FOSSIL POLLEN GRAINS OF ASTERACEAE (NASSAUVIINAE) FROM THE MIOCENE OF PATAGONIA, SOUTHERN SOUTH AMERICA

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Fossil pollen grains with morphological features unique in the tribe Nassauviinae (subfamily Mutisioideae, Asteraceae) occur in Miocene marine deposits of eastern Patagonia, southern South America. They are characterized by having a complex bi-layered exine structure with delicate columellae, separated by an internal tectum. Two major morphotypes were identified by their shape and exine types. Fossil subprolate specimens with Trixis exine type (ectosexine thinner than endosexine, straight internal tectum) are similar to pollen of extant Acourtia, Holocheilus, Jungia, and Proustia. Suboblate specimens with Oxyphyllum exine type (ectosexine and endosexine equally thick, zigzag internal tectum) are similar to pollen of extant Triptilion. The spore pollen suites in which Nassauviinae pollen types occur suggest a wide range of vegetation types varying from forest dominated during the Early Miocene (Chenque Formation) to virtually xerophytic ones during the Late Miocene (Puerto Madryn Formation). The tribe Nassauviinae comprises 25 genera and ca. 320 species of vines, shrubs and low trees endemic to America with a wide range of ecological preferences; the nearest living relatives of the fossil types being mostly confined to humid landscapes. The unusual persistence of these groups during the arid characterized Late Miocene time could be attributed to the complex interplay of the mountain uplift and global circulation patterns. These forcing factors would have created a mosaic of different habitats with both patches of forest and dry-adapted species developing in relatively small regions. This is the first fossil record of Nassauviinae and confirms that this tribe of Asteraceae was differentiated by the Miocene.

MIOCENE AND PLIOCENE PALYNOLOGY OF THE BELVERDE BOREHOLE, LOWER TAGUS BASIN, PORTUGAL

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A palynological analysis of the Neogene of the Belverde borehole (38°35'54"N; 9°8'24"W), drilled in the distal sector of the lower Tagus basin, is presented. It crossed 130m of Plio–Pleistocene continental deposits and 460m of marine Miocene levels. Planktonic foraminifera and 87Sr/86Sr isotopic ages were used to establish a chronostratigraphic framework.

In some of the Miocene samples, the spores/pollen are commonest than dinoflagellates; in others, dinoflagellates are particularly frequent. Acritarchs (Cyclopsiella granosa, Quadrina sp.) and peridinioids (Selenopemphix nephroides, S. brevispinosa, Lejeunecysta sp.) are represented. During the Burdigalian, Polysphaeridium zoharyi, Cleistosphaeridium placacanthum and Cribroperidinium tenuitabulatum occur. In the Langhian, C. tenuitabulatum is abundant; P. zoharyi and Operculodinium israelianum are common. During the Serravallian, Spiniferites sp., Spiniferites/Achomosphaera, Hystrichosphaeropsis obscura, L. machaerophorum and O. israelianum are frequent. Spiniferites/Achomosphaera, S. pseudofurcatus, L. machaerophorum and Homotryblium spp. are common during the Tortonian.

In the Miocene, dinoflagellates indicate littoral environments during the Burdigalian and the Tortonian. The peridinioids and acritarchs from the Tortonian suggest a shallow marine brackish environment.

During the Pliocene, the pollen spectra show the dominance of Pinus, Myrica and Quercus. Ericaceae and Oleaceae occur. The herbs are dominated by Amaranthaceae-Chenopodiaceae, Poaceae; Asteraceae are scarce. The presence of mesothermic forms (Quercus, Alnus, Liquidambar), mega–mesothermic elements (Myrica) and scarce Engelhardia suggest a mixed forest developed under relative humid conditions. The increase of Cistaceae, Amaranthaceae-Chenopodiaceae and Poaceae and the decrease of Myrica and Engelhardia to the top of the borehole, points out to a transition to a prairie habitat.