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North Atlantic subpolar and subtropical gyres variability during the last 2000 years: a contribution to the THOR project.

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Recent oceanographic measurements showed that the Atlantic Meridional Overturning Circulation (AMOC) underwent fluctuations in decadal period of time over the past. The causes of these fluctuations are still poorly understood, and available observations are too limited in time (few decades only) to investigate the detailed mechanisms. The Gulf Stream (GS), which actively transports heat from low to high latitudes, mainly in the first few hundred meters of the water column, could play an important role in the natural variability of the AMOC.

This study aims at better constraining the variability of North Atlantic surface and subsurface waters over the last 2000 years, in order to improve our understanding of the links between AMOC oscillations and variations in the upper Atlantic heat content. This work is part of the European THOR (Thermohaline Overturning – at Risk?) project.

Three cores are considered in key areas of the North Atlantic: (1) IMAGES core MD08-3182 (52°41.99'N, 35°56.15'W, 3757m) is located in the main pathway of the Gulf Stream in the Charlie Gibbs Fracture Zone, a key location for monitoring the subpolar gyre dynamics. (2) IMAGES core MD99-2203 (34°58.38N, 75°12.06'W-620m) off Cape Hatteras is well located to record the past variability of the GS. (3) Core CADI2KS12 (36°42.79'N, 08°31.39'W-1120m), from the Gulf of Cádiz, monitors the return current of the subtropical gyre. All cores are radiocarbon dated by AMS. In each core, the upper water column characteristics are reconstructed by complementary geochemical analysis: paired measurements of oxygen isotopic composition and trace elements ratio (Mg/Ca) in planktonic foraminifera are combined to reconstruct the seawater temperature and oxygen isotopic composition. Both surface and deep-dwelling species are considered to obtain temperature and oxygen isotopic composition records of the first few hundred meters of the water column.

We will present our first results of the variability of the North Atlantic upper water column during the Late Holocene, with a particular focus on the last 2000 years, to extend the information available from observations on the ocean heat content fluctuations. These results will be compared to existing data.