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PALYNOLOGY, PALEOVEGETATION, PALEOCLIMATES AND PALEOCEANOGRAPHY OF THE PALEOGENE OF ARGENTINA

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ABSTRACT

The aim of this conference is to describe the changes in plant communities, palaeoclimates and palaeo-phytogeographic in Argentina in the Paleogene. The plant communities and depositional environments are seen as non-linear systems that are unique and highly changing in any given time. External factors influencing plant communities include: climate, sea level changes, tectonics, soil development and even planetary forcing. Internal processes of forest dynamics include competition among existing species and interactions between existing species and potential invading species. Efforts to understand the transition from Mesozoic terrestrial ecosystems, dominated by ferns, conifers, cycads and bennettitals, to Late Cretaceous and Tertiary ecosystems dominated by flowering plants have revived research into the origins and diversification of angiosperms. The plant microfossil assemblages from southern South America reveals distinct differences in Palaeogene times. Palaeophysiographical reconstruction based on fossil palynoflora on palaeobotanical data show that all taxa in the Danian could be accommodated within an altitudinal range from sea level to 1200–2500 m. Based on the palynological record at the genus or species level and at the palaeocommunity level, two major palaeophytogeoprovinces could be recognized during the Danian in Argentina: the Ulmaceae Phytogeoprovince in the north and the Phytogeoprovince of *Nothofagidites* in the south. A subprovince with triprojectate (which possess apertures borne in three arms that project from a central body) pollen (*Mtchedlishvilia*) could be distinguished in central north-western Argentina. Warm and humid climatic conditions are inferred for the Ulmaceae Phytogeoprovince and more temperate conditions for the Phytogeoprovince of *Nothofagidites*. There was a general retraction of the genus *Nothofagidites* during the Early Palaeocene and an increase during the Late Palaeocene (Thanetian; the Río Chico Formation), and a great expansion during the Eocene (the Río Turbio Formation), probably related to the generation of new habitats originated attributable to the first movements of lifting of the Andean Ridge. The characteristic floras from the Late Eocene correspond to the «Palaeoflora Mixta» The 'Palaeoflora Mixta' has grown under subtropical climatic conditions, with relatively warm temperatures and high annual precipitations, with low seasonal variability and a climatic regime without modern equivalents. These floras continued during the Oligocene until the early Middle Miocene. Detrended Correspondence Analysis (DCA) shows differences between the different formations analysed in Patagonia. The cluster analysis also indicates that the samples are grouped according to their paleofloras. Both DCA and cluster analysis reflect a significant relationship with global climatic trends (Quattrocchio *et al*., 2013). During the Paleocene, the Gondwanic Paleoflora of southern South America was characterized by dominant Australasian, Neotropical and Pantropical phytogeographical elements. The climate was warm and very humid. Paleoenvironmental reconstruction based on Patagonian Paleocene floras allowed us to infer the presence of mangroves (with palms and *Pandanus*), swamp woodlands, mossy forests and sclerophyllous forests. In the Early Eocene, correspond to the Subtropical Gondwanic Paleoflora, with Neotropical and Pantropical taxa, with fewer Australasian and Antarctic elements. This is consistent with the suggested rich subtropical vegetation that existed over a large portion of Eocene Patagonia with the presence of megathermal families such as palms, other taxa with broader climatic requirements such as conifers, cycads, and Ginkgoales as well as the coals in east Patagonia. The Middle Eocene and Oligocene are characterized by the 'Mixed Flora» Near the Eocene/Oligocene boundary the sharp climatic cooling has been related to the formation of Antarctic ice and to the appearance of a circumpolar current around Antarctica as a result of the opening of the Drake Passage .The presence of Antarctic palynomorphs (Nothofagaceae, Podocarpaceae, Proteaceae) in Patagonia is consistent with the cooling trend recognized globally during the Late Eocene and Early Oligocene. By the Late Oligocene–Early Miocene, warm climates allowed the dispersal of neotropical

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elements southward (palms, *Cupania*, Alchornea, Rubiaceae, Combretaceae), adding megathermal elements to the local Gondwanic floras. The rise of xerophytic and halophytic shrubby herbaceous elements (Convolvulaceae, Asteraceae, Poaceae, Chenopodiaceae, Ephedraceae) during the Late Oligocene, and its subsequent increase in abundance during the Early Miocene began to give a modern appearance to plant communities.

Quattrocchio, M., Martínez, M.A., Hinojosa, L.F. , Jaramillo, C. 2013. Quantitative analysis of Cenozoic palynofloras from Patagonia (southern South America). **Palynology** 37(2): 246-258.