

Impacts of a Weakened Atlantic Meridional Overturning Circulation on Tropical Cyclone Activity in a Warming Climate

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Future changes in tropical cyclones (TC) formation under anthropogenic warming remain highly uncertain as they will result from a number of distinct dynamical processes themselves with complex climate sensitivities and impacts. One such process is the projected weakening of the Atlantic Meridional Overturning Circulation (AMOC) under greenhouse warming. This weakening is understood to cool midlatitude Atlantic surface temperature while also displacing the jet stream poleward. Here we seek to understand the implications of this for twenty-first century TCs. Following Liu et al. (2020), we isolate the AMOC impacts using two simulations of a coupled climate model: a standard 21st century RCP8.5 simulation that projects AMOC weakening and a second, mechanism denial experiment in which we fix the AMOC intensity by gradually removing freshwater in the high latitude North Atlantic. We find an overall suppression of tropical cyclone genesis in the Northern Hemisphere in a warm climate in which the AMOC is weakened. Also, in a warm climate with a declining AMOC, we also observe an enhancement of tropical cyclogenesis near the US Eastern Seaboard and Gulf of Mexico, likely impacted by changes in vertical wind shear. Our results highlight the important role that the weakening AMOC may play in future changes in tropical cyclone activity.