



JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

SPRING 2020 CEA FM SEMINAR SERIES

“Monsoon Intraseasonal Oscillations in Equatorial Atmosphere and Oceans”

The hydrology of Indian Summer Monsoons is sensitively determined by the active and break phases of rainfall. Such variability is related to a bevy of Intraseasonal oscillations (ISO) present in the tropical atmosphere and oceans with time scales ranging from about 30 to 60 days. Some examples of ISO are the ubiquitous equatorial planetary waves and the Madden Julian Oscillation that travel along an equatorial wave guide. Another important but meagerly understood ISO is the Monsoon Intraseasonal Oscillations (MISO) that propagate from the equatorial Indian Ocean toward the Bay of Bengal and then split into westward and northward branches. MISO events are directly related to the rainfall variability as well as a source of ISO with global reach that trigger larger scale phenomena, for example, El Niño. A comprehensive research program sponsored by the US Office of Naval Research (2012-2022) is afoot to peer into both oceanic and atmospheric ISO in the northern Indian Ocean. Under the umbrella of this initiative are the ASIRI, ASIRI-RAWI, NasCAR and MISO-BOB initiatives. Hypotheses are advanced on the dynamics of MISO propagation as well as convective-coupling of atmospheric and oceanic ISO across the air-sea interface. Two-month long ocean cruises were conducted in 2013, 2014, and 2015 concentrating on oceanic ISOs, complemented by deep ocean moorings and land based observations covering four southeast Asian countries. A Pilot experiment in the summer 2018 was exclusively focused on MISO events, and included observations aboard a research vessel and an instrumented aircraft. These in situ observations were complemented by satellite and reanalysis products to obtain a holistic picture of MISO dynamics. In unison, the research programs sheds light on the dynamics of MISO as well as processes that undergird convective coupling of MISO with the ocean below. The ocean was found to exert great control on MISO via complex multiscale air-sea interaction processes. Observations and modeling conducted during these programs will be outlined in this presentation, paying attention to intriguing phenomena and interactions across the scales that provide building blocks of weather variability in equatorial oceans and atmosphere.

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3:00 PM, Hodson Hall 213