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The Contribution to Tropical Cyclone Rainfall with respect to Precipitation Feature Size and Convective Intensity Using 11 years of TRMM Data

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Tropical cyclones have a great impact on the total precipitation over global ocean basins. There is no doubt that both the system size and convective intensity play an important role in producing the total storm rainfall. However, the question remains on how the total storm rainfall varies as a function of convective intensity and precipitation feature size. This study is aimed at answering this question with 11 years (1998-2008) of Tropical Rain Measuring Mission (TRMM) observations.

The TRMM satellite has passed over more than 900 tropical cyclones since its launch in late 1997. The unique suite of instruments, including Precipitation Radar (PR), TRMM Microwave Imager (TMI), Lightning Imaging Sensor (LIS), and Visible/Infrared Scanner (VIRS), allows examination of precipitation and convective characteristics of these storms. The University of Utah TRMM Tropical Cyclone Precipitation Feature (TCPF) database includes over 0.1 million precipitation features associated with tropical cyclones from six basins: Atlantic (ATL), east+central Pacific (EPA), northwest Pacific (NWP), north Indian Ocean (NIO), south Indian Ocean (SIO), and south Pacific (SPA). In this study, the TCPFs are grouped into eight classes of basic system types, based on size, maximum 20 dBZ echo height, and minimum 85-GHz brightness temperature. For each TCPF, instantaneous volumetric rain rates are calculated from the TRMM 2A25 algorithm. For the 6-month tropical cyclone season of each study basin, the rainfall contributions with respect to feature type, size, and convective intensity are calculated. Features over land and over ocean are compared. The population and rainfall contributions of TCPFs in each class are inter-compared in order to determine the relative importance of feature size and convective intensity to the total tropical cyclone rainfall.