Tropical cyclone genesis potential in CMIP6 climate models

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Tropical cyclones (TCs) are regularly listed among the costliest natural disasters, due to the associated strong wind, heavy precipitation, and risk of storm surges. Therefore, being able to understand and predict TC activity at different time scales would lead to clear societal and economic benefits.

Several genesis potential indices (GPIs) have been introduced in the literature, linking TC activity to favourable conditions in a number of large-scale meteo-climatic variables. The advantage of using such indices lies in the ability to study TC occurrence in climate model simulations, which do not usually reproduce individual TC accurately due to the limited horizontal resolution.

Existing GPIs generally have good skill in reproducing the spatial pattern and seasonal cycle of historical TC activity. On the other hand, they commonly fail to reproduce TC interannual variability across different ocean basins. A further issue is found for climate projections where, for those climate models with high-enough resolution to allow for TC tracking, the trends of GPI and directly detected cyclones are often in disagreement.

Here we revisit the issue of TC genesis potential in reproducing TC activity by exploiting the last generation of climate model simulations, obtained from the CMIP6 model intercomparison project. Using data obtained from both the ScenarioMIP and HighResMIP simulations, we investigate the effect of horizontal resolution and other model features on the modelled GPI's skill in reproducing TC interannual variability and trends.