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A Rotating Cloud-Resolving Radiative-Convective Equilibrium

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The results of rotating radiative-convective equilibrium (RCE) simulations performed over a wide range of prescribed sea-surface temperatures (SSTs) are presented. All simulations produce multiple coexisting tropical cyclones (TCs). The equilibrium number of TCs monotonically, but nonlinearly, decreases from 26 to 8 when SST increases from 21C to 36C. At the same time, the TCs' size, intensity, and per-TC precipitation rate increase with increasing SST. The results are consistent with scaling laws in which TC diameters scale with the potential intensity ratio to the Coriolis parameter. However, the separation between cyclone centers appears to scale with the deformation radius. Consequently, the number of TCs per unit area is inversely proportional to the saturation vapor pressure computed at the SST. The results also suggest that the TC outflow mean temperature measured at the height of the local maximum of the cloud fraction, tends to remain relatively invariant with SST.