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The Inland Maintenance and Reintensification of Tropical Storm Bill (2015). Part I: Contributions of the Brown Ocean Effect

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Abstract

Landfalling tropical cyclones (TCs) often decay rapidly due to a decrease in moisture and energy fluxes over land when compared to the ocean surface. Occasionally, however, these cyclones maintain intensity or reintensify over land. Post-landfall maintenance and intensification of TCs over land may be a result of fluxes of moisture and energy derived from anomalously wet soils. These soils act similarly to a warm sea surface, in a phenomenon coined the “brown ocean effect.” Tropical Storm (TS) Bill (2015) made landfall over a region previously moistened by anomalously heavy rainfall and displayed periods of reintensification and maintenance over land. This study evaluates the role of the brown ocean effect on the observed maintenance and intensification of TS Bill using a combination of existing and novel approaches, including the

evaluation of precursor conditions at varying temporal scales and making use of composite backward trajectories. Comparisons were made to landfalling TCs with similar paths that did not undergo TC maintenance and/or intensification (TCMI) as well as to TS Erin (2007), a known TCMI case. We show that the antecedent environment prior to TS Bill was similar to other known TCMI cases, but drastically different from the non-TCMI cases analyzed in this study. Furthermore, we show that contributions of evapotranspiration to the overall water vapor budget were nonnegligible prior to TCMI cases and that evapotranspiration along storm inflow was significantly ($p < 0.05$) greater for TCMI cases than non-TCMI cases suggesting a potential upstream contribution from the land surface.

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