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Tropical and Extratropical Warm-Core Cyclones in Cloud-System Resolving Aquaplanet Simulations under Different Meridional Sea-Surface Temperature Gradients

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We use a cloud-system resolving model that explicitly represents moist convection to study tropical cyclogenesis in warm climates. In doing these experiments we find that as the meridional SST gradient is reduced, the mid-latitudes become an active region of tropical cyclone (TC) formation and intensification. We also find a convergence in the physical properties and genesis locations of tropical and warm-core extra-tropical cyclones (ETC). These ETC originate from baroclinic waves when warm, moist air is advected into the center of synoptic storms. While end-members of both these types of storms remain very distinct, a large distribution of cyclones forming in the subtropics and mid-latitudes share properties between the two.
Since in these simulated climates the latitudes of TCs and ETCs overlap, it is necessary to objectively distinguish them without using genesis latitudes (as could be trivially done in climates equitable to contemporary Earth). We apply a formal clustering analysis based on geopotential heights to provide a physically-based definition of the two cyclone types. We discuss these cyclones and relate these findings to recent theoretical advances in understanding of the TC wind-pressure relationship.