

Mechanisms behind climate oscillations in full-glacial simulations.

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Millennial-scale variability has been extensively observed across the last glacial period records (115 to 12 thousand years ago) but our lack of understanding of its mechanisms makes it hard to reproduce in general circulation models. Most attempts at theorising millennial-scale variability have involved vast transfers of salt between the subtropical and subpolar gyres, often referred to as the salt oscillator mechanism, that in turn controlled the intensity of the north Atlantic current. We believe that the salt oscillator is in fact part of a larger harmonic motion spanning through all components of the climate system and that can enter into resonance under the specific boundary conditions and/or forcing.

We investigate these conditions using a new set of last glacial maximum (~21 thousand years ago) simulations that oscillate when forced with snapshots of the early last deglaciation meltwater history. The oscillations consist of shifts between cold modes with a weak to almost collapsed Atlantic Meridional Ocean Circulation (AMOC) and warmer and stronger AMOC modes, with large reorganisation of the deep-water formation sites, surface ocean and atmospheric circulations. The mapping of the main salinity and heat fluxes in the North Atlantic provide the opportunity to introduce a new interpretation of the salt oscillator including the effect of stochastic or prescribed forcing.