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Terrestrial climate variability and seasonality changes in the Mediterranean area over the last 15,000 years from marine pollen cores

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Research on the climate variability during the recent decades has been immensely stimulated by the increasing manifestation of anthropogenic climate change. Such research can provide support in evaluating future climate scenarios and as such may be instrumental in extending the lead-time for adaptation. The Mediterranean region is particularly sensitive to short-term climate change due to its intermediate position between the higher-latitude (i.e. North Atlantic in [U+FB02]uenced) and lower-latitude (i.e. monsoonally in [U+FB02]uenced) climate systems. Consequently, future climate change can be expected to be particularly strong in this region and will likely have a strong impact on terrestrial ecosystems. In the perspective of the present global warming, a growing interest has been focused on the climate study of the last 15,000 years, particularly in the Mediterranean area, a sensitive region in terms of hydrological variations and human impact. In the framework of the ANR project called LAMA (coordinated by Nathalie Combourieu Nebout and Michel Magny), a new palynological analysis of marine core MD 90-917, removed in the Adriatic Sea by the R/V Marion Dufresne have been investigated. The central location of this site in the Mediterranean Sea will allow the study of climatic gradients that could have influenced the changes in the Mediterranean vegetation during the Lateglacial and Holocene.

The age model of core MD 90-917 is based on 20 dates AMS 14C (Siani et al., 2004). The new palynological record complete those obtained by Combourieu Nebout et al. (1998). The temporal time resolution of the core is improved by the addition of new pollen samples. It allows reconstructing the millennial and centennial-scale variations of vegetation and climate during the last 15,000 years in Italy and Balkans areas. Heinrich event 1 (H1) and Younger Dryas are marked by a major expansion in semi-desert taxa which confirms cold and dry conditions prevailed. During the Bølling/Allerød and the Holocene, the temperate forest colonizes the environment, the climate is temperate, and seasonality of precipitation is similar to the present with high rainfall in winter and lower summer. Several short-lived cool intervals (such as cold 8.2ka event, Older Dryas and Gerzensee oscillation) connected to the North Atlantic climate system are documented in the Adriatic Sea records. This climate pattern can compared with the quantitative climate reconstructions based on other high-resolution cores in the Mediterranean region. Two high-temporal pollen records located in the Alboran and Aegean Seas records suggest a West/East gradient of decreasing precipitation across the Mediterranean area during the cooler Lateglacial and early Holocene periods, similar to the present-day conditions. Winter precipitation was highest during warm intervals and lowest during cooling phases.

The quantitative climate reconstructions for the Alboran, Adriatic and Aegean Sea records focus mainly on the reconstruction of the seasonality changes (temperatures and precipitation), a crucial parameter in the Mediterranean area. This study is based on a multi-method approach using 3 methods: the Modern Analogues Technique (MAT), the recent Non-Metric Multidimensional Scaling/Generalized Additive Model method (NMDS/GAM) and Partial Least Squares regression (PLS).