

Climate change initiated variation in the tracks of typhoons in the North West Pacific basin

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Increasing sea surface temperature (SST) due to climate change is potentially linked with the increasing strength of typhoons especially in the North West Pacific (NWP) basin in recent years. This research aims to quantitatively and climatologically analyze the tracks and cyclogenesis locations of all typhoons that occurred after 1976 in the NWP basin. The International Best Track Archive for Climate Stewardship (IBTrACS) and Optimum Interpolation (OI) SST V2 data directly accessed by the National Oceanic and Atmospheric Administration (NOAA) of USA, and the Centennial in situ Observation-Based Estimates (COBE) SST2 data of Japan Meteorological Agency (JMA) indirectly accessed by NOAA are used. The level of curviness in the track of a typhoon makes forecasting rather challenging for the atmospheric models, resulting in more prospective damages. Statistical analysis is carried out on fundamental typhoon parameters like maximum wind speed and central pressure. Also, statistical analysis was done for the typhoons based on their ocean of cyclogenesis and phases of El Niño Southern Oscillation (ENSO) at cyclogenesis. The Chi-square (χ^2) test shows that the curvy nature of tracks of typhoons supersedes the strength as far as the relation with longer survival of typhoons is concerned. More than double cyclogenesis is detected during the warm phase of ENSO than the cold phase. A gradual rise is observed in the frequency of typhoons during the warm phase of ENSO in the last 40 years. The warm phase of Pacific Decadal Oscillation (PDO) is also associated with the warm phase of ENSO and assists in cyclogenesis in the NWP basin. Convectively active phases of Madden Julian Oscillation (MJO) (phases 4, 5, 6, and 7) cause almost double cyclogenesis than non-MJO or convectively inactive phases in the NWP basin. A significant rise in the SST by more than 0.4 °C is measured in typhoon originating oceans for the whole typhoon season during the last 40 years. The El-Niño years significantly contribute to higher SST Anomaly (SSTA) values. The climatological analysis and statistical results validate each other and indicate climate change as the main reason behind the increasing intensity of typhoons in the NWP basin.

Keywords: Cyclogenesis, El Niño Southern Oscillation, Sea Surface Temperature Anomaly, Pacific Decadal Oscillation, Madden Julian Oscillation