Geophysical Research Abstracts, Vol. 9, 05536, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05536

Investigating Open Ocean Deep Convection in the Greenland Sea using adaptive modelling techniques.

Zoe Roberts(1), Peter Killworth(1), Matthew Piggott(2), Colin Cotter(2), Lucy Bricheno(2), David Ham(2), Chris Pain(2).

(1) National Oceanography Centre, Southampton, UK, (2) Imperial College, London, UK (zlr@noc.soton.ac.uk)

Open Ocean Deep Convection (OODC) is the process by which extremely dense deep water is formed. It is known to occur in only a few regions worldwide, and is sporadic in nature, making observations difficult. One region where OODC is known to occur is the Greenland Sea.

Studies have shown that small-scale features of open ocean deep convection (OODC) are of importance for climate e.g. Marotzke and Scott (1999), Dickson et al. (1996). However, traditional parameterisations for OODC in general circulation models (GCMs) omit these details because of poor resolution. There is therefore a need for greater understanding of the OODC process and its implications for climate change.

An investigation into the sensitivity of OODC to factors such as meteorology (wind, ice), bathymetry and stratification has been conducted using a numerical model. Initially, simplified box models of convection forced by uniform and disc cooling were conducted on fixed and adapting meshes and comparisons made. A simplified Greenland Sea basin was then designed and the sensitivity of simulated disc forced convection to the factors was tested on an adaptive mesh. Finally, a realistic Greenland Sea basin was formulated using GEBCO bathymetry, and realistic forcings such as NCEP winds will be used to force the model in conjunction with the disk cooling problem.

The Imperial College Ocean Model (ICOM) (Ford et al. 2004 a,b) is a 3D finite element non-hydrostatic model with an adaptive, unstructured mesh and non-uniform resolution, allowing modelling on the basin scale (e.g. gyre circulation) and resolution of small scale features such a s OODC simultaneously.

Due to the novel use of a finite element adaptive mesh in this investigation, classical fluid dynamics problems have been simulated in order to quantitatively assess the presence of numerical diffusivity, and compare the model with other non-hydrostatic models.