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Ocean-atmosphere interaction in the Atlantic storm track response to climate change

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It is often asserted that climate models predict a poleward shift of the midlatitude storm tracks in response to anthropogenic greenhouse-gas forcing. While this is true to some extent in the zonal mean, the response of the North Atlantic storm track is quite different, consisting of a strengthening and eastward extension of the storm track which is particularly apparent on its southern flank. These changes are expected to have considerable societal impact.

Several theories have been proposed to explain the more general poleward shift of the storm tracks and associated jets, and these theories focus exclusively on atmospheric dynamics. Here we show that ocean-atmosphere dynamical coupling is a key process which shapes the distinct storm track response in the North Atlantic. In particular, the weakening of the Atlantic Meridional Overturning Circulation limits the anthropogenic warming in the North Atlantic and so influences storm activity via changing temperature gradients. At least half of the model uncertainty in the storm track response is associated with uncertainty in the ocean circulation changes.