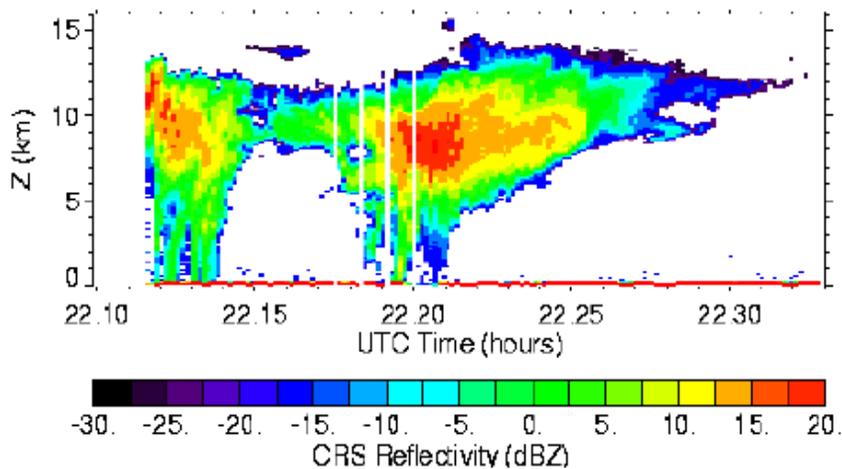
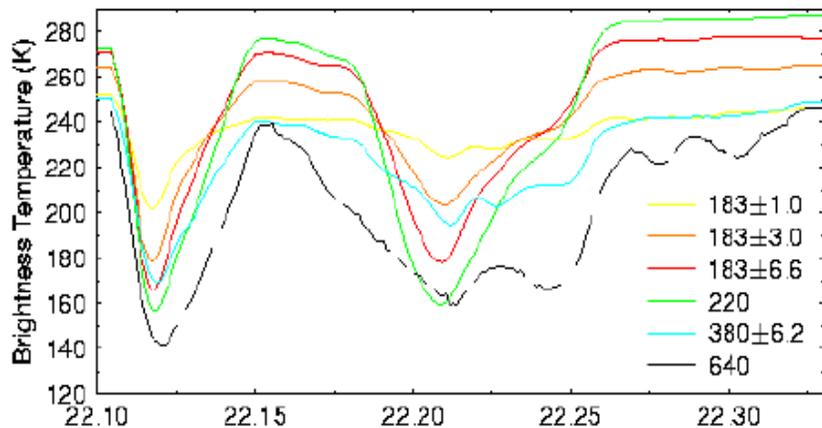
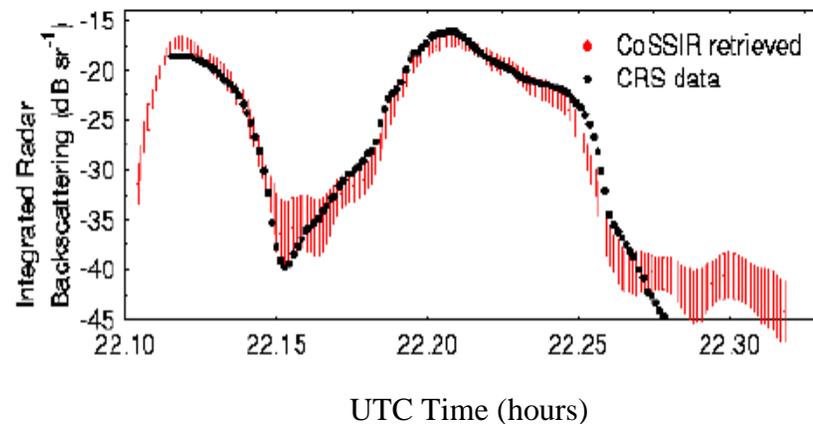
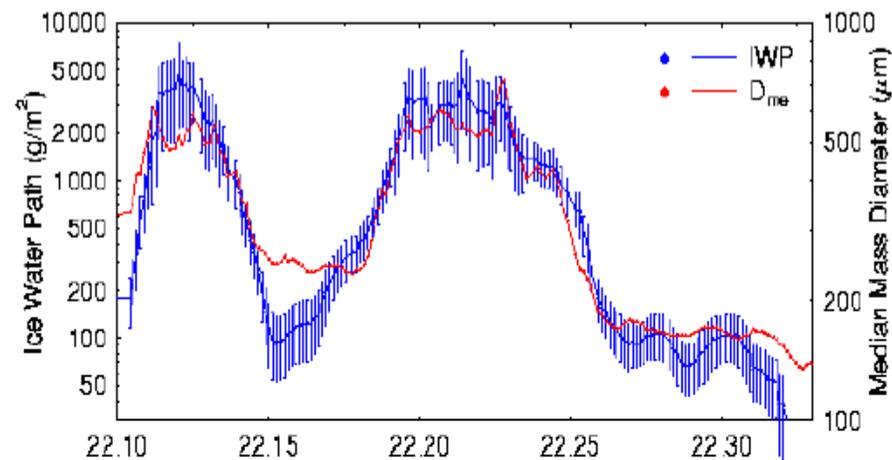


# CoSSIR Cirrus Retrievals and Comparison with CRS Reflectivities

CoSSIR and CRS Measurements, 7/28/2002



Cirrus Retrievals and Comparison, 7/28/2002



## CoSSIR Cirrus Retrievals and Comparison with CRS Reflectivities

- The Conical Scanning Submillimeter-wave Imaging Radiometer (CoSSIR) is a 12-channel (over frequency range of 183-640 GHz) total power radiometer system that was built and flown for the first time during the Florida Area Cirrus Experiment (FACE) in July 2002. The main objective is to remotely measure cirrus properties with particle sizes greater than about 50  $\mu\text{m}$  where optical sensors are not sensitive; i.e, it is a good complement to optical sensor like MODIS Airborne Simulator (MAS).
- The figure above shows an example of CoSSIR data (left plot) and retrieval results (right plot). The retrieved parameters are the ice water path (IWP), median mass equivalent sphere diameter ( $D_{\text{me}}$ ). The CoSSIR high-frequency measurements show a better sensitivity to thin cirrus than previous measurements at frequencies  $< 350$  GHz.
- Reflectivity measurements from the Cloud Radar System (CRS, which is on board the same aircraft) are used to evaluate the CoSSIR cirrus retrievals. Rather than retrieve IWP and  $D_{\text{me}}$  from CRS data, we instead compare vertically integrated 94 GHz radar backscattering (units of  $\text{sr}^{-1}$ ) between 4.5 and 17 km. IWP and  $D_{\text{me}}$  are retrieved with Bayesian algorithm. Retrieval data base contains 400,000 cases with random profiles/cirrus properties and associated simulated brightness temperatures. Scattering properties are calculated for 7-bullet rosettes, spherical “snow” with three density formulas, and spherical “graupel” with constant density ( $0.46 \text{ g/m}^3$ ).
- The retrieved values of IWP and  $D_{\text{me}}$  are used to calculate the vertically integrated radar reflectivity and compared with that derived from the CRS (right bottom). The agreement is very good, usually within the error bars of 1 to 2 dB for the thick anvils.
- The retrieval results from other flight segments basically gives the same results. This demonstrates that CoSSIR can provide information on cirrus properties that complement the results obtainable from the optical sensors. Another channel at 880 GHz will be added to the instrument in the near future to further improve the sensitivity of cirrus detection.