Geophysical Research Abstracts
Vol. 14, EGU2012-13236, 2012
EGU General Assembly 2012
© Author(s) 2012

Variations in the Strength of the North Atlantic Bottom water during Holocene.

C. Kissel, A. Van Toer, E. Michel, and E. Cortijo

CEA/CNRS/UVSQ, Laboratoire des Sciences du Climat et de l'environnement, Gif-sur-Yvette Cedex, France (KISSEL@LSCE.IPSL.FR, 0033 169823568)

One aspect of the Past4Future project is to combine multidisciplinary approaches to monitor changes in ocean circulation during previous interglacial periods. In the framework of this project, our study focusses on the changes in the strength of the North Atlantic deep water during the Holocene period using multiproxy analysis (magnetic and sedimentary).

The main part of the study has been conducted on two cores located at the western termination of the northern deep channel of the Charlie-Gibbs fracture zone. This natural E-W corridor is bathed by the Iceland-Scotland overflow water (ISOW) when it passes westward out of the Iceland Basin into the western North Atlantic basin. At present, it is also described as the place where southern sourced silicate-rich Lower Deep Water (LDW) derived from the Antarctic Bottom Waters (AABW) are passing westward, mixing with the ISOW.

One core had been taken by the R. V. Charcot in 1977 and the second one is a CASQ core taken during the IMAGES-AMOCINT MD168- cruise in the framework of the 06-EuroMARC-FP-008 Project on board the R.V. Marion Dufresne (French Polar Institute, IPEV) in 2008. Radiocarbon ages indicate an average sedimentation rate of about 90 cm/kyr during early Holocene and 50 cm/kyr through middle and late Holocene allowing a data resolution ranging from 40 to 100 years depending on the proxy. We coupled magnetic properties, anisotropy, sortable silt and benthic foraminifera isotopes.

On the long term, a decrease in the amount of magnetic particles (normalized by the carbonate content) is first observed from 10 kyr to 8.6 kyr and then from 6 to 2 kyrs before reaching a steady state during the last two millenia. Following Kissel et al. (2009), this indicates a two steps decrease in the ISOW strength. The mean sortable silt shows exactly the same pattern indicating that not only the intensity of the ISOW but the whole deep water mass bathing the sites has decreased.

On the short term, a first very prominent event centered at about 8.4 kyr (cal. ages) is marked by a pronounced minima in magnetic content and the smaller mean sortable silt sizes, typical for an abrupt reduction in deep flow speed. At the same time, the benthic delta13C values which could be obtained from Cib. wuellerstorfi reach significantly negative values (–0.5‰ providing evidence of a significant change to a major downwelling limb of the Atlantic meridional overturning circulation. This event is in phase with the meltwater outbursts from the final drainage of the proglacial lakes associated with the decaying Laurentide Ice Sheet margin. In addition, all through the Holocene, a series of short-term events of lower bottom flow speed and weaker ISOW always illustrated by minima mean size of the sortable silt and in magnetic concentration respectively are observed with a periodicity of 300-600 years between 6 and 2 kyr.

These results are compared to those we obtained from other cores located along the Gardar Drift (P.I.C.A.S.S.O cruise in 2003) and the Eirik drift and with recently published results.