

TRACE FOSSILS OF THE EARLY VALANGINIAN IN THE HOCHKOGEL SECTION (UPPER AUSTRIA, NORTHERN CALCAREOUS ALPS): THEIR IMPACT ON LOG ORIENTATION AND PALAEOENVIRONMENTAL INTERPRETATIONS

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The Hochkogel section (Ebenforst Syncline, Northern Calcareous Alps) belongs to the the Rossfeld Formation. The stratigraphic investigation of the microfauna revealed that the Hochkogel section comprises Lower Valanginian sediments of the *Calpionellites* Zone (*Darderi* and *Major* Subzones), which corresponds to the *B. campylotoxus* and/or *T. pertransiens* ammonoid zones (Lukeneder, 2005).

The deposition of the sandstone-limestone beds in this area took place in an unstable environment disturbed by gravitational sediment flows, which transported different sedimentary components and accompanying fossils (mostly ammonites) from a source area situated to the south. The sandstone beds were deposited by turbidity currents. They display graded bedding and common concentration of plant debris at their top. The fossils were sorted, packed, aligned and concentrated by the bottom currents and occasionally influenced by bioturbation. The macrofauna and the sedimentological features support the interpretation of a highly dynamic palaeoenvironment on the basin slope, where turbiditic currents redeposited fragmented ammonite shells from shallower areas.

The Rossfeld Formation is mainly composed of grey silty marls accompanied by conglomerates and sandstones. The sandstones are fine-grained and some of their

beds show convolute or slump structures. The intercalated marly bioturbated limestones are light-coloured and are associated with a relatively monotonous benthic macrofauna (brachiopods and bivalves). The fabric is mottled to completely homogenised due to bioturbation and indicates intensive benthic colonization.

The Rossfeld Formation at the Hochkogel section is represented by an approx. 30 m-thick succession of grey, fine-grained calcareous sandstone beds, which are 5-50 cm thick. Three intercalated sandstone-limestone beds are 10-40 cm thick. The beds no. 1-3 are rich in calpionellids and ammonoids. These sandstone-limestone beds contain thin, 2-3 cm thick sandstone layers in the lower part, which pass gradually in the marly limestones in the upper part. The sandstone layers show sharp, erosive bases and a general graded bedding towards the transition to the limestone layer. They display incomplete Bouma intervals, mostly the parallel lamination sandstones (Tb) followed by cross lamination (Tc) and, bioturbated marly limestones (Td-e). The limestones contain dispersed sand grains in the lower part. Some, thinner sandstone layers are bioturbated, and they do not display any primary lamination. In many cases, the beds are welded and only the sandstone layers mark lower parts of turbiditic flows.

The incidental sedimentation of several, sandstone-limestone layers correspond to the period of the so-called Oravice Event, which is widespread throughout the Carpathians. Microfossils and other evidences from sections point to a large siliciclastic input in the West Carpathians during the Oravice Event, which is correlated with a third-order sea-level fall (Reháková, 2000).

New data on the trace fossils and sedimentology detect that the bed succession in the Hochkogel section is inverse. This is shown by the sharp lower boundaries of the sandstone-limestone beds, their general graded bedding, the diffusive transition between sandstones and limestones in the beds and the superposition of Tc on Tb Bouma intervals. Moreover, the full-relief preservation of *Scolicia* on a bed sole, a typically wrapped up axial part of *Zoophycos* and branching down *Chondrites* prove way up orientation. The trace fossils are abundant and show dominance of *Chondrites*, *Zoophycos* and *Planolites*. *Thalassinoides*, *Palaeophycus*, *Trichichnus*, *Phycosiphon*, "*Scolicia* and an unnamed small spreiten form are less common. The trace fossil association is typical of the *Zoophycos* ichnofacies, which is placed on the basin slopes in the classical ichnofacies model. Noteworthy is the occurrence of *Scolicia* in the Lower Valanginian because this trace fossil is very rare in the Lower Cretaceous. *Scolicia* is produced by irregular echinoids, which colonized deep seas since the Tithonian (Tchoumatchenco & Uchman,

2001). It became more common since the Late Cretaceous.

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