**Program LEFE/ action(s)**
IMAGO

**Project Title**
"ICE_BIO_RAM"

(Impact des Changements Environnementaux sur la Biodiversité marine lors des Réchauffements Abrupts du climat)

**Years**
2013

**PI name, email and lab:** Frédérique EYNAUD, f.eynaud@epoc.u-bordeaux1.fr,
UMR CNRS 5805 EPOC

**Participating Laboratories:**
- UMR 6538 Domaines Océaniques, UBO-IUEM, Brest
- LCSE, Gif/Yvette
- Laboratoire des Géosciences Marines et Sciences du Sol, Université El Jadida
- UMI 3376 TAKUVIK, Université Laval Québec (Ca)

**Contribution to Nom des programmes internationaux**
PHC Volubilis MA/11/251, 24451WG

**Other funding sources:**
INSU TS INTERRIVIE

**Objectives (2-3 lignes):**
ICE-BIO-RAM aims at identifying the impact of abrupt climatic warmings which occurred during the last glacial period (known as Dansgaard-Oesgcher, i.e. DO) on fossil protist populations along the Atlantic European margin.

**Main results (y compris les relevés de conclusions des réunions de coordination si c’est l’objet du financement LEFE)**
In one year and thanks to the INSU support, the ICE-BIO-RAM project has allowed us to obtain additional high resolution data on archives mainly from the Moroccan, the Iberian and the Faeroe margins. On these sites, we have especially documented the concomitant evolution of planktic foraminifera and dinocyst communities (see illustrations).

The focus was put along the main warming events (Wₙ) initially identified in the project, i.e.:
- W₁ : onset of the Greenland interstadial event 8, Heinrich event –HE 4 termination (Faeroe margin, core MD99-2281, Wary et al., 2013, in prep.; work still ongoing on core MD99-2285 + Iberian margin, core MD99-2339, Penaud et al., in prep.).
- Wₙ following HE1 (glacial termination), completed on several cores, from the Iberian margin to the Bay of Biscay (Penaud et al., in prep.; Eynaud et al., 2013).
- Wₙ the Younger Dryas event termination, and Wₙ the end of the 8.2 early Holocene cold spell, were mainly documented within the subtropical belt (Eynaud et al., 2013) and on the Moroccan margin (El Oihli et al., 2013; ongoing work) with additional proxies, i.e. stable isotopes -δ¹⁵N, δ¹³C, δ¹⁸O, ostracoda and benthic foraminifera assemblages.

As mentioned in the initial project we have also coordinated our efforts regarding modelling issues of the index protist communities and their response to abrupt climate changes (ongoing work under the supervision of Didier Swingedouw).

**Illustration 1** : Evolution of index micro-planktonic assemblages between 10 to 50 ka in the subpolar North Atlantic (60°N). (a) NGRIP–GICC05 δ¹⁸O record – (b) Relative abundances of the dominant planktic foraminifera species – (c) Absolute abundances (nb. of specimen in the sediment) of dinocysts and planktonic foraminifera (after Wary et al., 2013, in prep.)

**Illustration 2** : Evolution of index micro-planktonic assemblages (cold planktonic foraminifera and dinocysts) along the last 50 ka in the subtropical North Atlantic (34°N). (after Penaud et al., in prep.)
The two figures illustrate the main results obtained. Microfossil qualitative data (main species relative abundances as well as absolute abundances in the sediment, i.e. number of specimen / g of dry sed.) are compared to the NGRIP stratotype (e.g. Austin & Hibbert, 2012) underlining the perfect matching of the biotic responses to the high climatic variability of the last 50 ka. Especially noticeable are the abrupt changes that characterize the Marine Isotopic stage 3 (50-25 ka) during which each microfossil community, and whatever the latitude considered (Norwegian sea on Illustration1, Gulf of Cadiz Illustration2), presents sharp diversity excursions between stadial and interstadial events. The large time window here used allows us to document and compare the main warming events targeted by the ICE-Bio-RAM project.

Future of the project:

Work is still ongoing especially for the Moroccan and Norwegian sites. Ultra high resolution data will be produced in the next academic years thanks to two PhD students (one finishing in 2014, and the other in 2015, see next section). Additional chronostratigraphical tie points have been obtained with the ARTEMIS 2014 Call (project "Evolution des gradients océaniques bioclimatiques et hydrologiques en Atlantique nord au cours des derniers 40 ka : vers un historique très haute résolution", PI : Eynaud) and will directly serve the ICE-Bio-RAM project.

We did not ask for additional financial supports in 2014, but this is planned for the next 2015 calls.

This work is also at the boundary of questions targeted by the new french ANR HAMOC project (C. Colin coord., 2013-2017) which includes some ICE-BIO-RAM members: D. Swingdeouwn, A. Penaud, J. Bonnin and F. Eynaud.

Nombre de publications, de communications et de thèses (citer au maximum 5 publications en lien direct avec le projet):

Articles:
2. Wary M., Eynaud F., Matsuzaki K., Zumaque J., and 10 others. Stratification of surface waters during the last glacial millennial climatic events: a controlling factor on sub-surface and deep water mass dynamics. In prep. for Paleoceanography.

Communications:

Ongoing PhD:
1. WARY Mélanie, 2013-2015. "The role of Ice-shelves in glacial ice-sheet collapses: a focus on stadial events", Bordeaux University
2. EL OIHLI Fatima, 2011-2014. "Environmental and paleoclimatic changes in Morocco over the last millennia", El Jadida University, Morocco (co supervision).