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The impact of changing ocean eddies pathways on regional sea surface height extremes in the North Atlantic

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Ocean eddies strongly influences short-term variations in sea surface height (SSH). Changing ocean circulation can lead to shifting eddy pathways, which may cause an additional contribution to sea level extremes in different regions. Therefore, dynamic sea surface height (SSH) changes that occur in the North Atlantic due to an abrupt weakening of the Atlantic Meridional Overturning Circulation (AMOC) are simulated using the Parallel Ocean Program (POP). The weakening of the AMOC is introduced by applying strong freshwater perturbations around Greenland. To study the effect of ocean model resolution, simulations are performed using a high-resolution (HR) strongly eddying model version and a low-resolution model (LR) version in which the effect of eddies is parameterized. Results show that a rapid decrease of the AMOC in the HR version leads to a change in the main eddy pathways in the North Atlantic associated with a change in the separation latitude of the Gulf Stream. This induces shorter return times of different regional and coastal extremes in North Atlantic SSH than in the LR version. This effect causes an additional short-term SSH change of several centimeters, which may occur during an already high background sea level.