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Uncertainties too large to predict tipping times of major Earth system components

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Observations are increasingly used to detect critical slowing down (CSD) in potentially multistable components of the Earth system in order to warn of forthcoming critical transitions in these components. In addition, it has been suggested to use the statistical changes in these historical observations to extrapolate into the future and predict the tipping time. We argue that this extrapolation is too sensitive to uncertainties to give robust results. In particular, we raise concerns regarding (1) the modelling assumptions underlying the approaches to extrapolate results obtained from analyzing historical data into the future, (2) the representativeness of individual time series representing the variability of the respective Earth system components, and (3) the effect of uncertainties and preprocessing of the employed observational datasets, with focus on non-stationary observational coverage and the way gaps are filled. We explore these uncertainties both qualitatively and quantitatively for the Atlantic Meridional Overturning Circulation (AMOC). We argue that even under the assumption that these natural systems have a tipping point that they are getting closer to, the different uncertainties are too large to be able to estimate the time of tipping based on extrapolation from historical data.