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Rapid climate and environmental changes in the western Iberian Peninsula since the last glacial period

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The warm and saline Mediterranean Outflow Waters (MOW) affect density structure of the North Atlantic current, thereby altering the Atlantic Meridional Overturning circulation and thus global climate. Previous studies on south-western European margin sequences have demonstrated their capability to reconstruct past changes in atmospheric and oceanic conditions at orbital and millennial time scales. However, the detailed evolution of the climate and environmental variability during the last climatic transition, especially during the last major abrupt climate events (e.g. the Dansgaard-Oeschger, Heinrich and 8.2 kyr events), is not well documented. Furthermore, the potential impact of changes in the Mediterranean Outflow Waters (MOW) on the North Atlantic and climate are far from being understood. Here we scrutinize changes in MOW over the last 25 kyrs by investigating sediment core MD99-2339 (35.89°N, 7.53°W, 1170 m water depth) collected in the Gulf of Cadiz. We analyzed alkenones (UK'37) to gain information on the sea surface temperatures. We also analyzed n-alkanes and their associated carbon (d13C) isotopes that we combined to pollen assemblages to reconstruct vegetation and humidity changes. We find that the cold alkenone-derived SST periods (Last Glacial Maximum (LGM), Younger Dryas (YD) and Heinrich Stadial 1 (HS1)) might be associated to a regional increase in the upwelling activity driven by stronger coastal off-shore winds that supply this area by cold deep waters. Stronger upwelling intensity may be linked to a greater export of MOW. In comparison, the d13C n-alkanes indicate drier conditions during HS1 and YD, and wetter conditions during the LGM and Holocene, which is opposite to the recorded precipitation signal by pollen assemblages. This inverse relationship suggest an opposite trend in seasonal precipitation (summer vs winter) which might imply a distinct forcing since the last glacial period. Alternatively, the signals of d13C n-alkanes might indicate climatic signals from a different source area in comparison to those of the pollen assemblages. To better constrain the underlying mechanisms recorded by both methods should be further investigated in near future.