Intraseasonal Disturbances and their Role in Air-Sea Interactions in Equatorial Regions

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Abstract. The hydrology of Indian Summer Monsoons is sensitively determined by their active and break phases, which are directly related to a host of intraseasonal oscillations (ISOs) present in the tropics with time scales ranging from about 10 to 60 days. Some examples are the ubiquitous equatorial planetary waves in the atmosphere and oceans, tropical depressions and the Madden Julian Oscillation. The ISOs interact with landmass (e.g. maritime continent) and topographic features, cause exchanges between the stratosphere, troposphere and atmospheric boundary layer, and produce significant air-sea interactions that have significant feedbacks. Air-sea coupling has been identified as a critical factor in the dynamics of ISOs, yet underlying mechanisms and relevant scales of coupling are largely unknown. The on-going efforts of 'seamless' modeling from climate to weather scales also require a deeper understanding of dominant processes at canonical scales (e.g., meso, synoptic, seasonal and decadal) as well as transitional phenomena (e.g. ISOs) in between those scales. During 2012-2015, an extensive field experimental program was conducted in the northern Indian Ocean under the sponsorship of the Office of Naval Research to study how ISOs in the tropics interact with atmospheric boundary layer, and hence with the upper ocean. These research programs were dubbed ASIRI (Air Sea Interactions in the Northern Indian Ocean) and ASIRI-RAWI (Remote Sensing of Atmospheric Waves and Instabilities). An array of observing platforms were used, covering multiple countries and several ocean basins. Observations and associated modeling conducted during these programs will be described in this presentation, paying particular attention to intriguing phenomena and interactions across the scales that could be the building blocks of weather variability in equatorial oceans and atmosphere.