Geophysical Research Abstracts, Vol. 8, 07865, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07865

Propagation of wave signals along the western boundary and their link to ocean overturning in the North Atlantic

V. Roussenov (1), R.G. Williams (1) and C.W. Hughes (2)

(1) Department of Earth and Ocean Sciences, Liverpool University, Liverpool, UK, (2) Proudman Oceanographic Laboratory, Liverpool, UK (v.roussenov@liv.ac.uk)

Changes in high latitude forcing induce changes in overturning, which are communicated over the basin through wave propagation and advection along the western boundary. This communication process is explored here using an isopycnal model (MICOM) with horizontal resolution of 0.23 degrees on a Mercator grid. The model is integrated over realistic topography and driven by wind and buoyancy forcing. A transient model tracer is released in Labrador Sea in order to monitor the deep advection after the climatological mean state has been reached. Twin experiments are conducted during the last 10 years of integration with either unchanged or altered wind and buoyancy forcing. High latitude forcing perturbations lead to a pressure signal rapidly propagating along the western boundary on a timescale of several months. This rapid communication is induced by boundary waves, a mixture of Kelvin and topographic Rossby waves, and is followed by an intermediate response involving changes in local circulation and layer thickness, excited by the waves. Eventually, there is a slower far-field, advective response, as marked by the arrival of the Labrador Sea tracer with a timescale of typically several years. The frequency response of the wave signals alters with latitude with shorter periods confined to northern latitudes, while only longer period oscillations (of several months or longer) reach the tropics. This wave communication is associated with changes in the ocean overturning streamfunction. The numerical experiments are designed to provide insight into the ongoing UK RAPID monitoring experiment, WAVE (Western Atlantic Variability Experiment), along the western boundary of the North Atlantic by Hughes, Marshall, Williams and Meredith.