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Numerical analysis of palynological data from Neogene fluvial sediments as evidence for rainforest dynamics in western Amazonia

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Deep-time records that give an insight into the composition and dynamics of the ancestral Amazon rain forest are rare. Yet to understand the modern biodiversity patterns it is important to untangle the long-term evolution of this forest. Sampling Neogene strata requires drilling operations or complex fieldwork along the rivers where outcrops generally are small. In the nineties an exceptionally good exposure of fluvial sediments of early Miocene age (17.7-16.1 Ma) was documented near the island of Mariñame (Caquetá River, Colombian Amazonia) (Hoorn, 1994). This 60 m sediment succession consists of quartz-rich sands with a circa 10 m black, sandy clay intercalation. Palynomorphs are well preserved in these organic-rich clays and palynological analysis indicated high pollen diversity and changes in composition following changes in the sedimentary environment and water composition (see van Soelen et al., this session). A numerical analysis in R (2013) of the existing data, using a number of multivariate and other statistical techniques now shows a gradient of change in the composition of the Miocene palynological assemblages. Non-metric-multidimensional scaling using distance matrixes (Oksanen, 2012) and their visualizations in correlograms (Friendly, 2002) indicate that the regional (palm) swamp forests of Mauritiides franciscoi (Mauritia), frequently found together with other palms such as Psilamonocolpites amazonicus (Euterpe?) and Psilamonocolpites rinconii, were affected by a marine incursion. The latter is suggested by the change of composition and the presence of estuarine elements such as Zonocostites ramonae (Rhizophora), foraminifer linings and dinoflagellate cysts, which became common during the marine event. In the older part of the section, and at the top, Rhoipites guianensis (Sterculiaceae/Tiliaceae) is quite abundant, in contrast with the relatively low abundance of M. franciscoi. The numerical analysis allowed us to: a) group the pollen data into 3 associations, and b) estimate the palynological diversity along the sampled interval. Together these data suggest that the marine incursion altered the vegetation composition, but did not dramatically alter the diversity. After the marine incursion the vegetation returned to a modified version of the former floodplain forest. As yet no clear analogue has been found for this ancestral forest, but the palynological composition suggests a tropical rain forest to woody savanna.

References

Friendly, M., 2002. Correlograms: Exploratory Displays for Correlation Matrices. The American Statistician, 56, 316-324.

Hoorn, 1994. Hoorn, C. (1994). Fluvial palaeoenvironments in the intracratonic Amazonas Basin (Early Miocene-early Middle Miocene, Colomnbian). Palaeogeography, Palaeoclimatology, Palaeoecology , vol 109, 1-54.

Oksanen, J., Blanchet, F.G., Kindt, R., Legendre, P., Minchin, P.R., O'Hara, R. B., Simpson, G.L., Solymos, P., Henry, M. Stevensand, H., Wagner, H., 2013. Vegan: Community Ecology Package. R package version 2.0-8., J. 2012.

R: A Language and Environment for Statistical Computing, R Foundation for Statistical Computing, 2013