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Tropical Cyclones - Ocean feedbacks: Effects on the Ocean Heat Transport as simulated by a High Resolution Coupled General Circulation Model

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Tropical cyclones (TCs) activity and their relationship with the Northern hemispheric Ocean Heat Transport (OHT) is investigated. The analysis has been performed using 20C3M (20th Century) and A1B (21st Century) IPCC scenario climate simulations obtained running a state-of-the-art atmosphere-ocean-seaice coupled global model, with high-resolution in the atmosphere. The capability of the model to reproduce a realistic TC climatology has been assessed by comparing the model results from the simulation of the 20th Century with observations. The model is able to simulate tropical cyclone-like vortices with many features similar to the observed TCs. The simulated TC activity exhibits realistic structure, geographical distribution and interannual variability, indicating that the model is able to reproduce the major basic mechanisms that link the TC activity with the large scale circulation.

The TC-induced ocean cooling is well represented and the TCs activity increases significantly the poleward OHT out of the tropics, but also increases the heat transport into the deep tropics. This effect, investigated looking at the 100 most intense Northern hemisphere TCs, is strongly correlated to the TC-induced momentum flux at the surface of the ocean: the winds associated to the TCs significantly weaken the Trade Winds in the 5-18oN latitude belt and reinforce them in the 18-30oN band. TCs frequency and intensity appear to be substantially stationary through the whole 1950- 2069 period. Also the effect of the TCs induced OHT (TCiOHT) does not significantly change during the simulated period.