INTEGRATED LEAF TRAIT ANALYSIS – A NEW TOOL FOR ANALYZING EUROPEAN PALEOGENE ECOSYSTEMS

Müller, C.[1], Roth-Nebelsick, A.[2], Wappler, T.[3] & Kunzmann, L.[1]

[1]Senckenberg Natural History Collections Dresden, Museum of Mineralogy and Geology, Dresden, Germany, christian.mueller@senckenberg.de
[2]Staatliches Museum für Naturkunde Stuttgart, Stuttgart, Germany
[3]Hessisches Landesmuseum Darmstadt, Department of Natural History, Darmstadt, Germany

Fossil leaf assemblages are excellent archives of environmental evolution of the earth´s history. Leaves as primary photosynthetic organs are directly exposed to their environment and their traits thus reflect adaptions or responses to habitat conditions through time. Functional leaf traits are keys to shifts in plant economics; insect damage types on fossil leaves, as evidence of plant-insect interaction, are the key to the complex and intricate trophic network in terrestrial ecosystems. As a new approach, the integrated leaf trait analysis combines these features of fossil leaf assemblages to characterize palaeoecosystem functioning. Exemplary on two lower Oligocene volcanic floras, namely Seifhennersdorf (Saxony, Germany) and Suletice-Berand (Northern Bohemia, Czech Republic), the concept of the integrated leaf trait analysis will be introduced. Further, methodological issues concerning applied methods, such as the Trait Combination Type (TCT) analysis, the image-based reconstruction of fossil leaves to obtain leaf size and leaf mass per area (LM_A), as well as the acquisition of insect herbivory parameter will be discussed. In the Seifhennersdorf flora insect herbivore traces are mainly evident on leaves of deciduous fossil species characterized by low LM_A, like *Betula alboides*, *Carpinus grandis* or *Carya fragiliformis*. In contrast to that, a higher diversity and abundance of herbivory traces on fossil species like *Engelhardia orsbergensis*, *Sloanea artocarpites* and *Daphnogene cinnamomifolia* indicate increased interaction with evergreen hosts in Suletice-Berand. Generally, evergreen species with long-living leaves are characterized by showing an opposite pattern of low insect herbivory caused by their traits (e.g., high LM_A through increased robustness/ toughness, high amount of plant secondary metabolites as defensive compounds). In both fossil floras, the host plants showing simple toothed leaves with craspedodromous venation (TCT F) are preferred by herbivores, as well as rareness or absence of leaf mining and galling.