COSMIC refractivity data have been collected to study the thermodynamic environment near tropical cyclones of 2008 and 2009.

Christopher Hill

Mississippi State University

A comparison of COSMIC refractivity profiles measured at varying latitudes relative to cyclones reveals a clear difference of refractivity (order of 10) at the middle and lower troposphere, indicating a difference of moisture content between profiles. This result may be useful in the detection of the dry air component of a Saharan Air Layer (SAL) over the eastern Atlantic Ocean. Data from the aerosol-detecting CALIPSO indicate that desert dust is most prevalent between 10°N and 20°N over the eastern Atlantic Ocean, where a strong meridional gradient of COSMIC refractivity tends to exist. The placement of desert dust aerosols in relation to COSMIC refractivity suggests that desert dust is primarily advected along the boundary of dry and moist air, and is not necessarily collocated with the driest air. The COSMIC and CALIPSO data recorded in the environment near recent Atlantic tropical cyclones will be compared.

In addition to detecting the presence of SAL in the environment of a tropical cyclone, COSMIC data can be used to examine the internal thermodynamic structure of a tropical cyclone. For example, a profile of COSMIC refractivity was found to transect the inner core of Hurricane Paloma of 2008. When differenced from 4^{th}-order polynomial approximations of refractivity, and compared against airborne radar data, the transecting COSMIC profile reveals the high moisture regions of the rainbands with a positive difference of refractivity, and similarly reveals the drier regions with a negative difference of refractivity.