

ACER-INTIMATE joint workshop on « Last Glacial Abrupt Climate Changes and Sea Surface Temperature Response »

Scientific Report

The workshop was held at the University Bordeaux 1 between the 3rd and the 6th October 2011. Fourteen scientists attended this workshop which was funded by INQUA and COST (European Cooperation in Science and Technology) (see the program below). This assembly was a continuation of the QUEST-DESIRE and ACER workshops devoted to document the vegetation and fire regime response to the abrupt climatic variability of the Last Glacial, Dansgaard-Oeschger and Heinrich events. This data-synthesis effort is crucial to understand the dynamics of the climate system and to explain rapid (i.e. abrupt) and large-amplitude variations observed in ice archives including feedback mechanisms involved. Abrupt climate change can be defined as a change which takes place in less than 200 years and, in magnitude exceeds the decadal variability typical of the interval in which occurs.

At the beginning of the meeting, Sandy Harrison and Maria F. Sanchez Goñi presented an overview of the global project “Abrupt Climate Changes and Environmental Responses” (ACER). Within this project pollen and microcharcoal global databases have been already compiled to assess the global and regional response of the terrestrial environments to the abrupt climate changes of the last glacial (Sanchez Goñi & Harrison, QSR special issue, 2010). The second goal of this project, which is the objective of this ACER-INTIMATE joint workshop, is to document the temperature response of the sea surface realm. To achieve this goal, we need to compile and correlate all the available sea surface temperature (SST) records. For achieving this correlation, first we need to build a robust chronostratigraphical framework for all the records. The talks by Anders Svensson and Bill Austin synthesized remarkably well the improvement of the different calibrations to integrate marine, terrestrial and ice records. They also highlighted the advantages of using tephra layers to synchronize these different records.

A state of the art of the available regional SST data was presented by the different participants. Franck Bassinot presented a compilation of the existing SST records for the Indian Ocean and highlighted the paucity of records documenting SST changes at millennial-time scales in this region. He also pointed out that most of the records reveal more changes in the ocean-atmosphere dynamics (e.g. changes in upwelling) than direct SST shifts. Markus Kienast convincingly showed that the uncertainties in age models for Tropical Pacific SST records can lead to the proposition, based on the same dataset, of two opposite climatic scenarios. Erin McClymont, J.-H. Kim and Belén Martrat showed different information given by two climatic sensors for tropical regions and the Mediterranean basin: alkenones analysis indicating SST, and subsurface conditions (below 10 m depth) inferred from TEX86. Harmut Schultz presented new alkenone-derived SST records from the Eastern Mediterranean and compared them with those from the Western part. He pointed out that this sensor document SST in spring-summer in the Atlantic Ocean and the Western Mediterranean basin, but it records winter SST in the Eastern Mediterranean. Frédérique Eynaud and Antje Voelker synthesized the Arctic Ocean and North Atlantic SST records. They both highlighted the lack of data for the Last Glacial Arctic Ocean when this area was almost entirely covered

by ice as indicated by the dinocyst assemblages. Therefore, the northernmost SST record available comes from the Nordic Seas. Finally, Jeremy Shakun showed the application of multivariate statistical analysis to treat global data and discriminate the global sea surface signal from noise. Didier Roche ended the oral communications by presenting the regional impact of freshwater input from different locations on SST, using the LOVECLIM model. The comparison of different model simulations with future global SST syntheses will allow us to identify the most probable locations of freshwater pulses during the last glacial.

After these formal presentations, the last day of the meeting was devoted to discuss a strategy for developing a SST database and to address several issues related to the different SST sensors, chronology and correlations. For the future development of this project, it is planned to organize a 2nd ACER-INTIMATE joint workshop involving more researchers from the modeling community. One of the objectives of the next workshop will be the evaluation of different simulations dealing with rapid climate changes through their comparison with marine and terrestrial climatic maps and data.



Visit to the wine Château Mission Haut Brion (Pessac). From right to left: Belén Martrat, Bill Austion, Markus Kienast, Sandy Harrison, Harmut Schultz, Antje Voelker, Maria F. Sanchez Goñi, Franck Bassinot, Erin McClymont, J.-H. Kim, Jeremy Shakun and Anders Svensson.



**ACER₁-INTIMATE₂ joint workshop on
“Last Glacial Abrupt Climate Changes and Sea Surface
Temperature Response”**

Bordeaux, 2nd to 6th October 2011

Château de Castelterrefort, University Bordeaux 1 (Talence)

₁ Abrupt Climate Changes and Environmental Responses

₂ Integration of Ice core, Marine and Terrestrial Records

Monday, October 3rd

09.00 Welcome, introduction and opening remarks

Sandy Harrison & Maria F. Sanchez Goñi

09.30 General project overview

Sandy Harrison

10.00 Global patterns of vegetation response to abrupt climate changes of the Last Glacial

M.F. Sanchez Goñi, S.P. Harrison, P.J. Bartlein and members of the IFG ACER

10.30 *Coffee break*

11.00 Chronology of the Greenland climatic variability

Anders Svensson

11.30 SST-proxy event-based stratigraphy

Bill Austin

12.0 *Lunch* Restaurant Carpe Diem

14.00 SST records in the Indian Ocean

Franck Bassinot

14.30 SST records in the East and West Tropical Pacific

Markus Kienast

15.00 SST records in the Equatorial Pacific

Erin McClymont

15.30 *Coffee break*

16.00 SST records in the Tropical Atlantic

J.-H. Kim

16.30 SST records in the Eastern Mediterranean

Harmut Schultz

Tuesday, October 4th

09.00 SST records in the Arctic Ocean

Frédérique Eynaud

09.30 SST records in the North Atlantic

Antje Voelker

10.00 SST records in the Mediterranean region

Belén Martrat

10.30 *Coffee break*

11.0 SST records in the mid and high-latitudes of the Southern Hemisphere: off South America (to be confirmed)

11.30 **SST records in the mid and high-latitudes of the Southern Hemisphere: off South Africa**
(to be confirmed)

12.00 *Lunch* Restaurant Carpe Diem

14.00 Visit to the wine Château Haut Brion

19h30 Conference dinner at “Le Bô Bar”, 8, Place Saint Pierre 33000 Bordeaux

Wednesday, 5th

9.00 **Global and regional climate modes during the last deglaciation: Separating signal from noise**

Jeremy Shakun

9.30 **The impact of freshwater pulses with respect to different geographical locations**

Didier Roche

10.00 **Environmental responses to D-O cycles**

Sandy Harrison

10.30 *Coffee break*

11.00 **Report on previous SST databases (e.g. MARGO)**

- different SST tracers
- issues on chronology and correlation
- identifying regional gaps for SST records

12.00 *Lunch* Restaurant Carpe Diem

14.00 **Working groups for the synthesis of marine data: how to proceed**

Thursday, 6th

14.00 **Discussion on data and metadata compilation**

10.30 *Coffee break*

11.00 **Final remarks, end of the meeting**

12.00 *Lunch* Restaurant Carpe Diem