Lightning Talk: Atlantic Meridional Overturning Circulation (AMOC) Tipping Point: A GAN Test Case

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Abstract

Using the four-box AMOC model described by Gnanadesikan (1999), we aim to identify underlying causes of the inter-model differences in projected AMOC strength under global warming. Using outputs from 1850-2100 under SSP3-70, we fit vertical and isopycnal mixing rates and the parameter for resistance (as in Brett et al. 2022) to overturning for two global climate models, the Community Earth System Model (CESM2) and the Goddard Institute for Space Studies model (GISS-E2.1). Human exploration of the thus-fitted surrogates for these two global climate models shows that the AMOC shutoff occurs under different strengths of the hydrological cycle and winds over the Southern Ocean. Using a multi-generator tipping-point GAN (generative adversarial network, TIP-GAN, Sleeman et al. 2022) will allow for the identification of the separatrix in the 10-dimensional space of the surrogates, rather than the 2D space explored by hand. The results of the continuing work will feed back into the global models by allowing scientists to better understand inter-model disagreement and the risks of the AMOC tipping point in a warming climate.

References

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