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Using high resolution TRMM observations to understand the role of topography in spatial variations in precipitation and storm structure

S. Nesbitt
Department of Atmospheric Sciences, University of Illinois, Urbana, Illinois, USA

TRMM has provided an unprecedented view of the spatial and temporal variation of precipitation processes since its launch in 1997. It has also improved our understanding of the extent of convective organization in the tropics, convective organization's role in modulating the rainfall diurnal cycle, as well as the impacts of organized convection in the tropical circulation. With over 11 years of data now in hand, sampling uncertainties have been reduced such that small spatial scale variations of precipitation characteristics and convective organization can be observed using the TRMM data record. We will present the 11-year high-resolution precipitation climatology from the TRMM precipitation radar (PR) and TRMM microwave imager (TMI) at resolutions as high as the 10 km scale. We will examine climatological high-resolution precipitation variations in rainfall frequency, accumulation, and vertical structure along topographic features to show (1) the varying degree the various TRMM algorithms can depict variations in orographic precipitation, (2) the extreme horizontal variations in precipitation and latent heating associated with tropical orographic precipitation, often with impacts on the monsoon systems of which it is manifested, and (3) examine the interplay between dynamic forcing for orogenic convective systems, resulting convective structures, latent heating, and the resulting diurnal cycle of convective systems. The 11 year TRMM climatology dataset will be presented as a new benchmark precipitation climatology to not only examine the representation of the spatial distribution of precipitation near topography, but also as the basis for evaluation of improved representation of precipitation physics near topography in cloud-resolving to climate models.