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High resolution taxonomic study of the late Eocene (∼34 Ma) Florissant palynoflora, Colorado, USA

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The Florissant Fossil Beds National Monument is located in Teller County in central Colorado, at approximate latitude 38°54'N and longitude 105°13'. The lithologies of the Florissant Formation consist of coarse-grained arkosic and volcanoclastic sandstones and conglomerates, finer shale, and tuffaceus mudstone and siltstone. It is divided into six units, mostly of lacustrine and fluvial origin with volcanic sediments interfingering and topping the strata. Volcanic units have been dated using the 40Ar/39Ar single-crystal method, giving an absolute age of ca. 34 Ma for the upper fossiliferous sedimentary unit. This pinpoints the formation of the Florissant sediments at the end of the Eocene, providing fruitful insight into the changing palaeoecosystem of the region at the dawn of the Oligocene.
The formation is very well known for its rich fossil insect fauna and well preserved plant macrofossils found in the shale units, and the silicified tree stumps occurring in the lower mudstone unit. The sample used for this study originates from the upper shale unit, the fifth unit from the base of the formation. Previous studies on the plant macrofossils, mesofossils and the palynoflora have shown that during the late Eocene the surroundings of Florissant palaeo-lake were covered by diverse mixed broad-leaved evergreen/deciduous and needle-leafed forests. Until now pollen from the Florissant Formation has mostly been described according to conventional morphological nomenclature, using light microscopy (LM) only. In this study the same individual pollen grains are investigated using both LM and scanning electron microscopy (SEM), by means of single grain technique. This provides best exploitable results concerning a more detailed resolution regarding taxonomy and more accurate identifications. The main goal of this study is to compile a well resolved taxonomic species list based on the palynoflora, to clarify the generic and species diversity of selected families (e.g. Fagaceae, Malvaceae, Onagraceae, Rosaceae, Rutaceae, Platanaceae), to group taxa into representative vegetation units, and to estimate the palaeoclimate.
Preliminary results show that the Fagaceae are represented by at least 5 species (including two different Quercus types), the Malvaceae, Rosaceae and Rutaceae are represented by 3 species, and the Onagraceae and the Platanaceae by 2 species. The method used has also allowed the new discovery of the following: rarly occurring pollen grains of Asteraceae, and relatively small grains of Tetracentron (Trochodendraceae).