



## **The diurnal cycle of tropical large-scale overturning circulation**

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Observations are suggestive of a clear, persistent diurnal cycle in tropical large-scale overturning circulation (e.g., the Hadley cell). The phasing of this diurnal cycle implies the role of nocturnally amplified deep moist convection within the ascending branch of the overturning (e.g., the ITCZ). Some exemplary observations are first briefly reviewed. Numerical simulations are then discussed wherein the relationship between diurnally varying moist convection and large-scale circulation can be studied in a general sense—that is, in the framework of self-aggregated moist convection in radiative–convective equilibrium (RCE). In this framework, large-scale circulation develops (over roughly two weeks) and intensifies as initially scattered convective clouds aggregate into a developing moist patch. The diurnal cycle in this framework is characterized by a pronounced morning peak in rainfall, roughly consistent with the observed diurnal rainfall cycle over tropical open oceans. This diurnal rainfall cycle is the result of a pronounced diurnal cycle of convective clouds, which is coupled to a diurnal pulsing of the large-scale circulation.