Geophysical Research Abstracts, Vol. 9, 01096, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01096

The Impact on the Ocean of Extreme Greenland Sea Heat Loss in HadCM3

J. P. Grist, S. A. Josey and B. Sinha

National Oceanography Centre, Southampton, UK (jyg@noc.soton.ac.uk / FAX: +44 23 8059640 / Phone: +44 23 80597738)

The ocean response to air-sea flux variability in the Greenland Sea is investigated using the 1000 year control run of the coupled ocean-atmosphere model, HadCM3. Evaluation of the density flux reveals that net heat flux anomalies have a greater impact on surface density changes than anomalies in both net evaporation and ice melt / formation. Averaged over the Greenland Sea, the annual mean density flux due to heat loss is 1.8 x 10^{-6} kg m^{-2} s^{-1}, over an order of magnitude greater than the net evaporation and the ice melt / formation terms, which are –0.1 and –0.2 x 10^{-6} kg m^{-2} s^{-1} respectively. Extreme winter heat loss events reach 250 Wm^{-2} and are associated with reduced ice cover and anomalously strong northerly airflow over the Greenland Sea. They result in enhanced convection and modify the properties of deep water flowing south through the Denmark Strait. The dense water transport increases by about 30% when the strongest and weakest heat loss events are compared. We also find significant correlations between deep western basin temperatures at 60, 55 and 49 ^{o}N and the Greenland Sea heat flux anomalies which peak at lags of up to 4 years with the time delay increasing towards more southerly latitudes. Our results suggest that extreme Greenland Sea heat flux events are key to understanding recent observations of significant interannual variability in Denmark Strait transport characteristics.