Climate variability during the last deglaciation in north-western Iberian margin and adjacent landmasses

F. Naughton; M.F. Sánchez Goñi; J. Duprat; E. Cortijo; F. Abrantes

Direct correlation between terrestrial (pollen) and marine climatic indicators from deep sea core MD03-2697 (north-western Iberian margin) allows the detection of millennial scale climate variability for the last deglaciation in the mid-latitudes of the North Atlantic realm.

The Last Glacial Maximum (LGM) was relatively cold and humid in north-western Iberia while sea surface conditions were warm. More vigorous Meridional Overturning Circulation (MOC) favored moisture transfer from the mid-latitudes of the North Atlantic to the western Iberia whereas increasing albedo, high seasonality and atmospheric CO2 drop maintain the continent cold.

The mid-latitudes of the North Atlantic were marked by a complex pattern within Heinrich 1 (H1) event. In the first phase, sea surface conditions were extremely cold with almost no evidence for iceberg calving while the second one was less cold with high quantity of Ice-rafted detritus (IRD). In north-western Iberia vegetation has responded synchronously to this H1 pattern. During the first phase a drastic *Pinus* forest decline and heaths expansion reflect extremely cold and moist conditions whereas the second phase reveals the expansion of *Pinus* forest and semi-desert plants representing relatively cold and dry conditions on the continent. The first coldest phase was probably triggered by the MOC shutdown followed by ocean-atmosphere rapid reorganizations while the wet and dry phases were the result of prevailing negative and positive North Atlantic Oscillation (NAO like) indexes, respectively.

The continental (deciduous *Quercus* expansion) and sea-surface warming characterizing the Bölling-Alleröd (B-A) event was produced by both the increase of mid-latitude summer insolation of the northern Hemisphere and the strengthening of the MOC.

During the Younger Dryas (YD) the decrease of deciduous *Quercus* forest and the expansion of semi-desert plants reflect continental cooling and dryness which is contemporaneous with sea surface cooling. MOC reduction but increasing northern mid-latitudes summer insolation favored a decrease rather than a complete decline of deciduous *Quercus* forest in north-western Iberia. Beyond the MOC reduction, a prevailing positive NAO-like index could explain the observed dryness. Following this, the Holocene Thermal Maximum in this region is identified between 11 700 and 8 200 cal yr BP. At around 8 200 cal yr BP a sudden land (decrease of deciduous *Quercus* forest and *Corylus* woodlands) and sea cooling marks the 8.2 Ky event in Iberia as the result of the culmination of the successive episodes of the Laurentide Ice sheet decay which enhanced the cooling over Greenland and Europe. After the 8.2 Ky event the long-term temperate forest decrease has responded to the orbitally-induced cooling rather than to human impact.