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Observations and Modeling of the Sea-Breeze Convergence and Diurnal Convection Over Java Island

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The importance of diurnal convective activities over the Maritime Continent of Indonesia has long been recognized among meteorologists but the their mechanisms have not been completely understood. The accuracy of numerical weather models in predicting the phase and amplitude of the diurnal convection is crucial for the success of short and middle range weather forecasting in the region. The main concern of this work is to investigate the role of sea-breeze convergence and its relationship with the diurnal convection over Java Island. Evidence for the existence of sea-breeze circulation and sea-breeze convergence has been found in previous observational studies. Inspection of available satellite data revealed that there are at least five types of convective cloud development over land; ranging from suppressed to enhanced island-scale convection. Further analysis of the satellite images showed a gradual change of the convection type during the transition phase from dry to rainy season periods. Five cases representing each of the convection types were then simulated using PSU/NCAR MM5 mesoscale model and NCEP's global analysis data, with moderate horizontal resolution of 10 km. The results suggest that sea-breeze convergence plays dominant role in the diurnal convection over land prior to active monsoon periods. However, more complex processes seem to be involved in the development of island-scale convections that typically occur during active monsoon periods. Possible impacts of these different convection types on the forecast skill of numerical weather prediction models such as MM5 are discussed.