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Decomposition of the Mean Barotropic Transport in a High-Resolution Model of the North Atlantic Ocean

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We show how a barotropic shallow water model can be used to decompose the mean barotropic transport from a high-resolution ocean model based on the vertically averaged momentum equations. We apply the method to a high-resolution model of the North Atlantic for which the local vorticity budget is both noisy and dominated by small spatial scales. The shallow water model acts as an effective filter and clearly reveals the transport driven by each term. The potential energy (joint effect of baroclinicity and bottom relief) term is the most important for driving transport, including in the northwest corner, while mean flow advection is important for driving transport along f/H contours around the Labrador Sea continental slope. Both the eddy momentum flux and the mean flow advection terms drive significant transport along the pathway of the Gulf Stream and the North Atlantic Current.