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Sensitivity of Tropical Cyclones to Resolution, Convection Scheme and Ocean Flux Parameterization over Eastern Tropical Pacific and Tropical North Atlantic Oceans in RegCM4 Model

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The sensitivity of simulated tropical cyclones (TC) to resolution and convection scheme parameterization is investigated over the CORDEX Central America domain. The performance of the simulations, performed for a ten-year period (1989-1998) using ERA-Interim reanalysis as boundary and initial conditions, is assessed considering 50 km and 25 km resolution, and the use of two different convection schemes: Emanuel (Em) and Kain-Fritsch (KF). Two ocean surface fluxes are also compared as well: the Monin-Obukhov scheme, and the one proposed by Zeng et al. (1998).
By comparing with observations, for the whole period we assess the spatial representation of the TC, and their intensity. At interannual scale we assess the representation of their variability and at daily scale we compare observed and simulated tracks in order to establish a measure of how similar to observed are the simulated tracks.
In general the simulations using KF convection scheme show higher TC density, as well as longer-duration TC (up to 15 days) with stronger winds (> 50ms-1) than those using Em (<40ms-1). Similar results were found for simulations using 25 km respect to 50 km resolution. All simulations show a better spatial representation of simulated TC density and its interannual variability over the Tropical North Atlantic Ocean (TNA) than over the Eastern Tropical Pacific Ocean (ETP). The 25 km resolution simulations show an overestimation of TC density compared to observations over ETP off the coast of Mexico. The duration of the TC in simulations using 25km resolution is similar to the observations, while is underestimated by the 50km resolution. The Monin-Obukhov ocean flux overestimates the number of TCs, while Zeng parameterization give a number similar to observations in both oceans.
At daily scale, in general all simulations capture the density of cyclones during highly active TC seasons over the TNA, however the tracks generally are not coincident with observations, except for highly active seasons. Over the ETP the observed daily scale variability of TC is higher and models in general fail to reproduce the observed TC density and tracks. As for interannual scales, at daily scale, the 25 km resolution and those using KF, show an improvement regarding the TC density and tracks than the 50 km resolution and those using Em respectively.