

The NOAA Aeronomy Laboratory deployed a vertically pointing S-band profiler (2.8 GHz) at the Kendall-Tamiami Airport (the Eastern Ground Site) during the CRYSTAL-FACE campaign held 3 - 31 July 2002. The S-band profiler observed precipitating cloud systems with reflectivities greater than 0 dBZe at 10 km.

A Ka-band profiler (35 GHz) operated by the NOAA Environmental Technology Laboratory and a W-band profiler (94 GHz) operated by the University of Miami were also deployed at the Eastern Ground Site.

While the shorter wavelength Ka-band and W-band profilers (0.86 cm and 0.32 cm) are affected by attenuation through liquid clouds and precipitation, the longer wavelength S-band profiler (10 cm) provides unattenuated estimates of the reflectivity.

The S-band profiler observations will quantify the attenuation and provide a correction for the attenuation inherent in shorter wavelength cloud profilers.

# S-band Profiler Observations from the Eastern Ground Site During CRYSTAL-FACE

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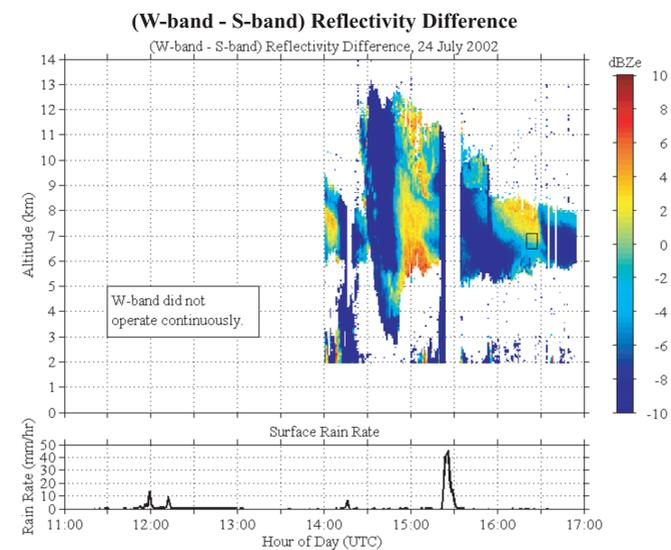
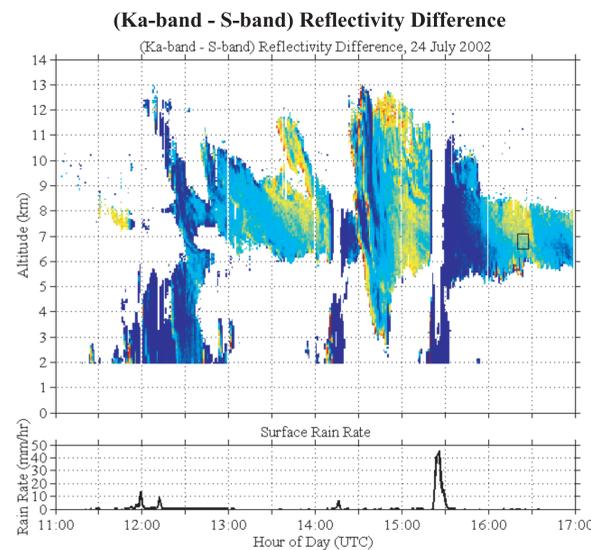
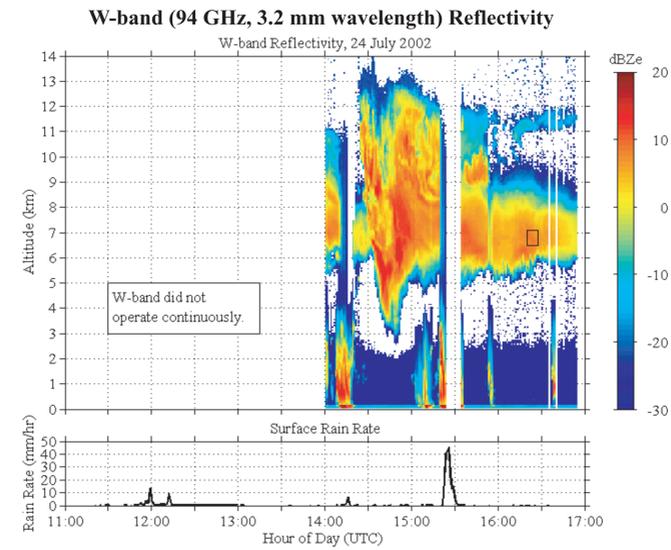
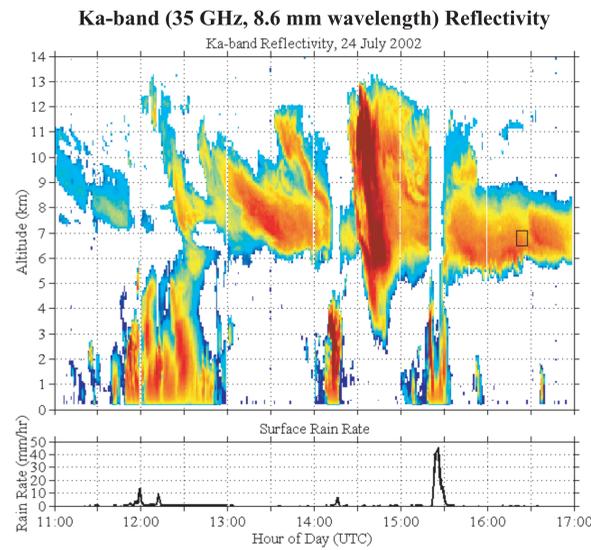
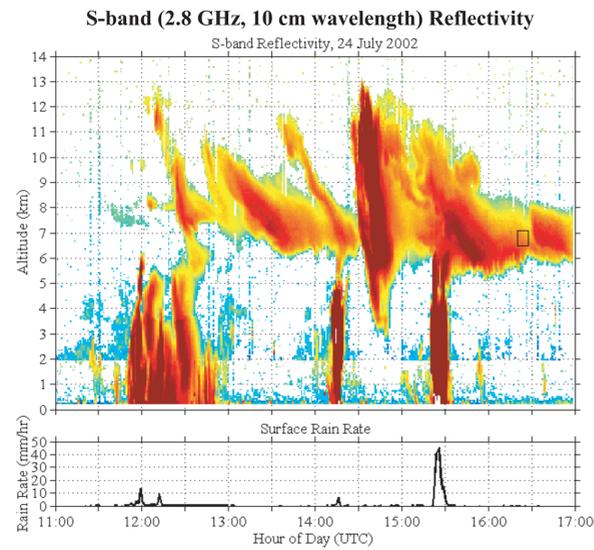
Bruce Albrecht                  Rosenstiel School of Marine Atmospheric Science,  
Pavlos Kollias                  University of Miami

Matthew Shupe                  NOAA Environmental Technology Laboratory

## Q. Why deploy a precipitation profiler to study cirrus clouds?

**A. Because cloud profilers under estimate the reflectivity in cirrus clouds when precipitation is present and the precipitation profiler can correct for this attenuation.**

The top three panels show the reflectivity of a cloud system observed by each profiler.  
The bottom two panels show the difference in reflectivity relative to the unattenuated S-band profiler.  
Under each reflectivity panel is the surface rain rate observed by a Joss-Waldvogel disdrometer.



The resolution of all three profiler data sets has been degraded to 1 minute time and 60 meter vertical resolution.

The box at 16:20 UTC and 7 km indicates the region used to force the reflectivity of all three profilers to agree.

As expected, when rain is detected at the surface, the Ka-band and W-band profilers have severe attenuation. No attenuation correction will be possible in these cases.

It appears that the Ka-band and W-band profilers have attenuation after the surface rain has stopped and the precipitating clouds have passed. Is there attenuation through the wet radome?

When the cloud system extends below the freezing level (at about 4.5 km at 14:45 UTC), the liquid water causes attenuation in the Ka-band and W-band profilers (even without surface precipitation). Attenuation correction will be possible in these cases.

Differences in reflectivity between the three profilers are due to attenuation, absorption, and the particle size distribution.