Geophysical Research Abstracts
Vol. 14, EGU2012-5044, 2012
EGU General Assembly 2012

Impact of planetary waves on ice-sheet evolution throughout the last glacial - interglacial cycle

P. Beghin (1), S. Charbit (1), C. Dumas (1), M. Kageyama (1), D.M. Roche (1), and C. Ritz (2)

(1) Laboratoire des Sciences du Climat et de l'Environnement, Gif sur Yvette, France (pauline.beghin@lsce.ipsl.fr), (2) Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France

Planetary waves can be forced by azonal heating patterns due for example to land-sea contrast, by the topography or by transient eddies. A lot of studies have shown that orographic effect have a great impact on the evolution of ice sheets, and, in turn, that large continental ice masses strongly influence the stationary waves pattern .
In general circulation models (GCMs), all these effects are explicitly represented through equations of dynamics but their influence cannot be studied separately. By contrast, in the climate model of intermediate complexity CLIMBER, planetary waves are parameterized as a function of the azonal component of sea-level pressure which depends (in our own version of the model) on the azonal sea-level temperature and the orography. It is therefore much simpler to investigate the influence of both thermal and orographic effects with this kind of model. The other great advantage of CLIMBER compared to GCMs is its small computational time. Moreover it has been coupled to the 3D thermo-mechanical ice-sheet model GRISLI and is therefore well suited for studies of climate-ice sheet interactions at the $\sim$ 100 kyr time scale.
Using the CLIMBER-GRISLI model, we investigate in this study the role of both thermal and orographic forcings on the evolution of past Northern hemisphere ice sheets. To achieve this goal, three types of parametrizations of planetary waves are tested and compared to our reference simulation (i.e. planetary waves are removed). The first one relies only on the thermal effect ; the second one only uses the orographic effect ; and the last one is a combination of both. Results are analysed in terms of temperature and accumulation pattern changes and their influence on the simulated climatic cycles.
The choice of these parameterizations is shown to have a strong impact on the dynamics of the glaciation history.