

Radar Rainfall Estimation during DYNAMO

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The DYNAMO/CINDY-2011 (Dynamics of the MJO, Cooperative Indian Ocean Experiment on Intraseasonal Variability in the Year 2011) field campaign enabled collection of single- and dual-polarized Doppler radar data in the Indian Ocean to investigate the 3-D evolution of precipitating clouds before, during, and after the MJO in its alleged initiation region, the central equatorial Indian Ocean. Preliminary rainfall time series statistics from various S- and C-band radars across the DYNAMO observational array show considerable disagreement, especially on high rainfall accumulation days. The co-located SMART-R and S-polKa radars on Gas Is. agreed well at low to moderate rain accumulations, however the Z-based SMART-R estimate was well below the polarimetric based estimate from S-polKa. This study seeks to rectify these rainfall discrepancies by deriving new reflectivity-rainfall relationships (Z-R) for eventual application to the three non-polarimetric C-band Doppler radars. We first investigate the S-polKa rain estimates to ensure that the polarimetric based rain estimators are representative of MJO rainfall. To accomplish this we use Gan Is. distrometer data to develop polarimetric power law rain estimators and compare those to the NCAR hybrid rain algorithm. Once the S-polKa rain rates are validated, we develop so called pole-tuned Z-R power laws for both convective and stratiform rain. These relations will be compared to previous Z-R equations derived from other tropical MJO-related oceanic field experiments such as MISMO (Indian Ocean) and TOGA-COARE (west Pacific warm pool). We consider the importance of ice microphysics, lightning, and the variability of rainfall during stratiform vs. convective precipitating systems and perhaps different MJO phases. With this work, we can more meaningfully compare rainfall statistics a) between radar sites within the DYNAMO/CINDY-2011 array and b) to other coincident atmospheric and oceanographic measurements.