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New palynological data from the Late Pleistocene glacial refugium of South-West Iberia: The case of Doñana

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ABSTRACT

The Doñana area in southern Iberia is one of the most renowned protected areas of Europe, mostly due to the diversity and value of its wetland ecosystems. The large biogeographical significance of this territory and the outstanding availability of sedimentary archives have made this region a hotspot of paleobotanical research in the Iberian Peninsula. Specifically, the organic deposits on El Asperillo Cliff have been studied during the past few decades from the geomorphological and paleobotanical (pollen, macrofossils) points of view. However, large uncertainties remain concerning the chronology of certain sections of the exposed profile and the paleobotanical potential of this site has not been fully exploited yet. In this study, we revisited El Asperillo with the aims of completing the paleobotanical record and refining the chronology of this site. The age of the studied deposits ranges from ca. 22,000 to 30,900 cal. yr BP according to the radiocarbon dates obtained, thus embracing the particularly cold and dry Heinrich Event 2 and the Last Glacial Maximum. Our palynological results allow inferring the presence of a coastal marshland system. Additionally, the new pollen records highlight the relevance and diversity of pines (*Pinus nigra*-sylvestris type, *P. pinaster*, *P. halepensis*-pinea type) in the Late Pleistocene landscape of Doñana, reinforcing the native status of pines. Last but not least, the results stress the persistence of a highly diverse woody flora in Doñana during the harshest periods of the last glacial cycle, highlighting the importance of this enclave in postglacial vegetation recolonization of the Iberian Peninsula.

1. Introduction

The Doñana Protected Area (DPA), which includes the Doñana Natural and National Parks, is an extremely interesting enclave for paleopalynological studies due to its geographical location at the southwestern edge of the European continent very close to Africa and its great physiographic complexity. Doñana itself hosts a notably heterogeneous landscapes with numerous plant communities, a highly diverse flora rich in endemics, and a complex network of ecological interactions, that justify its large international ecological and biogeographical interest. In fact, DPA is one of the most emblematic protected areas of Europe (Sousa et al., 2009). It was declared a UNESCO Biosphere Reserve in 1980, Wetland of International Importance (RAMSAR Agreement) in 1982, Special Protection Area for Birds (ZEPA) in 2003, and a Site of Community Importance in 2006. In 2015, it joined the IUCN Green List

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