Assessing uncertainties on the stability of the AMOC during Heinrich events using simulations from one Earth System model

Marlos Goes[2,1] , Lisa Murphy[3], Amy Clement[3]
[1]Atlantic Oceanographic and Meteorological Laboratory, NOAA, Miami, FL,
[2]Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Miami, FL,
[3]Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL

.

In a recent paper (Murphy et al. 2017), two modes of stability of the Atlantic Meridional Overturning Circulation (AMOC) were simulated by changing the background wind climatology in the University of Victoria (UVic) earth system model. In the simulations that presented a stronger AMOC, the AMOC was in a stable mode, as opposed to the simulations with a weaker AMOC, in which the AMOC could exist in two stable modes. Previous studies that used the same model to produce an ensemble with parametric uncertainties driven by vertical mixing, showed the opposite effect, where the simulations with stronger AMOC were more unstable. To tackle this conundrum, we analyze an extended UVic model ensemble featuring parametric uncertainty related to wind forcing, freshwater housing and vertical mixing to understand the role of feedbacks between the ocean, ice and surface fluxes on the AMOC stability. Analyzing parametric uncertainty rather than structural (multi-model) uncertainties may provide a better framework to understand the processes underlying the AMOC stability process.