Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00741, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00741
EGU General Assembly 2008


# Improving the representation of small-scale processes with a finite element sea-ice model

**O. Lietaer** (1,2), S. Bouillon (2,1), T. Fichefet (2), V. Legat (1)

(1) Université catholique de Louvain, Centre for Systems Engineering and Applied Mechanics, Belgium, (2) Université catholique de Louvain, G. Lemaitre Institute of Astronomy and Geophysics, Belgium (olivier.lietaer@uclouvain.be)

A finite element, unstructured grid sea-ice model is used to investigate the benefits from resolving small-scale processes in sea-ice modeling. Our model has representations of both dynamic and thermodynamic sea-ice processes and includes viscous-plastic rheology along with a complete parametrization of the atmospheric fluxes. Unstructured meshes, with their natural ability to fit boundaries and increase locally the mesh resolution, propose an alternative framework to capture the complex oceanic areas formed by coasts and islands. In particular, higher mesh resolution in the vicinity of the coastlines and the islands allows for representing the formation of shelf-water polynyas. We show such an example in the Svalbard Archipelago where an offshore-oriented wind along with fine mesh resolution yields a rapid decrease in the mean ice thickness and the ice concentration on a 10-days period.

Furthermore, a numerical experiment has been performed to investigate the influence of resolving the narrow straits of the Canadian Arctic Archipelago on the sea-ice features in the Arctic. Our study shows that no significant change is found on the large-scale sea-ice features in our model, the impact on the thickness pattern being merely local. However, we emphasize that the local and short-term influences of the ice exchanges are non-negligible. In particular, depending whether the straits are open or closed in the numerical experiment, the domain boundary and the associated boundary condition influence directly the numerical solution in the proximity of those straits. Moreover, the ice fluxes through the Archipelago represent a non-negligible freshwater flux towards Baffin Bay and the Labrador Sea, whose impact on the convective

overturning is still unclear.

Finally, some numerical simulations of the Southern Ocean sea-ice are presented.