



## **Fossil Atherospermataceae from lower Eocene sediments of Austria: Laurelia Juss. from the EECO section at Krappfeld in Carinthia**

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*Laurelia* Juss. (Atherospermataceae R. Br.) today is a disjunct genus in the southern hemisphere that inhabit temperate moist forests of South America and New Zealand. Unequivocal Atherospermataceae fossils are still rare and are known since the Upper Cretaceous from the southern hemisphere. Here, we present the first findings of *Laurelia* pollen in the northern hemisphere, preserved in EECO (Early Eocene Climate Optimum) sediments in southern Austria.

The sediments of the Paleogene Holzer Formation rest with an erosional unconformity on Campanian rocks, is 8 m-thick and composed of soft red and green claystone, and coaly lenses rich in terrestrial palynomorphs. The pollen and spores were examined with LM and SEM and assigned to botanical families and genera. Overall, three different palynomorph-rich facies were identified: The first, at the base of the Holzer Formation, is characterized by abundant and diverse fern spores, various Arecaceae, Myricaceae, and Juglandaceae. The second is from the black transgressive shale and characterized by the co-occurrence of marine dinoflagellates and Normapolles, *Nypa*, palm pollen, and *Avicennia*. The third facies is dominated by wind pollinated triporate taxa (e.g., Normapolles, Myricaceae, Juglandaceae), monosulcate palm taxa and numerous fern spores. The Atherospermataceae pollen, which resembles most closely the genus *Laurelia* Juss., were encountered in low numbers in all three facies of the Holzer Formation, but previously misidentified. The reason lies in the aperture type: Atherospermataceae pollen are composed of two hemispherical halves that are separated by a complete ring-like aperture or an incomplete ring-like aperture that acts as a zone of weakness so that the deposited fossil pollen, tend to fall apart. Most fossil *Laurelia* pollen in the Krappfeld are preserved as rolled up individual halves and look like boat-shaped sulcate pollen grains of monocots or basal angiosperms; preservation of complete grains is rare. The presence of *Laurelia* pollen during the EECO in Austria supports the theory that the taxon originated in western Gondwana and subsequently migrated to New Zealand before the early Miocene (*Laurelia* leaf fossils), but also is a witness of a northward migration through Africa to reach southern Europe. During northward migration, the plant must have adapted to warmer temperatures in order to grow under the early Eocene “subtropical to tropical” conditions and probably evolved into an understorey tree where the environment was less hot and more humid.