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summertime stationary waves integrate tropical and extratropical impacts on tropical cyclone activity

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Tropical cyclones (TC) are one of the most severe storm systems on Earth and cause significant loss of life and property upon landfall in coastal areas. A better understanding of their variability mech- anisms will help improve the TC seasonal prediction skill and mitigate the destructive impacts of the storms. Early studies focused primarily on tropical processes in regulating the variability of TC activity, while recent studies suggest also some long-range impacts of extratropical processes, such as lateral transport of dry air and potential vorticity by large-scale waves. Here we show that stationary waves in the Northern Hemisphere integrate tropical and extratropical impacts on TC activity in July through October. In particular, tropical upper-tropospheric troughs (TUTTs), as part of the summertime stationary waves, are associated with the var- iability of large-scale environmental conditions in the tropical North Atlantic and North Pacific and significantly correlated to the variability of TC activity in these basins. TUTTs are subject to the modulation of diabatic heating in various regions and are the preferred locations for extratropical Rossby wave breaking (RWB). A strong TUTT in a basin is associated with enhanced RWB and tropical−extratropical stirring in that basin, and the resultant changes in the tropical atmospheric conditions modulate TC activ- ity. In addition, the anticorrelation of TUTTs between the North Atlantic and North Pacific makes the TC activity indices over the two basins compensate each other, rendering the global TC activ- ity less variable than otherwise would be the case if TUTTs were independent.