15D.3 TROPICAL CYCLONE LANDFALL ON THE EAST ASIAN COAST FROM A STATISTICAL TRACK MODEL WITH ENSO-DEPENDENCE

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ABSTRACT

Tropical cyclones (TC) in the western North Pacific present a yearly threat to the East Asian coast, though the risk of landfall for cities like Manilla, Shanghai, Seoul, and Tokyo is not equal. Therefore, it is crucial to better understand the risk of landfall on a regional basis. One of the main climate influences on these TCs is the El Nino-Southern Oscillation (ENSO), which has been previously shown to have impacts on cyclogenesis location, track propagation, intensity, and landfall. We use a statistical tropical cyclone track model based on the International Best Track Archive for Climate Stewardship (IBTrACS) best track data in order to model the full lifecycle of TCs in the western North Pacific. The cyclogenesis and track propagation components of the model are dependent on the value of the JASO Nino3.4 Index, a measure of the state of ENSO during the peak of the TC season. TC maximum sustained winds (Vmax) are modeled using local linear regression of the change in Vmax on persistence, track speed, and an exponential term that limits intensification based on potential intensity.

An ensemble of simulations of the 1945-2007 period is made using the historical time series of the Nino 3.4 index. We compare these simulations to the track characteristics of the IBTrACS storms as a diagnostic, showing that the model is able to reproduce realistic TCs. Furthermore, the ensemble of simulations is used to evaluate return periods of intense landfalling TCs for five coastal regions with large populations. An investigation of western North Pacific TC behavior during extreme ENSO events is conducted by running 5000-year simulations at stationary values of Nino3.4 index: +2 for a strong El Nino and -2 for a strong La Nina. The largest change in landfall rates between the two extreme events occurs on the central and southeast regions of the mainland, centered on the coast of China. The dominant change is for higher landfall rates to occur during a strong La Nina due to genesis location shift to the northwest.

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