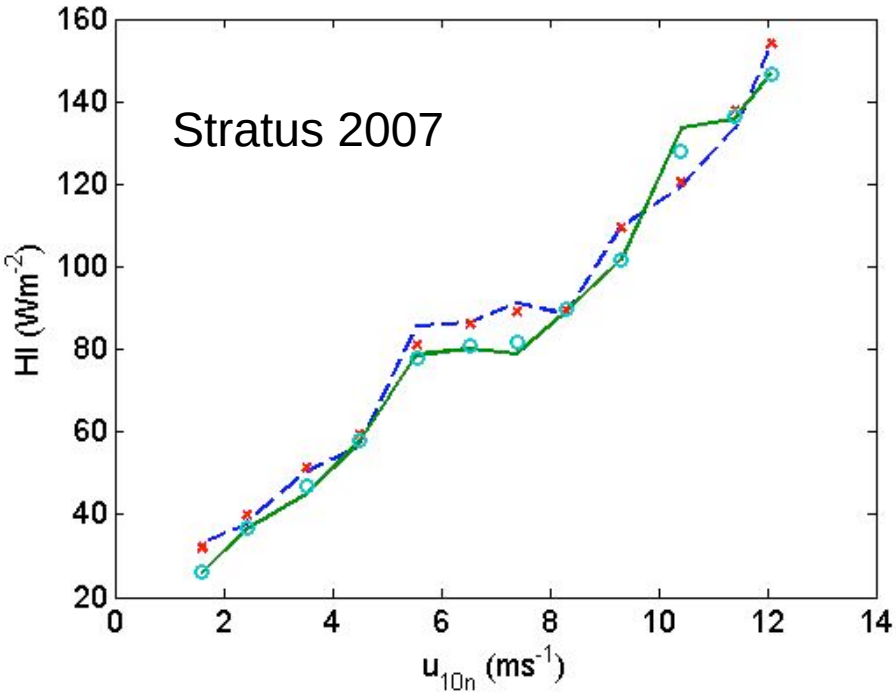






Working on Intercomparisons of Fluxes and Context of VOCALS within the 2001-2007 Climatology





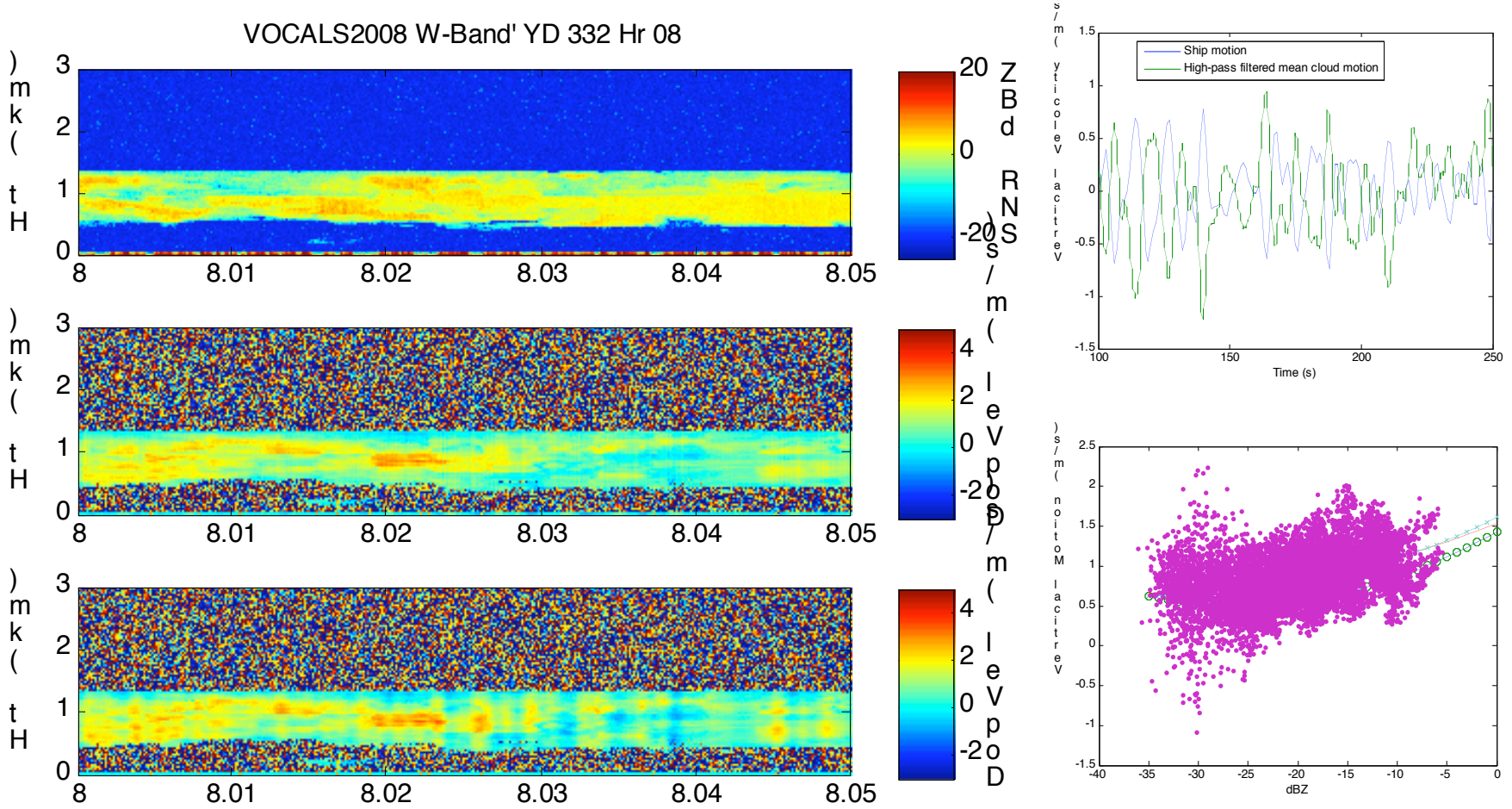
Latent heat fluxes averaged in 10-m neutral wind speed bins: COARE3.0 (dashed line – median; x – mean) and Direct Measurements (solid line – median; circle – mean). Left panel is VOCALS and right panel is Stratus2007.

PSD Wband Cloud Radar from the 2008 VOCALS Cruise – Version 1

PSD Air-Sea Interaction Group
C. Fairall June 27, 2009

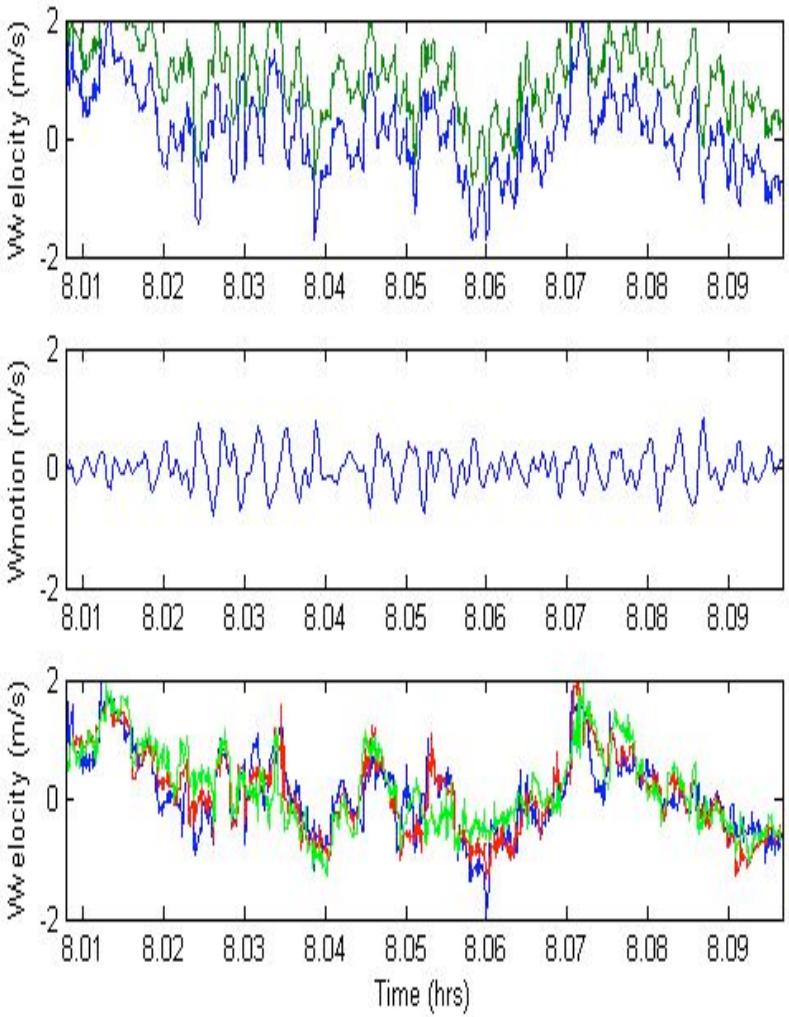
- Raw data at ftp://ftp.etl.noaa.gov/et6/cruises/VOCALS_2008/RHB/radar/wband/
  - Radar dBZ, vertical Doppler, Doppler width, motion files
- Some read/plot programs at ftp://ftp.etl.noaa.gov/et6/cruises/VOCALS_2008/RHB/radar/wband/Processed/Matlab/
- Needed corrections:
  - Absolute dBZ correction, platform motion, some quality control (e.g., pitch/roll motion correction not working)
  - A new set of files will be written with these corrections included
- Will process data to produce cloud top ht, thickness, profiles of dBZ, etc.
- LegI ran without preamp – greatly reduced sensitivity. Not really a cloud radar.

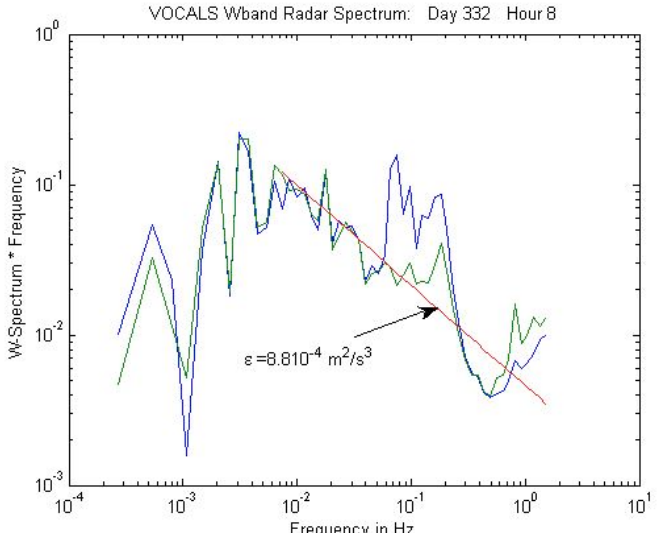
Wband Radar Velocities

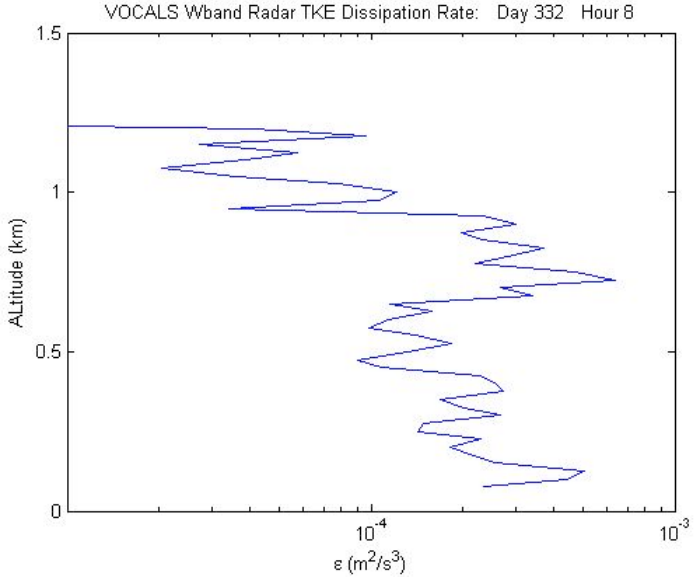


Velocity Profile Information

$$W_{air} = W_{meas} - W_{Gravity}(dBZ) - W_{mot}$$

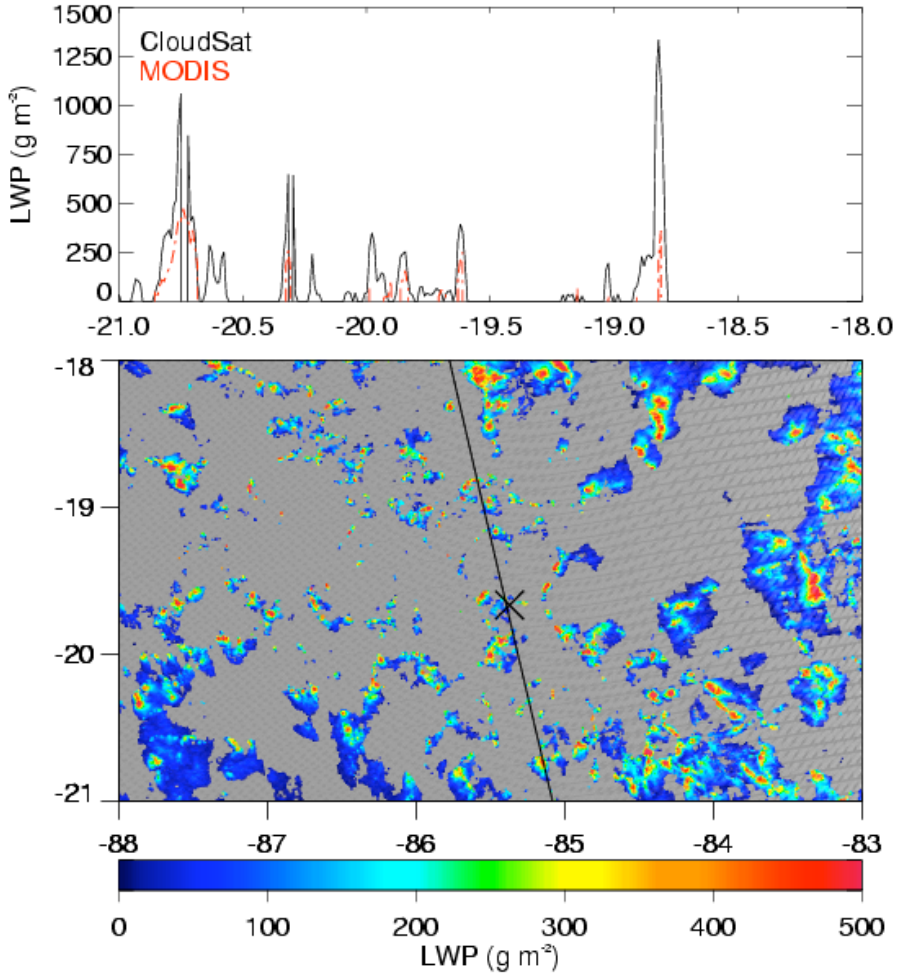


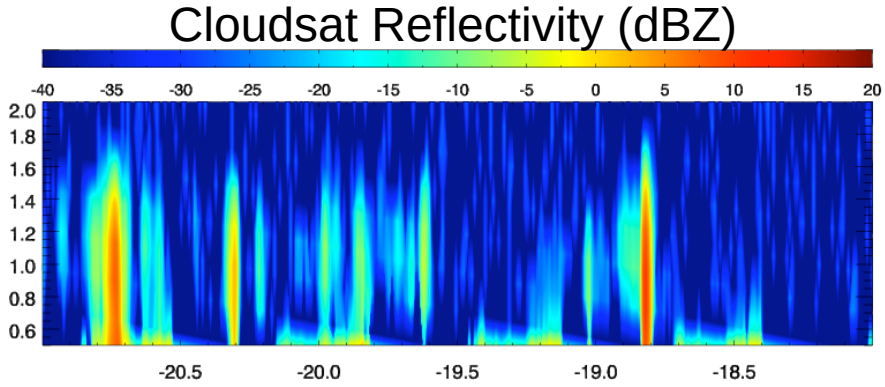


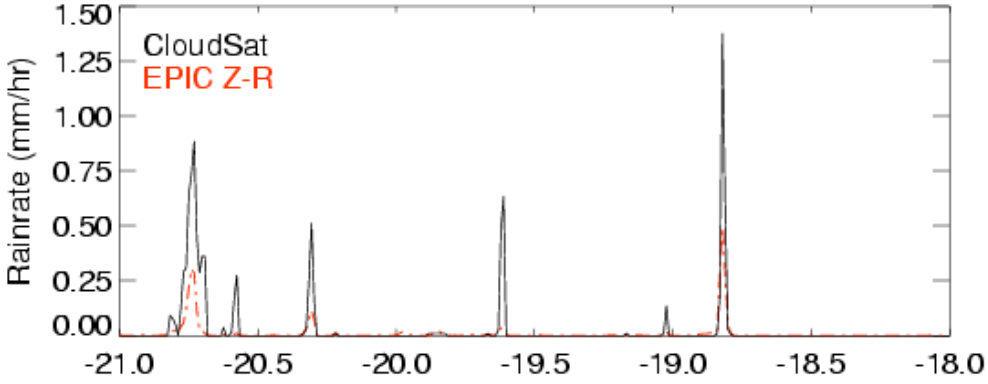


Anita Rapp
CIRES Visiting Fellow
University Colorado
NOAA/ESRL

Oct 27 - Isolated Drizzle Cells (CloudSat within Ron Brown C-Band Range)

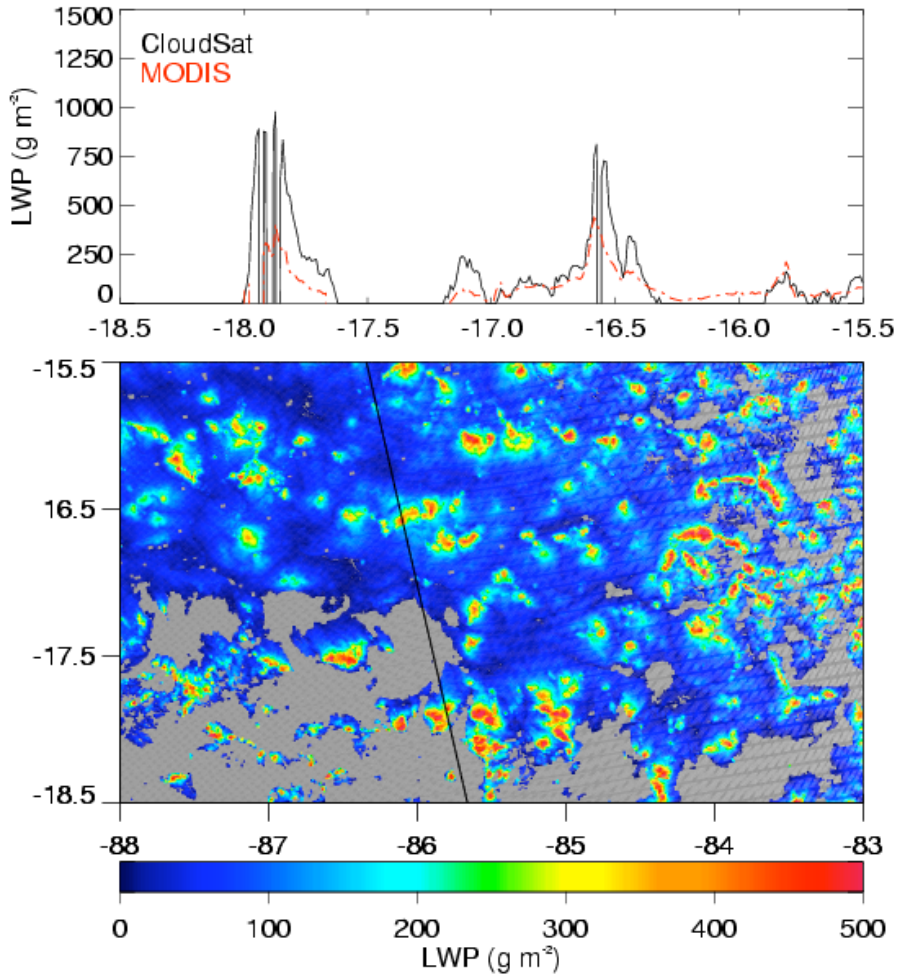


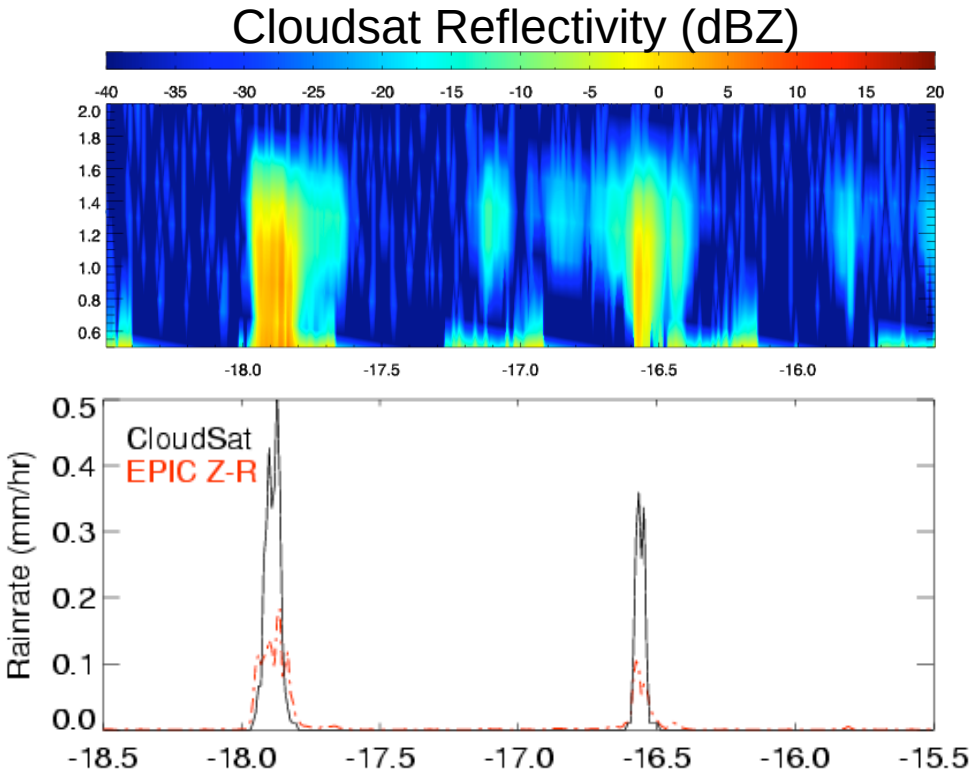




** High reflectivities in isolated cells*

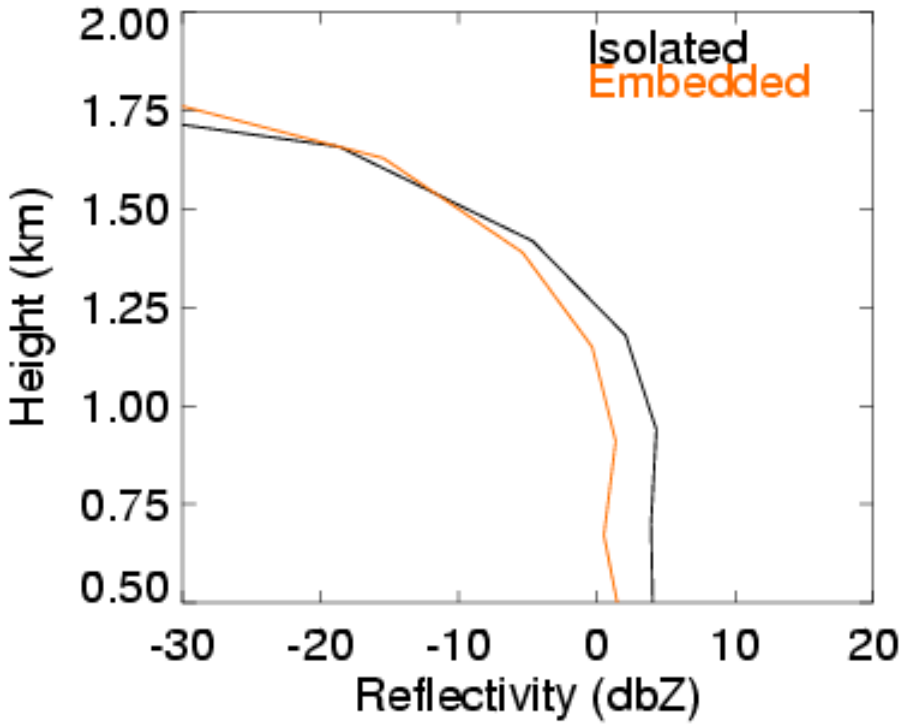
Oct 27 - Embedded Drizzle Cells





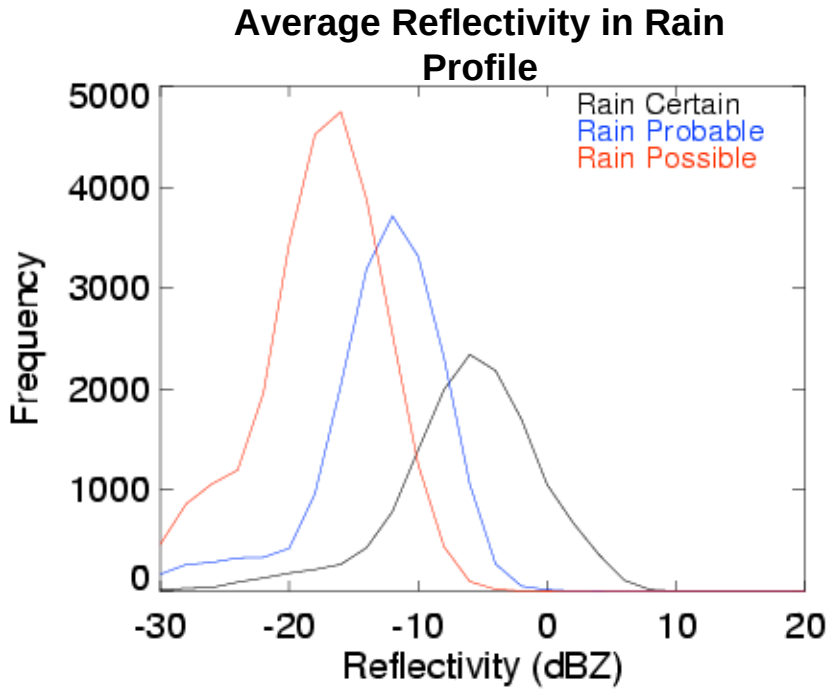
** Embedded drizzle cells have lower reflectivities and seem more widespread than isolated cells*

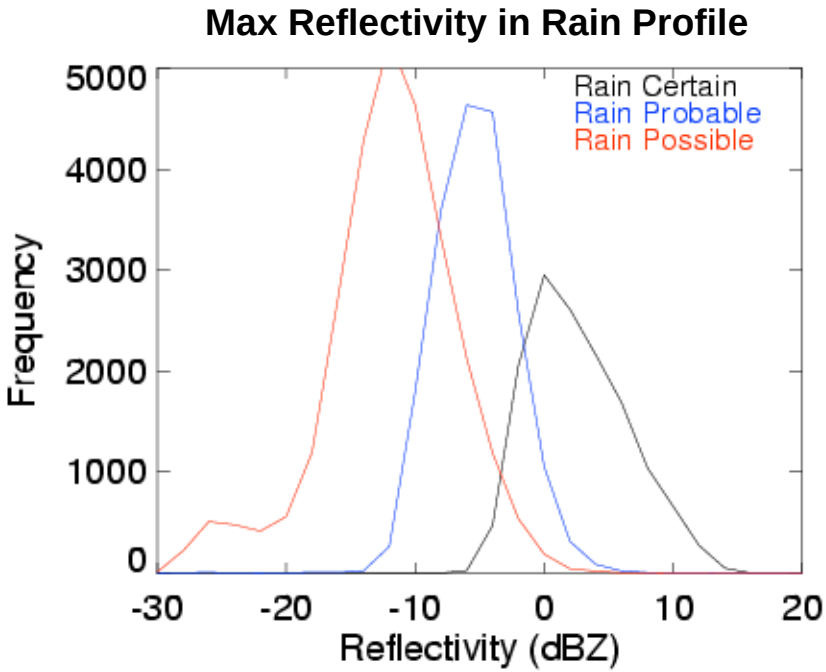
Mean Reflectivity Profiles Comparison for Oct 27



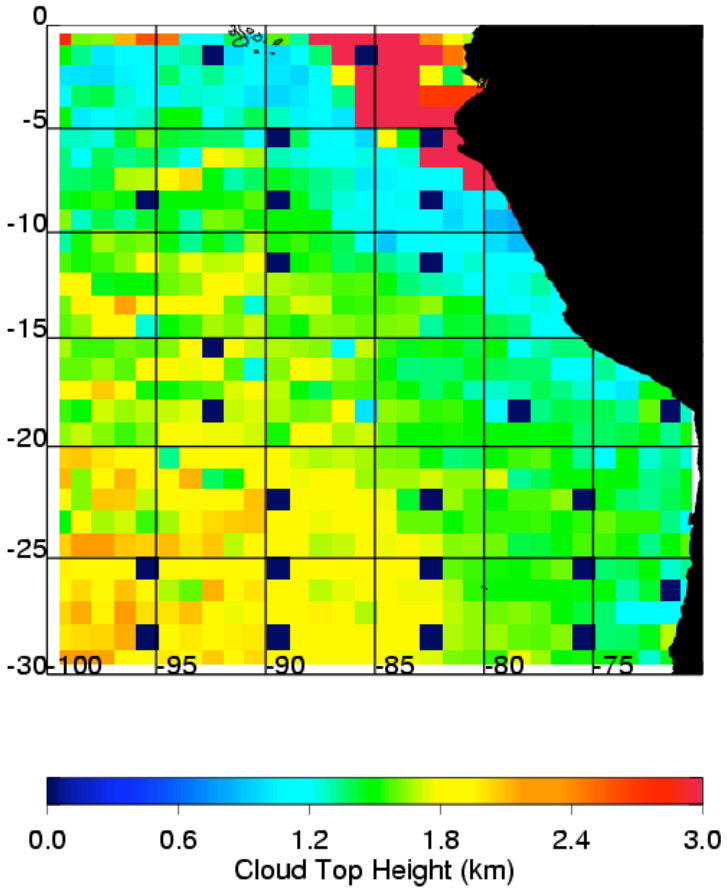
**Profiles have similar shape, but embedded cells have lower reflectivity. Both show nearly constant reflectivity up to 1-1.25 km, then decrease rapidly to cloud top.*

Frequency Distribution of CloudSat Reflectivities During VOCALS Classified by Probability of Precipitation

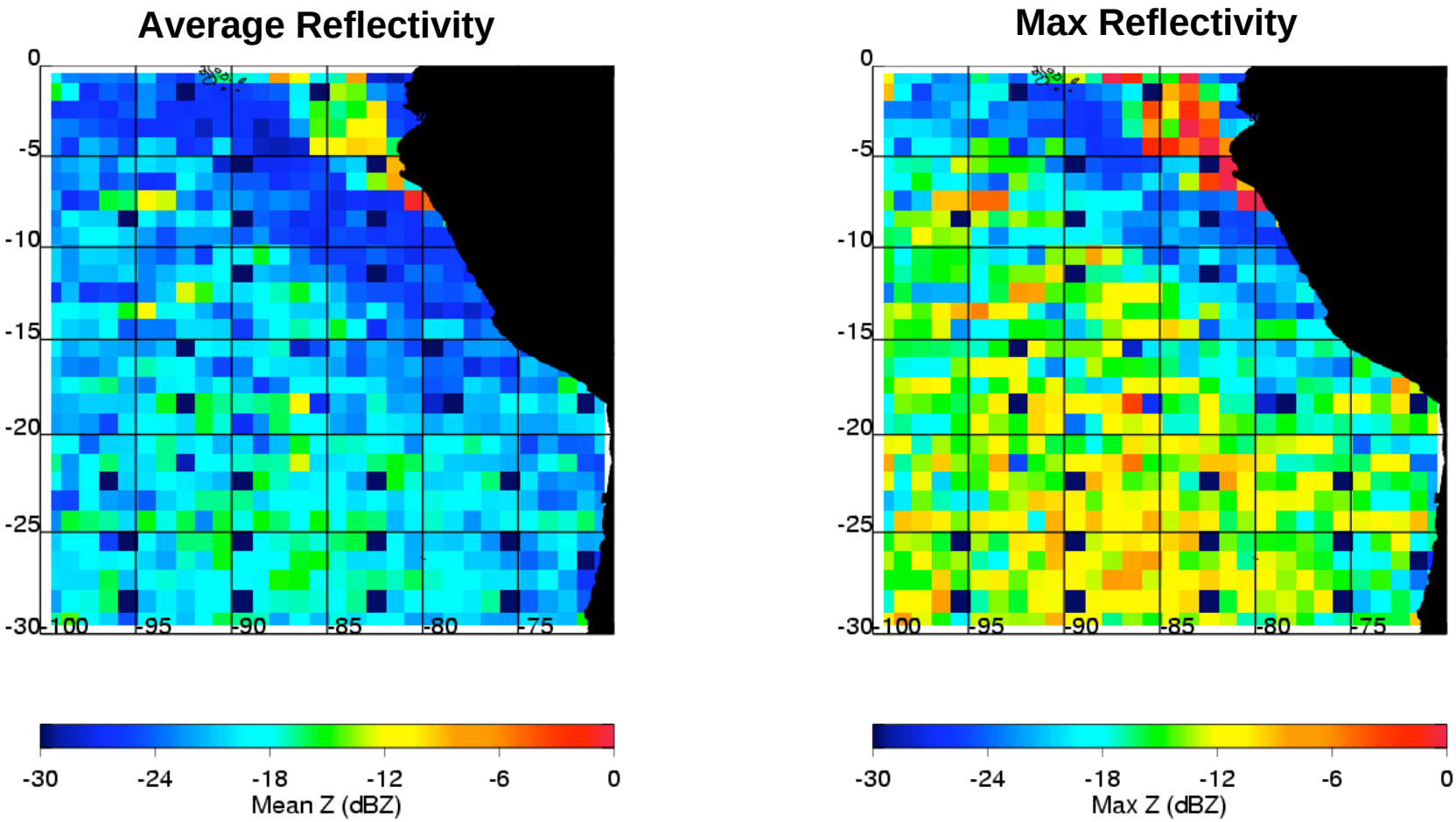




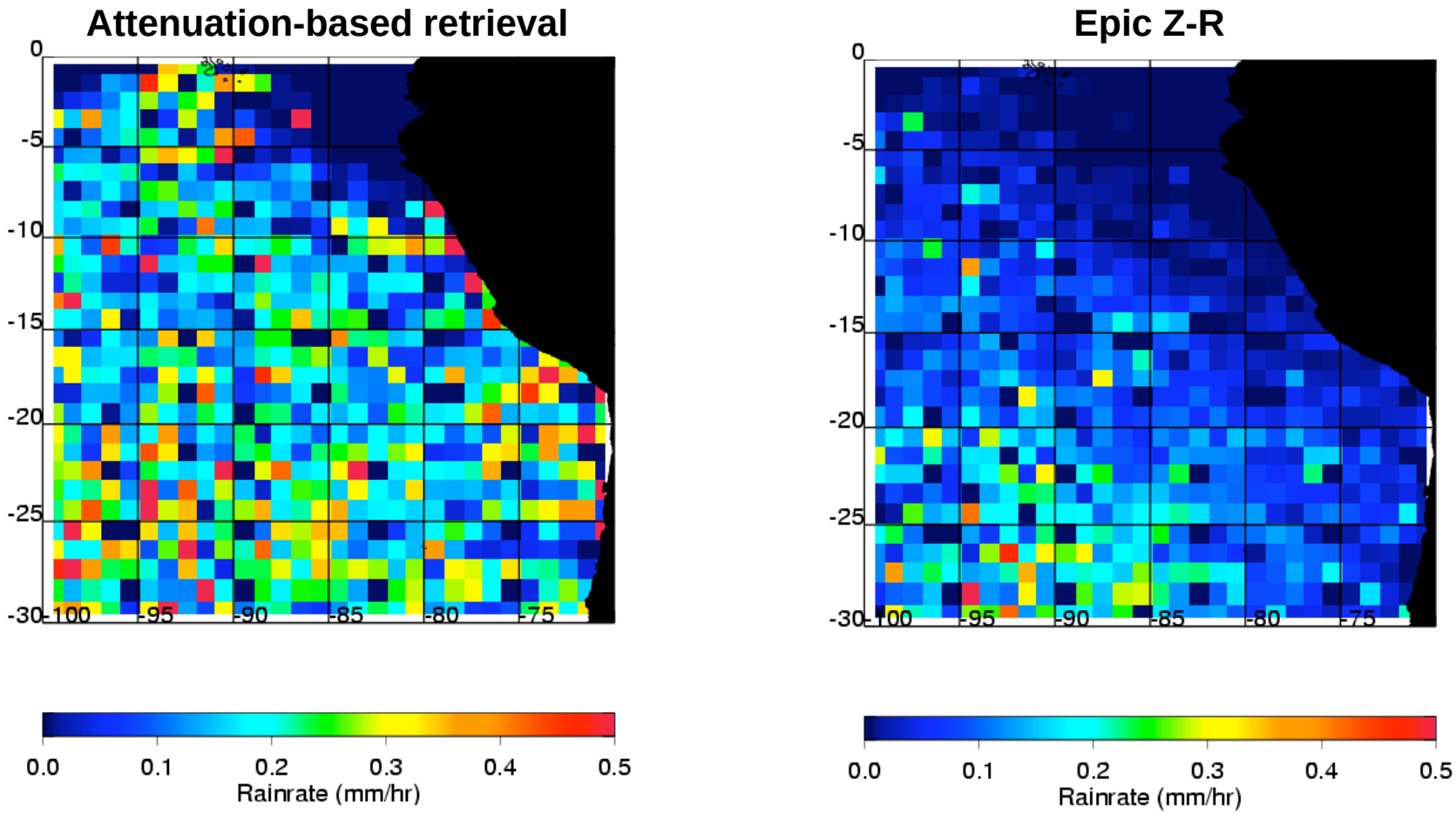
Cloud Top Heights for VOCALS



CloudSat Reflectivity Map for VOCALS

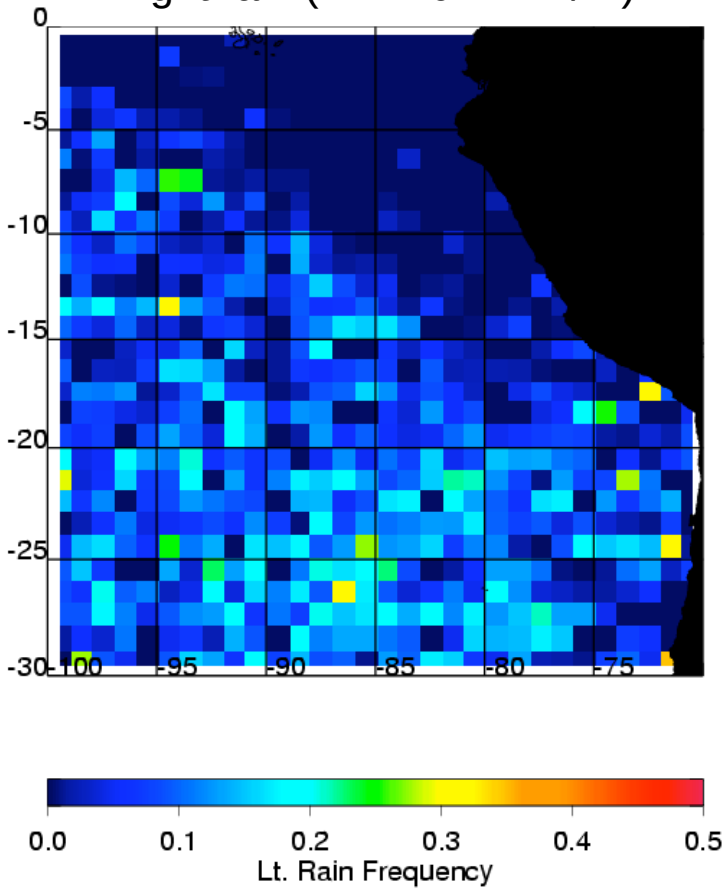


CloudSat Average Rainrate for VOCALS (in precipitating clouds)



Frequency of Precipitation Occurrence in VOCALS mSc clouds

Light rain (RR > 0.2 mm/hr)



Drizzle (RR < 0.2 mm/hr)