Benthic and Planktic foraminiferal distributions in the Bay of Biscay during the Holocene - Evaluation of hydrological patterns

H. Howa1,2, M. Mojtahid1, J. Garcia1,2, M. Cremer3, F. Eynaud3, H. Gillet3, E. Michel1, S. terrien1, F. Jorissen1
1. BIAF, UPRES EA 2644, Université Angers ; 2. LEBIM, Ker Chalon, Ile D’Yeu; 3. EPOC, UMR-CNRS 5805, Université Bordeaux 1 ; 4. LSCE, UMR-CNRS 1572, Gif/Yvette

Context:
ANR-FORCLIM Project; Quantification of North Atlantic hydrology during the Holocene

Objective:
The use of foraminifera as proxies to evaluate hydrological changes in the North Atlantic during the Holocene, period of rapid climatic change

Study area: Southeastern part of the Bay of Biscay
- Temperate marginal oceanic area
- Wide range of contrasting hydrological conditions
- Under continental influence, the site is likely to record amplified climatic variations compared to the deep-sea
- Relatively high sedimentation rate (Schmidt et al., 2009)

Core KS10b
Kullenberg Oceanographic cruise PROSECAN 2007
Localisation:
Station B
43°50’ N, 2°03’ W
550m water depth

Sedimentology
The highest sedimentation rate is estimated between ≈10000 and 7630 yrs BP. From 7630 yrs BP, it decreases and remains constant until 1470 yrs BP and increases again afterwards.

Planktic foraminifera

Benthic foraminifera

Planktic foraminiferal faunas are dominated by N. pachyderma d. intergrade, N. pachyderma d., G. bulloides and G. inflata. This assemblage is typical of this marginal environment of "Plateau des Landes". Before 8000 and after 1400 yrs BP, these dominating species show similar relative densities. In between, G. inflata decreases to less than 5 % whereas N. pachyderma d. intergrade increases to about 40 %.

During the Holocene, a general decreasing tendency is observed for the transition species O. universae and G. glactinata, and the tropical to subtropical species G. ruber.

Benthic foraminiferal faunas show major variations:
- The very eutrophic species C. carinata and B. marginata show a general decreasing tendency and are replaced gradually by the eutrophic species U. mediterranea and M. barleeanus.
- The eutrophic to mesotrophic species H. balthica shows maximum abundances before 8000 yrs BP and seems to decrease gradually towards the present; the same distributional pattern as for the very eutrophic species C. carinata and B. marginata.
- The mesotrophic species U. peregrina shows relatively stable percentages during the Holocene whereas the oligotrophic species C. pachydermus increases gradually from about 8000 yrs BP.

Conclusions:
- The faunal changes and granularity variations suggest a rapid evolution of the basin dynamics.
- The succession of planktic foraminiferal assemblages during the last 10 000 yrs indicates a general cooling of sea surface temperatures, which is probably related to the general circulation in the Bay of Biscay. We suggest a strengthening of the eastern branch of the North Atlantic Current that may have weakened the incursions of warm waters from the Portugal coast (The Navidad Current). This process is opposed to what is currently observed in the last 30 yrs.
- Benthic foraminiferal assemblages suggest a progressive distancing from continental influence, from very eutrophic assemblages in the early Holocene to more mesotrophic assemblages nowadays. This is probably due to the increasing sea level.

- References

Grain size (µm)
Percentages

<table>
<thead>
<tr>
<th>Grain size (µm)</th>
<th>Percentages</th>
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</thead>
<tbody>
<tr>
<td>9 µm</td>
<td>silty-clayey facies</td>
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<tr>
<td>100 µm</td>
<td>bimodal facies</td>
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</tbody>
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Variation in granularity: D50 between 9 and 18 µm
Two facies: silty-clayey facies (9 µm) and bimodal facies (9µm + 100µm)