



Millennial-scale Oscillations in a Box Model of the Atlantic Overturning: The Role of Sea Ice

Ben Marzeion (1) and Harald Bartenstein (2)

(1) University of Innsbruck, Center of Climate and Cryosphere, Innsbruck, Austria (ben.marzeion@uibk.ac.at), (2) University of Innsbruck, Institute of Meteorology and Geophysics, Innsbruck, Austria (bartenstein@gmx.net)

We investigate the role of sea ice in the mechanism of self-sustained, millennial-scale oscillations of the Atlantic Meridional Overturning Circulation (AMOC).

The ocean box model is driven both by wind and thermohaline forcing. It exhibits multiple equilibria, and millennial-scale oscillations in certain regions of the parameter space. The mechanism of the oscillation is based on a rapid flushing of positive salinity anomalies in the northern North Atlantic by convective mixing, and the accumulation of a new salt anomaly further south following the collapse of the AMOC (Johnson et al., 2007).

Based on this single-basin box model, we build a hierarchy of models by including a second ocean basin (both basins being connected by the Southern Ocean), an atmospheric box model, and simple parameterizations of land ice and sea ice. We explore the models' behavior in parameter space, and particularly focus on the role of sea ice in the North Atlantic in modulating the oscillatory mechanism.