RADAR COMPARISONS AT THE EASTERN CRYSTAL-FACE SITE

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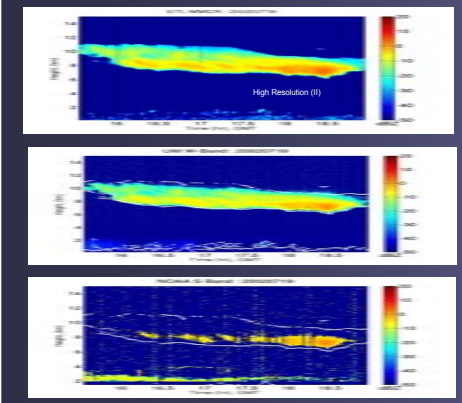
Introduction

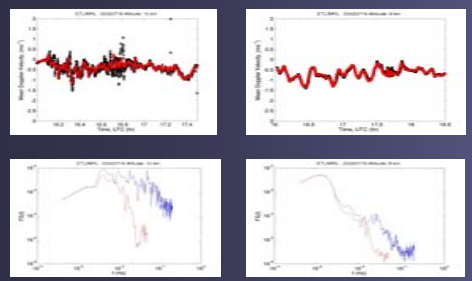
The NOAA Aeronomy Laboratory S-band, the ETL K_a-band and the Univ. of Miami W-band radar were deployed during CRYSTAL-FACE at the eastern ground site (Tamiami airport). All the radars were vertically pointing, thus providing profiles of cloud and precipitation over the site. Several cases of convective and stratiform precipitation, cirrus anvils and fair weather cumuli clouds were sampled as they overpass the ground site. The collocation of the three radars provides the opportunity for the development and use of multi-wavelength techniques for the retrieval of cloud microphysical and dynamical characteristics. Radar hardware characteristics, wavelength, temporal and spatial resolution are quite different among the radars. All these factors affect the way each radar samples over passing clouds and precipitation. In the poster, we present some radar comparison examples of cloud and precipitation from the eastern site.

Cloud Boundaries



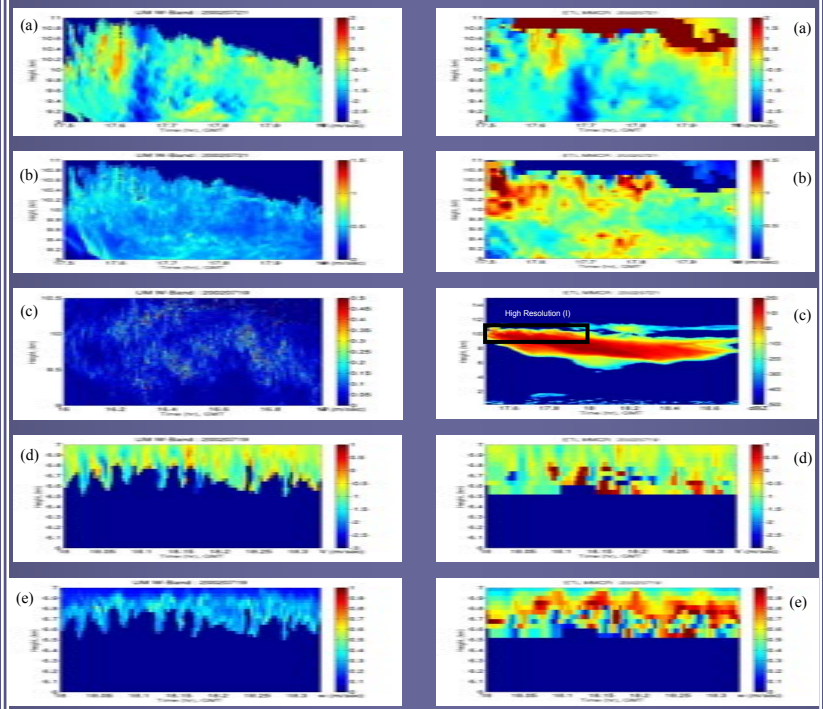
Example of cirrus cloud as observed by the three radars at the CRYSTAL-FACE eastern ground site (ETL (top), UM (middle) and AL (bottom). The white dots are the cloud boundaries as detected by the MMCR.

Mean Doppler Velocity



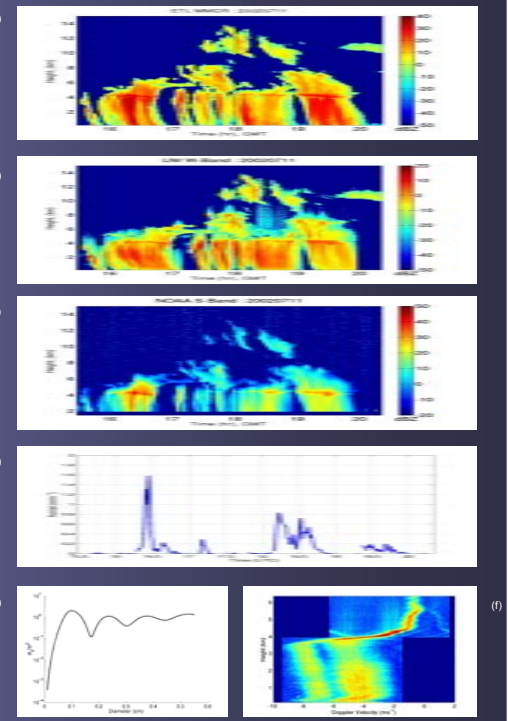
Mean Doppler velocity time series with a cirrus layer at two different altitudes (10 km (top left) and 8 km (top right). The red circle is the mean Doppler from the ETL radar and the black circles are the UM radar mean Doppler velocity estimates. The bottom graphs show the power spectrum of the mean Doppler velocity time series (UM (blue) and ETL (red).

Resolution



Left column: Time-height high resolution data from the UM W-band radar: (a) and (d) Mean Doppler velocity, (b) and (e) Doppler spectrum width, © Horizontal shear of the Mean Doppler velocity. Right column: Time-height data from the ETL K-band radar: (a) and (d) Mean Doppler velocity, (b) and (e) Doppler spectrum width, © Cloud reflectivity.

Precipitation



(a) K-band radar reflectivity mapping of the precipitating system, (b) 94-GHz Doppler radar reflectivity mapping of the precipitating system © S-band radar reflectivity mapping of the precipitating system, (d) Disdrometer R (mmh-1).
(e) Normalized backscattering cross-section as a function of the diameter for oblate spheroids (solid) and spherical raindrops (dashed) at 94-GHz and vertical incident and (f) Example of Doppler spectra with altitude from stratiform rain observed at vertical incidence with the University of Miami 94-GHz Doppler radar.

Summary

Three radar profiling systems were collocated at the eastern ground site during CRYSTAL-FACE. The NOAA S-band, the ETL K-band and the Univ. of Miami W-band.

The collocation of these radar systems during Crystal-Face offers a unique opportunity for radar comparisons and development/testing of new retrieval algorithms for cloud properties

The ETL K-band exhibit the best sensitivity in cirrus clouds. The use of different operational modes allow the mapping of the hydrometeor distribution over the site. The cirrus cloud boundaries and morphology were well defined by the MMCR

The NOAA S-band exhibit great operational stability and provided non attenuated profiles of cloud reflectivity during precipitating periods (25% of total observation time).

The Univ. of Miami W-band operated during daytime periods and provided high resolution Doppler moments valuable for turbulent studies in cirrus clouds.