Typhoon Nida; November 28, 2009

Typhoon Nida was the most intense tropical cyclone during 2009, with a minimum central pressure of 955 hPa. Nida formed late in the season from a monsoon trough, and became a Category 5 Typhoon. The A-Train had an overpass of the storm when it was at or near maximum intensity, with sustained winds of 156 km/h and central pressure of 956 hPa. The overpass was near the eye of the Typhoon, which was in this case covered at high altitude with cirrus clouds observed by the IIR and CALIPSO. The radar observed heavy rain near the surface. The Nida overpass makes an ideal case study for understanding how the instruments perform while observing deep convection. The optical depth of the storm varies, so a comparison can be made of one big convective system that has many varied conditions associated with it. The core of Nida is opaque to the lidar, but the edges of the storm are transparent. The cloud tops reach 18 km, but not only above the eyewall and core, but also at the transparent edges of the storm where they remain as high. CALIPSO sees a very thin, weakly layer of barely visible cirrus at 19 km above the eye. The IIR shows the variation in effective particle size and optical properties. This Typhoon suggests that a more detailed case study of Typhoon Nida will be rewarding.

The View from the Top: CALIOP Ice Water Content in the Uppermost Layer of Tropical Cyclones

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Introduction: NASA’s CALIOP satellite carries both the Cloud and Aerosol Lidar with Orthogonal Polarization (CALIOP) and the Imaging Infrared Radiometer (IIR). The lidar is ideally suited to viewing the very top of tropical cyclones, and the IIR provides critical optical and microphysical information. The lidar and the IIR work together to understand storm clouds since they are perfectly collocated, and big tropical cyclones provide an excellent complex target for comparing the observations. There is a lot of information from these case studies for understanding both the observations and the tropical cyclones, and we are just beginning to scratch the surface of what can be learned. Many tropical cyclone cloud particle measurements are found on the meso and lower regions of storms, but characterization of cyclone interaction with the lower troposphere is still largely left to the imagination.

The CALIPSO radar for the purpose of this study is the IIR data, which is the output from the CALIPSO instrument and is always made available in near real time. The CALIPSO and CloudSat radar overpasses of Sandy on this day occurred at 7:15 UTC (nighttime overpass, outlined in blue) and at 17:15 UTC (daytime overpass, outlined in red). During the night the VIIRS instrument also captured an image of the land overpass day MODIS and CloudSat also provide data.

These images were made with the VIIRS day/night band using data from the land (B) and air (A) overpasses. The larger image has the CALIPSO satellite overpass plotted in green, with points A, B, and C corresponding to these labeled points on the CALIPSO (A), MODIS (B), and VIIRS (C) data plots. The smaller image shows the location of Hurricane Sandy on the previous NPP MODIS overpass.

Hurricane Sandy Ice Water Content from CALIOP

Hurricane Sandy; October 29, 2012

NOAA/NASA GOES-13 13.7 μm IR images from October 29, 2012, enhanced by the SSFC at the University of Wisconsin, CIMSS. The images show the substantial development and merging with an extratropical system just before Sandy’s landfall. The CALIOP observations for the overpass of Sandy on this day occurred at 7:15 UTC (nighttime overpass, outlined in blue) and at 17:15 UTC (daytime overpass, outlined in red). During the night the VIIRS instrument also captured an image of the land overpass day MODIS and CloudSat also provide data.

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