Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08914, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08914
EGU General Assembly 2008

Investigation of wind-driven, coastal polynya dynamics with a mass and momentum conserving, one-dimensional model

M. A. Morales Maqueda (1), I. A. Walkington (2), A. J. Willmott (1)

(1) Proudman Oceanographic Laboratory, United Kingdom (mamm@pol.ac.uk, ajwil@pol.ac.uk), (2) Department of Engineering , The University of Liverpool, United Kingdom (I.A.Walkington@liverpool.ac.uk)

Sea ice growth in wind-driven, coastal polynyas is believed to be an important mechanism for the formation of dense, intermediate and deep waters in the Arctic Ocean and subarctic seas. Coastal polynyas are typically only a few kilometers wide and so are difficult to resolve in current sea ice-ocean models. For this reason, the dynamics of these polynyas have been often investigated with relatively simple flux models that use the ice continuity, or mass balance, equation to calculate polynya evolution [Willmott et al., 2007]. Here we discuss the strengths and weaknesses of the flux model approach and extend it to include conservation of momentum as well as mass. We show that mass and momentum conserving models behave in ways sensibly different from traditional flux polynya models. In particular, while flux models admit polynya solutions that open to a steady state in times scales of hours to days, models that conserve both ice mass and ice momentum tend to create polynyas that open indefinitely.

REFERENCES

Willmott, A. J., Holland, D. M. and Morales Maqueda, M. A., 2007. Polynya Modeling. In Polynyas: Windows into Polar Oceans. Eds. W. O. Smith and D. Barber. Elsevier Oceanography Series (David Halpern, series Ed.).