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CONTRIBUTIONS TO THE EUROPEAN POLLEN DATABASE

57. Manantial de las Queseras, Gregos Range (central Spain)

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Site details

The Manantial de las Queseras mire (40° 16′ 59.82″ N, 4° 55′ 15.28″ W; size *c.* 0.054 ha; 1295 m above sea level [a.s.l.]) lies on the southeastern slope of the 'Sierra de Cabeza Aguda' in the eastern part of the Gredos Range (Pedro Bernardo, Ávila). The area experiences a Mediterranean climate with dry and warm summers and rainy winter months, influenced by the Atlantic winds from the west. The average annual temperature is 14 °C and the annual precipitation is 1400 mm. The most representative plant communities of the area are maritime pine (*Pinus pinaster* Ait.) woodlands, and isolated *Pinus nigra* Arnold subsp. *salzmannii* (Dunal) Franco and *Pinus sylvestris* L. trees (López-Sáez et al. 2019). The uppermost areas (1600–2008 m a.s.l.) are occupied by broom communities of *Cytisus oromediterraneus* Rivas-Martínez, Díaz, Prieto, Loidi & Penas and *Echinospartum barnadesii* (Graells) Rothm. (López-Sáez et al. 2016). Riparian forests are characterised by black alder (*Alnus glutinosa* [L.] Gaertn.) and *Fraxinus angustifolia* Vahl. The mire vegetation is composed mainly of *Sphagnum* sp., *Carex nigra* (L.) Reich. and *Drosera rotundifolia* L. The bedrock is old siliceous basement made up mainly of Late-Hercynian granites.

Sediment description

A 39-cm-core was collected in 2002 using a Russian corer with a 5 cm diameter. The composition was as follows:

0–7 cm: herbaceous detritus
7–15 cm: light brown, partly decomposed *Sphagnum*-Cyperaceae peat with sand
15–39 cm: dark brown decomposed peat rich in mineral matter

Dating

Accelerator mass spectrometry (AMS) carbon-14 (^{14}C) was performed on bulk peat samples by the Ångström Laboratory in Uppsala (Sweden). The calibration (2σ range) was performed using CALIB 8.2 (Reimer et al. 2020) and CALIBomb with the calibration dataset NH zone 1 (Hua et al. 2013) software. Calibrated radiocarbon dates are given as cal AD. Dating results are as follows:

7 cm: Ua-55287, 107.4 ± 0.4 pM (cal AD 1957–1959)
39 cm: Ua-55302, 318 ± 25 BP (cal AD 1492–1643)

Interpretation

The core was sampled at 2 cm intervals. More than 350 terrestrial pollen grains were identified in each sample. The pollen sum (100%) includes all pollen grains except those of hygrophytes and aquatic plants, spores of ferns and non-pollen palynomorphs. Three local pollen assemblage zones (LPAZs) were defined using CONISS in the TGVIEW® (©Eric C. Grimm) software package (Figure 1):

MQ-1 (39-22 cm; c. *cal AD 1550–1775*)

The landscape is dominated by herb communities composed of Poaceae, Caryophyllaceae, Fabaceae and ruderal plants (*Aster*-type, Cichorioideae). Groups of *Alnus*

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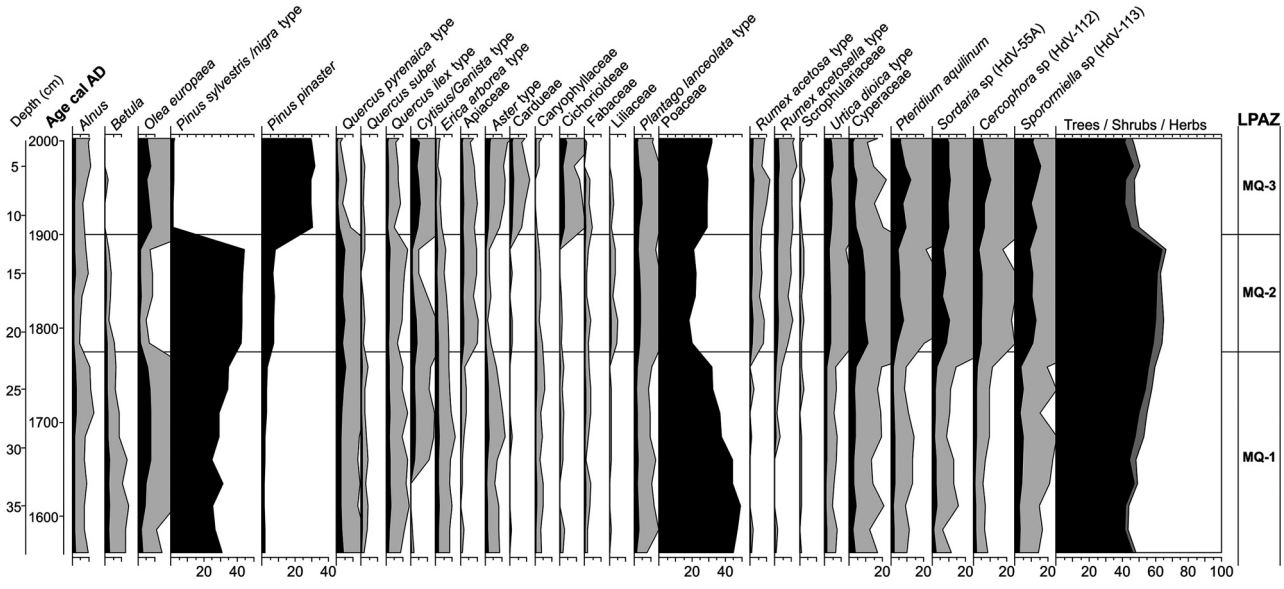

Figure 1. Pollen diagram from Manantial de las Queseras mire (Gredos Range, central Spain) plotted against age (cal. AD). Grey curves are exaggerated 5 ×.

and *Betula* were probably distributed along the periphery of the mire or along the surrounding streams. Tree and shrub cover is low comprising *Pinus sylvestris/nigra*-type, *Pinus pinaster, Quercus ilex*-type, *Q. pyrenaica*-type, *Q. suber, Cytisus/Genista*-type and *Erica arborea*-type. According to modern pollen assemblages analysis across the entire Gredos Range (López-Sáez et al. 2013, 2015; Broothaerts et al. 2018), low high-mountain pine and deciduous oak percentages (< 25%) suggest intense deforestation caused by human and/or a regional origin of the pollen rain. The presence of anthropozoogenous herbs (*Plantago lanceolata*-type, *Urtica dioica*-type) and dung-related fungal spores (*Cercophora* sp., *Sordaria* sp., *Sporormiella* sp.) suggest local grazing during the Early Modern Period (López-Merino et al. 2009; López-Sáez et al. 2014). Anthropogenic influence is also related to olive crops (*Olea europaea*) at the bottom valley.

MQ-2 (22-12 cm; c. *cal AD 1775–1990)*

The main features are the decrease of *Alnus, Betula* and *Olea* pollen rates and the recovery of *Pinus sylvestris/nigra*-type (40%), with an undergrowth of ferns (*Pteridium aquilinum* (L.) Kuhn.), indicating high-mountain pine colonisation of the supra-Mediterranean belt during the Late Modern Period (Robles-López et al. 2020), as well as maritime pine (*Pinus pinaster*) at lower altitudes (López-Sáez et al. 2010). An increase in pastoral pressure is suggested by increased percentages of *Plantago lanceolata*-type, *Rumex* sp., *Urtica dioica*-type, *Cercophora* sp., *Sordaria* sp. and *Sporormiella* sp. (López-Sáez & López-Merino 2007). Hygrophytes are well represented by Cyperaceae and Apiaceae.

MQ-3 (12-1 cm; c. *cal AD 1990–2002)*

In this pollen zone the previous landscape abruptly changes to one dominated by maritime pine (*Pinus pinaster*) woodlands and broom communities (*Cytisus/Genista*-type). High-mountain pines (*Pinus sylvestris/nigra*-type) and birches (*Betula*) practically disappear from the pollen record, while olive cultivation increases in the lowlands to the detriment of *Quercus* species. Weak human impact is suggested by the continuous presence of anthropogenic pollen indicators (*Aster*-type, Cardueae, Cichorioideae), while signs of pastoral pressure noted in the earlier pollen zone remain and even increase slightly. This abrupt change in forest vegetation can be related to the use of local fires, as shown by the continued presence of macrocharcoal particles, suggesting that recurrent fires could be triggering the maritime pine colonisation (Robles-López et al. 2018).

Disclosure statement

No potential conflict of interest was reported by the authors.

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