Vertical Structure of the Intraseasonal Variability from Contemporary Satellite Data: TRMM, AIRS, and CloudSat

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Abstract

The realistic representation of the intraseasonal variability in current global circulation models is a long-standing challenge for weather forecasts and climate predictions. Meanwhile, well-accepted and comprehensive theories to explain this form of variability are still elusive. To help address this challenge, recently available satellite observations provide unprecedented opportunity for both process understanding and model evaluation/improvement. This presentation will summarize our recent efforts in utilizing NASA's satellite datasets to characterize the vertical structures of the Madden-Julian Oscillation (MJO) as well as boreal summer intraseasonal oscillation (BSISO) associated with the Asian monsoon variability. Specific topics included in the presentation are: (1) The moisture and temperature profiles associated with the MJO based on Atmospheric Infrared Sounder (AIRS) dataset in recent 7 years (2003-2009) as an update of results in Tian et al (2005) which was based on 2.5-year AIRS data; (2) Vertical cloud water structure of the BSISO by utilizing the CloudSat dataset during 2006-2008; (3) Vertical diabatic heating structure of the MJO based on TRMM estimates since 1998. Diagnostics of these moist thermodynamic structures of the intraseasonal variability that combine recent ECMWF analyses and forecasts will also be exploited. Caveats regarding the use and interpretations associated with these satellite datasets as applied to the MJO will be discussed. We propose that some aspects of these results may provide useful climate model diagnostics/metrics.