Geophysical Research Abstracts, Vol. 8, 05874, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05874

The driving of millennial oscillations in a two-dimensional ocean model

L. A. te Raa (1), T. Huck (2)

(1) Institute for Marine and Atmospheric Research Utrecht, Utrecht, the Netherlands, (2) Laboratoire de Physique des Oceans, Brest, France (l.a.teraa@phys.uu.nl)

Strongly nonlinear oscillations with periods of several millennia are known to exist in ocean models of varying complexity, ranging from box models to three-dimensional general circulation models. Although a lot of information about these oscillations has been gathered, their precise driving is still unclear. As these oscillations might be related to long-term climate variations during the last glacial period, understanding their physical mechanism and their sensitivity to various processes is essential. In this study, we investigate millennial oscillations in a two-dimensional thermohaline ocean model under mixed boundary conditions. They are found to be one out of two possible types of internal oscillations that can exist in such a model, the other type being centennial oscillations. The millennial oscillations turn out to be robust over a much larger range of friction coefficients than the centennial oscillations. The relation between both types of oscillations is investigated through the construction of (approximate) bifurcation diagrams. Contrary to previous studies, we find that convection is not essential for the millennial oscillations to occur, although it does affect the parameter range for which oscillations exist. A new description of the physical mechanism of the millennial oscillations will be given, based on the evolution of the meridional overturning and the large scale density gradient.