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Future Changes in Propagating and Non-propagating Diurnal Rainfall over East Asia

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The characteristics of diurnal rainfall in the East Asian continent consist of a propagating regime over the Yangtze River and a non-propagating regime in southeast China. Simulations of these two diurnal rainfall regimes by 18 CMIP5 models were evaluated from the historical experiment of 1981-2005. The evaluation led to the identification of one model, the CMCC-CM that replicated the key characteristics of diurnal rainfall regimes including the propagation of moisture convergence. Using the CMCC-CM to assess the future (2076-2100) change of diurnal evolution and propagation projected by the RCP4.5 experiment, it was found that propagating diurnal rainfall will enhance and expand southward into the non-propagating regime in southeast China. This change in diurnal rainfall is attributed to the intensification of diurnal land-sea thermal contrast over eastern China and the southward shift of the upper-level jet stream over 20-30N. Similar projected changes in diurnal rainfall and associated large-scale dynamical mechanisms were also depicted by four other models (GFDL-ESM2G, GFDL-ESM2M, MRI-CGCM3, and MRI-ESM1) showing a higher skill in representing the diurnal rainfall regimes over East Asia. If such model projection holds true, southeast China will experience an increase in the eastward propagating diurnal rainfall, which could further impact Taiwan.