Geophysical Research Abstracts
Vol. 13, EGU2011-13629, 2011
EGU General Assembly 2011

Variability of thermocline and Antarctic Intermediate Water (AAIW) in the South Atlantic

Gerard McCarthy, Elaine McDonagh, and Brian King
National Oceanography Centre, Southampton, United Kingdom (gdm2v07@noc.soton.ac.uk)

There are two major impacts on the salinity of the thermocline and intermediate waters of the South Atlantic: the rate of inflow from the Indian Ocean and changes in the hydrological cycle - both of these are important climatically. The amount of inflow of warm, salty thermocline and intermediate water from the Indian Ocean into the South Atlantic has been shown by modelling (Biastoch et al., 2008) and paleooceanographic (Peeters et al., 2004) studies to have an effect on the strength of the MOC on decadal and historical timescales respectively. Likewise, a predicted intensification of the hydrological cycle (IPCC [2007]) has been linked with freshening of thermocline and intermediate waters in the southern hemisphere (Wong, Nature [1999], Bindoff and McDougall, JPO [2000], Curry et al., Nature [2003]). Changes in the salinity of the thermocline and intermediate water masses in the South Atlantic are analysed in the context of these factors.

Our analysis of repeat hydrographic sections at 24S (McCarthy et al., JPO [in press]) has shown basinwide changes in salinity in the thermocline. A salinification of 0.03 occured through the thermocline from 1958 to 1983 and a freshening of 0.05 from 1983 to 2009. Antarctic Intermediate Water (AAIW) was observed to increase in salinity by 0.03 from 1958 to 1983, which was different from other ocean basins where it had been freshening. It remained at the same salinity in 2009. A novel technique of combining salinity and oxygen measurements showed that the increase in salinity was related a higher proportion of older (lower oxygen), more saline AAIW being present in the 1983 and 2009 sections. The origin of this change is shown to be most likely due to increased inflow from the Indian Ocean.

Interannual variability of the salinity of AAIW and thermocline waters was investigated using Argo data. Salinity features which propagate westwards across the basin are the dominant mode of interannual salinity variability. The speeds with which these is lower than first mode baroclinic Rossby waves, which are visible in SSH signals. The signals appear to intensify in latitudes close to the Indian Ocean inflow.

Model data from a 40 year NEMO run was used to unify the interannual variability seen in Argo and the decadal changes seen in the hydrographic data. The model confirmed the presence of slow, westward propagating features in AAIW as the dominant mode of variability over both interannual and longer timescales. It also highlighted a slow oscillation in thermocline properties, which the Argo record would not be lengthy enough to resolve, but which was consistent with the sort of changes seen in the hydrographic data.