MJO Field Data and Science Workshop
4-8 March 2013, Kohala Coast, HI

Z-R Calculation and Rain Drop Microphysics from the NOAA P-3 2D Optical Probe

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ABSTRACT

The NOAA P-3 aircraft not only provided detailed vertical and horizontal structure of convective cloud systems, but also provide in-situ cloud and precipitation microphysical observations. The Particle Measuring System 2D precipitation (2D-P) probe collected data for particles between 100 μm – 6.2 mm (100 μm resolution). Drop size distributions (DSDs) were analyzed using the method of moments technique. Using the third and sixth moments, rainfall rate (R) and equivalent radar reflectivity factor (Z), respectively, were computed for each DSD. Linear regression was applied to establish a Z-R relationship for the data. The results compare favorably to those calculate during the TOGA COARE and MISMO projects. A gamma distribution model was used to fit the DSD data; and slope, shape, and intercept parameters were computed. The results of both the Z-R relationship and DSD model characteristics are compared to the TOGA COARE project and placed in context within the larger framework of previous results from literature. Results for time periods during the active MJO and suppressed (dry) phases are compared to corroborate and suggest microphysical differences occurring. The results presented are important in improved precipitation estimation and parameterization from both satellite observations and model simulations.