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The AMOC variability in millennial simulations with the ECHO-g atmosphere-ocean general circulation model.

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The main aim of this study is to analyse the AMOC variability in one 1000-yr long control simulation, two forced simulations of the last millennium and two IPCC climate change scenario simulations (A2 and B2), all performed with the ECHO-g Atmosphere-Ocean General Circulation Model (AOGCM). Several Meridional Overturning Indices (MOI) are used to describe the behaviour of ocean circulation in these simulations. Their evolution shows a weakening in the AMOC during the industrial era that intensifies through the 21^{st} century. No complete collapse of the AMOC is observed. Fourier and Wavelet spectral analysis of the indices reveals an AMOC behaviour close to a red noise process and a tendency to present larger variability at interannual and multidecadal timescales. The short-term AMOC variability is similar in all the simulations, and is associated to atmosphere dynamics that forces the ocean through changes in the wind stress. Low frequency forced and unforced AMOC variability responds to anomalies in ocean density. These are localized in the Atlantic basin in the control run, and develop at global-scales in the forced simulations.