

Wind Shear and Tropical Convection

Most of the tropics are covered with warm oceans. The overlying atmosphere is mostly cloud-free, but is also interspersed with randomly occurring convection (thunderstorms) and sometimes larger-scale convective systems. Radiative-convective equilibrium (RCE) is an idealization of the tropical atmosphere. It envisions a warm, moist atmosphere overlying a vast tropical ocean with constant surface temperature. Due to radiative cooling and surface evaporation, thunderstorms form spontaneously and populate the domain with clouds and localized precipitation. However, most studies of RCE set aside (i.e., set to zero) critical components of the real tropical atmosphere: mean surface wind and vertical wind shear. This study will address this shortcoming by performing extensive simulations of RCE with varying degrees of mean flow and wind shear, as well as considering other factors, such as the shapes of the wind shear profiles, the diurnal cycle, and the representation of precipitation processes. The graduate students will perform and analyze simulations of tropical convection and relate the results to dynamics in the real tropics. Students with undergraduate majors in sciences outside of meteorology are also welcome to apply. Note: This opportunity is contingent on available funding.

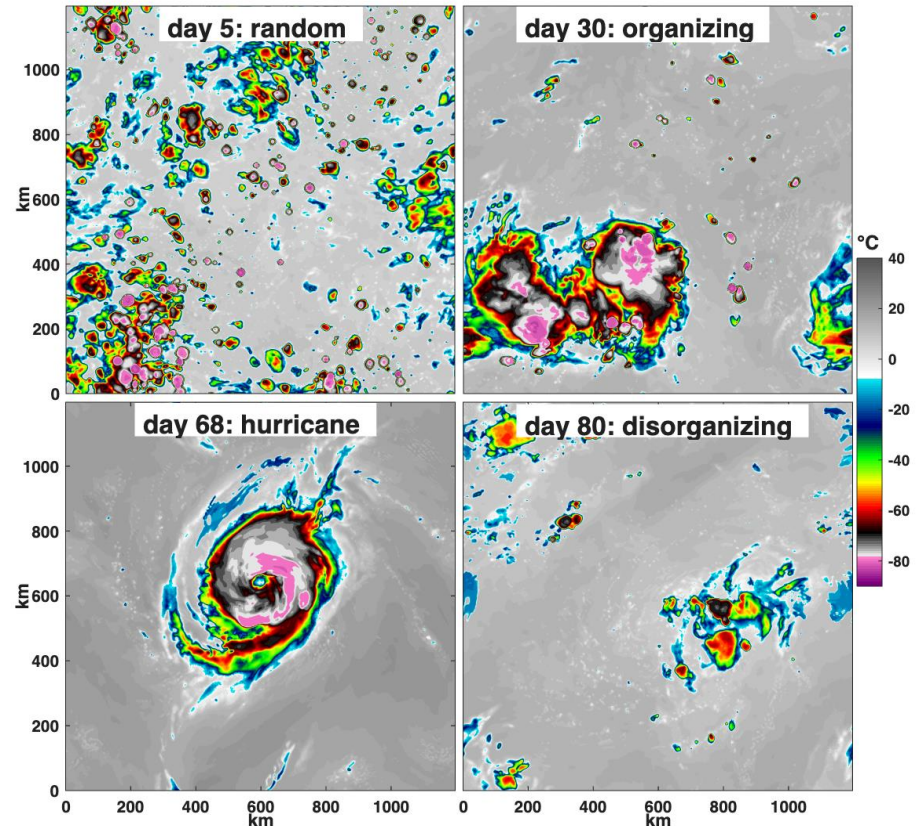


Figure: Temporal evolution of convection in a numerical simulation of random convection over a warm ocean, with Earth's rotation, mean surface wind, and wind shear. Colors show simulated IR brightness temperature.