

Upper level energy interactions between tropical cyclones and the environment

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A series of dynamics investigations have revealed important two-way interactions between tropical cyclones (and other convective weather systems) and the overworld environment (environment that does not come in contact with the surface except for convective plumes or tropical cyclones) that not only modulates the genesis and growth potential of the cyclone, but also results in the injection of potential energy from the cyclone into the overworld of the lower stratosphere and upper troposphere. This stored potential energy becomes active in modulating the growth of tropical cyclones by affecting the energy needed to develop the vertical circulation that connects the overworld and the underworld that is associated with the steady overturning of the tropical cyclone. Ultimately the additional stored potential energy deposited by the cyclone into the overworld, or other convective systems, is transported poleward through explicit interactions with Extratropical weather systems, such as Rossby waves and Extratropical cyclones rooted in the underworld. These interactions are needed to free the stored energy of angular momentum constraints that trap the energy in tropical latitudes, resulting from its isolation from surface momentum fluxes. In some cases, these interactions can be explicit, and in other cases, through global scale patterns erupting between the overall tropical overworld reservoir of potential energy and the polar cell. Studies showing the two-way nature of these energy interactions and their implications to tropical cyclone genesis as well as the general circulation will be discussed.