
How instable was the environment in the SW Mediterranean region during the penultimate glaciation (MIS 6)? New palynological and pollen-based climate reconstructions from ODP 976.

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Résumé

It is now well established from continental and marine proxies that the Mediterranean region was very sensitive to high-frequency climatic instability during the last glacial period (MIS 4-2), expressed through Dansgaard-Oeschger cycles and Heinrich events. A growing number of studies support the persistence of such rapid oscillations during the penultimate glaciation (MIS 6), and the close response of Mediterranean ecosystems. However, few palynological sequences in the Mediterranean region offer sufficient resolution to document the dynamics of vegetation at this time. Data are especially lacking in the western Mediterranean, a key region to understand the connection between North Atlantic and Mediterranean climatic influences. We provide new palynological data for MIS 6 from the long and continuous marine sequence ODP 976 in the Alboran Sea. The chronology was established by correlation with a reference core from the Portuguese margin, tuned with the Antarctic isotopic record. Results of two hundred samples are presented from 127 to 196 ka Before Present (BP), revealing long-term and rapid variations in the vegetation composition regionally. Four methods of pollen-based climate quantifications were applied to the pollen assemblages in order to reconstruct the annual and seasonal temperatures and precipitations, including modern analogues, regression, and machine learning approaches. Results show that three phases can be identified based on the vegetation composition and climate conditions. The first phase is characterized by important oscillations of temperate trees and rather cool and humid conditions during early MIS 6, coincident with a sapropel layer deposition in both the western and eastern Mediterranean. In the second phase, arid herbaceous vegetation is dominant, marking the main imprint of glacial maxima conditions and reduced climate variability. The third phase is marked by the development of Ericaceae and increased annual precipitations. At the end of MIS 6 glaciation, an abrupt and intense episode of steppe and semi-desert expansion and climate deterioration is identified as Heinrich Stadial 11 and mark a particular pattern for Termination II in the Western Mediterranean. Rapid oscillations appear like a pervasive feature of the Penultimate glacial in the SW Mediterranean, though they present reduced amplitude and frequency compared to the Last Glacial.

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Mots-Clés: Millennial scale oscillations, Heinrich Stadial 11, Termination II, vegetation dynamics, Middle Pleistocene, Alboran Sea