

ites types. Pollen morphology suggests that *Ephedripites* (*Distachyapites*) *claricristatus* might show botanical affinity with extant *Ephedra distachya*, while the other four *Ephedripites* types have it with *E. torreyana* and *E. nevadensis*. According to *Ephedra* molecular phylogeny (Rydin et al., 2004), the basal clade is composed of African species, followed by the Asian/European species; then North American, South American, Asian and Chinese species. *E. distachya* belongs to the Asian/European clade. Nowadays *E. distachya* is widely distributed, present in California U.S.A. and China, as well as extending from Spain to Russia. Nevertheless, it is absent in Mexico. *E. torreyana* and *E. nevadensis* belong to the North American clade, and both species are currently found in northern Mexico. Presence of the *Ephedripites* genera indicates semiarid conditions for the BCS region. The *Ephedripites* descriptions expand the fossil pollen record in Mexican Paleogene and Neogene paleobasins, and will therefore contribute to the reconstruction of Cenozoic *Ephedra* geographic distribution in this country.

The origin of the open landscapes of the highlands of Gredos (central Spain) during the Holocene: a pedoanthracological approach

TALK IN SESSION S27

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The current absence of natural forests at the highlands of Gredos (Central Iberian Range) has inspired controversial interpretations and remains today as a genuine feature of these mountains. In contrast, the available data about the vegetation history of the region indicates the existence of woodlands throughout the mid and late Holocene. Pollen records suggest that pinewoods have dominated during the mid- to late- Holocene, whereas the abundant macro- and mega-fossils studies support a prominent role of pines (mainly *Pinus sylvestris*) and birch at high altitudes (above 1300 m a.s.l.), especially during the late Holocene. Historical archives document the demise of forests since the Middle

Agés and the intensification in the use of the pastures of the highlands of Gredos since the fourteenth century. No signs of proto-historic human presence have been still reported at the highlands but its influence has been well documented at lower altitudes, North and South of the Range. In this context we made the first pedoanthracological sampling in the region, in order to obtain information about the vegetation history at high altitudes, including treeline location in the past and the role played by shrublands. Five soil profiles across an altitudinal transect from 1800 m a.s.l. to 2200 m a.s.l. were sampled at the north slope of the Central Massif of Gredos, at the heart of Gredos range. Dated macrofossils (charcoals) indicate the occurrence of fire events since the early-Holocene (ca 9700 cal yr BP) until the recent-Holocene (ca 1000 cal yr BP), with several intermediate dates (ca 9000, ca 8400, ca 3700 and ca 2100 cal yr BP). The charcoal assemblages show a strong dominance of Leguminosae shrubs throughout the whole Holocene, accompanied by *Betula* sp. and Maloideae. This suggests the long-term occurrence of shrublands, probably similar in taxonomic composition to those occurring today, not detected before presumably because of their limited pollen production. We interpret the local presence of birch as scattered individuals or as belonging to small patches of forest among the dominant Leguminosae shrublands. On the light of these preliminary results, the Holocene treeline could have been formed by *Betula* sp. and located at or below 2000 m a.s.l., as had been pointed by pollen studies in the westernmost part of the Central Range. Deciduous *Quercus* has been detected in the lower charcoal pit at 1800 m a.s.l. which is coherent with current ecological data that report the occasional presence of this taxon at these altitudes in other areas of the range.