Interbasin differences in environmental factors related to tropical cyclone genesis

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The genesis of tropical cyclone (TC) is known to be related to various environmental factors such as absolute vorticity (AV), relative humidity (RH), vertical wind shear (VWS), maximum potential intensity (MPI) and vertical wind velocity (VWV). On the basis of these factors, the genesis potential index (GPI) has been developed and widely used in researches on seasonal and multi-year variations for the TC genesis. This study investigated the correlation of yearly TC genesis variations with the GPI and the dominant environmental factors associated with TC genesis in 3 ocean basins, the western North Pacific (WNP), the North Atlantic (NA), and the eastern North Pacific (ENP). The environmental factors and TC genesis frequency were calculated using the monthly NCEP/NCAR Reanalysis data and the best track data from U.S. Navy's Joint Typhoon Warning Center (JTWC) for 1970–2013, respectively. For the TC peak seasons (JASO), the correlations between the yearly GPI and TC genesis frequency over the main TC genesis regions were high (statistically significant at the 99% confidence level) in both the NA (r=0.62) and the ENP (r=0.40), but very low in the WNP (r=-0.08). These differences were associated with interbasin discrepancy in major environmental factors related to the TC genesis and in their correlations with TC genesis: The GPI in the NA is mainly determined by AV, MPI and VWS, among which MPI and VWS were highly correlated with TC genesis (r=0.60 and r=0.64, respectively); The GPI in the ENP is primary influenced by VWS that were highly correlated with TC genesis (r=0.52); The GPI in the WNP is mostly affected by AV, RH and MPI, which were statistically uncorrelated with TC genesis (r=-0.09, r=-0.04 and r=-0.12, respectively). This result suggests that, unlike the NA and ENP, the TC genesis in the WNP is related to other factors rather than the well-known environmental factors.

Key words: Tropical Cyclone, Genesis Potential Index, Environmental Factors

* This research was a part of the project titled "Construction of Ocean Research Stations and their Application Studies" funded by the Ministry of Oceans and Fisheries, Korea.