# Diurnal and MJO-scale variations in diabatic heating in the Maritime Continent

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Intraseasonal variability and the diurnal cycle have been shown to play a major role in modulating rain-rates over the land and sea in the Maritime Continent. Despite its important role in global heat and moisture transport, modelling convection in the Maritime Continent region remains challenging, partly due to the unresolved interaction beteween intraseasonal, mesoscale and diurnal variability brought about by the complex coastlines and steep topography. With the diurnal and intraseasonal variation in deep convection and cloudiness is an associated variation in diabatic heating.

In this work, we ran convection-permitting simulations over the whole Maritime Continent region using the Weather Research and Forecasting model with a horizontal grid-length of 4 km for 10 Austral summer seasons. The simulations cover the whole Maritime Continent region, and therefore include intraseasonal variations in convection and cloudiness such as that associated with the Madden Julian Oscillation as well as diurnal and mesoscale variability. In the simulations, the atmosphere is nudged towards the large scale weather patterns for wavelengths greater than 1000 km above the boundary layer, which facilitates direct comparison with observed rainfall variability from TRMM 3B42 and CMORPH satellite precipitation estimates. Comparison with satellite precipitation estimates and detailed examination of the diurnal cycle on and around the major Maritime Continent islands suggests that the simulations are able to capture the main physical processes controlling the intraseasonal and diurnal variation, despite a wet bias and errors in the timing of peak diurnal precipitation over the land.

We explore the diurnal and intraseasonal variation in diabatic heating using diabatic heating terms from the model's microphyics scheme, boundary layer scheme and radiation schemes. Diabatic heating terms are composited according to time of day and phase of the Madden-Julian Oscillation for land and sea areas and on cross sections through several Maritime Continent Islands. The simulated heating terms are used to examine the relationship between the diabatic heating associated with deep convection over the land and the incidence of diurnally varying, far-offshore precipitation. Furthermore, the aggregated variation in diabatic heating with the passage of the MJO is examined.

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