Session: C28 Poster: W37B

Rainfall over the Tropical Western Pacific in relation to SST and mesoscale gradients thereof

Yanping Li[†]; Richard Carbone
[†] University of Hawaii, USA
Leading author: yanpingl@hawaii.edu

Conventional work on the climatology of SST in relation to atmospheric convection emphasizes regional to global oceanic scales. The focus of this study is on the mesoscale gradients of SST in the tropical western Pacific (TWP). Such gradients are transient, exhibiting a temporal scale that is daily to weekly, and a spatial scale of order 0.5-3C/100km. The study employs currently available satellite data since 2006, including GHRSST, MTSAT, and CMORPH, each of which facilitate new insights on high frequency ocean-atmosphere interactions at small spatial scales. The ensemble of westward propagating organized convective systems is prominent within the observed MJO. Over the TWP, there is influence of extra-tropical disturbances, Kelvin waves, equatorial Rossby waves, and westward inertio-gravity waves. In addition, the presence of local SST gradients, together with a critical level and sufficient easterly shear, may organize and propagate convective systems ~1000 km from their origin and contribute to a substantial fraction of total regional precipitation. The consequent rainfall and convectively-driven winds cool the ocean surface; systematically create new SST gradients, shallow/stable oceanic mixed layers. Such conditions may promulgate regeneration of events that become progressively phase-shifted with respect to larger scale, transient atmospheric forcings. Although the total seasonal or annual precipitation amount is strongly related to regional SST, these processes suggest that the origin of convection events is not fundamentally stochastic at a quasi-homogeneous lower boundary. The surface wind condition, steering winds aloft, and the mesoscale gradients of SST each play critical roles affecting the likelihood of locally triggered deep moist convection, owing to reduction of convective inhibition and a shear-enabled capacity to organize at larger mesoscales. Such events are triggered in a heterogeneous SST environment at average regional SST values, and likely produce remote ocean-atmosphere effects, hundreds to thousands of kilometers removed from the point of their initiation. Acknowledgement: This research is supported by NOAA sponsorship of the IPRC, University of Hawaii; NCAR is supported by the National Science Foundation.