Modeling Tropical Cyclone induced Power Dissipation Index: dependency on spatial and temporal resolution

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Abstract

The interaction between Tropical Cyclones (TCs) and ocean is a major mechanism responsible for energy exchange between the atmosphere and the ocean. TCs also affect the thermal and dynamical structure of the ocean, but the magnitude of the impact is still uncertain. Very few CMIP5 models demonstrated ability in representing TCs, mainly due to their horizontal resolution. On the other hand new generation Coupled General Circulation Models (CGCMs) planning to participate to the HighResMIP effort within CMIP6, with horizontal resolution up to ¼ degree, can represent also category-5 hurricanes. We aim to quantify the improved representation of TC intensity from CMIP5 to CMIP6 CGCM generation. Also, a good representation of the TC-Ocean interaction strongly depends on the coupling frequency between the atmospheric and the ocean components: in this work, we quantify the effect of a better representation of the negative Sea Surface Temperature - TC induced feedback, through a high (hourly) coupling frequency, in the reduction of the TC induced Power Dissipation Index (PDI) positive bias appearing in the high resolution simulations.

Keywords: Tropical Cyclones, Sea Surface Temperature, Coupled General Circulation Model, horizontal resolution, coupling frequency.

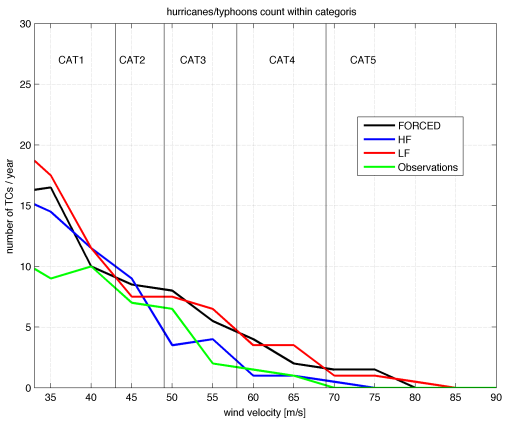

Figure 1: Tropical Cyclone count distribution among intensity classes in ¼ degree resolution Atmosphere only (black), daily coupled atmosphere-ocean (red) and hourly coupled atmosphere-ocean (blu) simulations. Green line represents observations.