

Diurnal Cycle Interactions with Madden-Julian Oscillation Propagation (DIMOP)
A Field Campaign Proposal Submitted to US. Department of Energy Atmospheric Radiation
Measurement (ARM) Program

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Campaign Name: Diurnal Cycle Interactions with Madden-Julian Oscillation Propagation (DIMOP)

When: Sept 1. 2018 – Sept 1. 2019

Where Pontianak, Borneo Island, Indonesia

Abstract

It has long been recognized that the Indo-Pacific Maritime Continent (MC) oftentimes acts as a barrier for the eastward propagation of the Madden-Julian Oscillation (MJO). The behavior of MJO episodes over the MC is rather erratic and unpredictable. Some episodes slowly propagate eastward relatively unaffected, others weaken or stall and terminate there. This barrier effect is often exaggerated in numerical models, creating a prediction limit for the MJO. The scientific community has recognized that understanding the mechanisms for the barrier effect of the MC on the MJO is a critical step toward addressing the associated modeling and prediction difficulties. Recent modeling and observational studies indicated that the diurnal cycle of land convection over the MC might play a crucial role in the barrier effect. Diurnal cycles of precipitation ahead of the MJO convection, known as the “vanguard of precipitation”, may influence the ability of the MJO to propagate across the MC. The field campaign aims to document the radiative and turbulent flux processes that control the strength of the diurnal cycle of this vanguard of precipitation and hence advancing understanding of the reason for some MJO convection events to propagate across the MC and others to stall. The overarching hypothesis motivating the campaign is that *the strength of this diurnal cycle and hence whether the MJO is disrupted over the MC depends on the net radiation flux reaching the surface and how it is proportioned into sensible heat flux and surface evaporation*. In order to test this hypothesis, an estimate of surface fluxes of radiation and sensible/latent heat and soil moisture over a major island of the MC during all phases of MJO episodes is required. This campaign will measure these quantities at an Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG) station in Pontianak, Borneo from September 2018 to September 2019. The relationship between the surface radiative and turbulent fluxes with the vanguard of precipitation and other fields will be paired with long-term satellite measurements to produce statistically robust estimates of the impacts of the processes on diurnal cycle and MJO propagation. The campaign is being carried out in conjunction with measurements at a local meteorological station as part of the Years of Maritime Continent (YMC), an international collaborative field campaign taking place from November 2017 through 2019. The international

field campaign is aimed at advancing understanding of the barrier effect thereby closing the sub-seasonal to seasonal (S2S) prediction skill gap. This ARM campaign is performed in partnership with the International YMC field campaign and will be an important and unique contribution to the broader effort aimed at understanding the MJO prediction barrier.