Geophysical Research Abstracts, Vol. 7, 05623, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05623

Exploring the high latitude ocean with Seagliders

P.Rhines, C.Eriksen, C.Lee and H.Hatun
Univ. of Washington

The northern subpolar zone is a region of 'tall' dynamics, from high in the stratosphere to deep in the ocean. Strong interactions occur up and down through atmosphere and ocean, and affect global climate strongly, the important tropical precursors of high-latitude climate variability notwithstanding.

Two autonomous undersea hydrographic samplers, or Seagliders, were launched west of Greenland during each of the winters of 2003/04 and 2004/05. These vehicle traversed the Labrador Sea gyre, its boundary currents and shelf-break front, and in 2004/05 made the first AUV sections across a major oceanic passage connecting Arctic and Atlantic (the Davis Strait). Roughly 3000 profiles (of hydrography, with a lesser number of oxygen, fluorescence and particle scattering) have been collected to date in multiple crossings of the Sea , together with depth-averaged velocity and fine-scale vertical velocity profiles. With horizontal resolution of 1.5 to 2.5 km we can see the inner detail of eddies, fronts, temperature/salinity fine structure, and upper ocean T/S structure. Distinct warming of the Labrador Sea's Irminger Water is seen between the two winters. The freshwater loading of the upper ocean (the 'resistance to convection') is evaluated, as is the ability of the horizontal velocity estimate to provide the reference velocity for the geostrophic velocity field.

The observational program provides input to the debate about the decline of subpolar gyre circulation seen from altimetry, and also to the problem of the interaction of subpolar gyre circulation and the global meridional overturning. This latter interaction is difficult to represent in climate models, and hence is important to address observationally.

This work provides the beginning of intense sampling of an essential part of the global ocean climate system with resolution appropriate to its structure. There remains the difficult problem of sampling the shallow continental shelf regions which transport

significant low salinity waters, and this will be discussed.