

Comparing performance of tropical cyclone genesis potential indices by using a large ensemble simulation

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Tropical cyclogenesis (TCG) is influenced by environmental conditions: the Coriolis parameter, low-level relative vorticity, ocean thermal energy, relative humidity in the mid-troposphere, atmospheric static stability and vertical wind shear (Gray 1998). Based on these environmental parameters, previous studies proposed various tropical cyclone genesis potential indices (GPIs). Recent study showed performance of GPI depends on their definition by using multi model ensemble with output CMIP6 HighResMIP (Cavicchia et al., 2023). Our previous studies showed ensemble simulation improved evaluation of performance of a GPI (Emanuel and Nolan, 2004).

In this study, we used a large ensemble simulation with a global 14-kilometer mesh Nonhydrostatic ICosahedral Model (NICAM) to evaluate the performance of four forms of GPI (Emanuel, 2010, 2022; Emanuel and Nolan, 2004; Murakami and Wang, 2022). The model was run for the boreal summer (June-October) between 2009 and 2019.

The result showed correlation coefficients between GPI and TCG differ among ensemble members for all the GPI. Focusing on the relationship between GPI and TCG on the western North Pacific, correlation coefficient is 0.41 for GPI proposed by Emanuel and Nolan (2004), -0.15 for that of Emanuel (2010), 0.84 for that of Emanuel (2022), and 0.92 for that of Murakami and Wang (2022). This suggests vertical velocity is strongly contributed to TCG on the western North Pacific.

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