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Early warning signals of AMOC collapse from North Atlantic array observations

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The Atlantic Meridional Overturning Circulation (AMOC), one of the most prominent climate tipping elements on Earth, can potentially collapse as a consequence of surface freshwater input in the North Atlantic. A collapse from its current strong northward overturning state would have major impacts for the global climate system. Although available reconstructions appear to indicate a gradual weakening of the AMOC over the last century, the proximity of the climate system to a potential future collapse of the AMOC remains unknown. Here, we use the results of the first AMOC tipping event modelled in a state-of-the-art Global Climate Model, the Community Earth System Model (CESM), to identify regions and variables that play a key role in a forthcoming AMOC collapse and can therefore serve as early-warning signals (EWS). We analyse the statistical EWS properties using two steady state simulations with the same CESM version, the steady state simulations differ in the distance to the AMOC tipping point. These results will subsequently be used to assess the usefulness of observations from the SAMBA, RAPID and OSNAP arrays to determine whether the present-day AMOC is approaching a tipping point.