

The house of the rising sauropods– Evidence from the Late Triassic of the Eastern Swiss Alps

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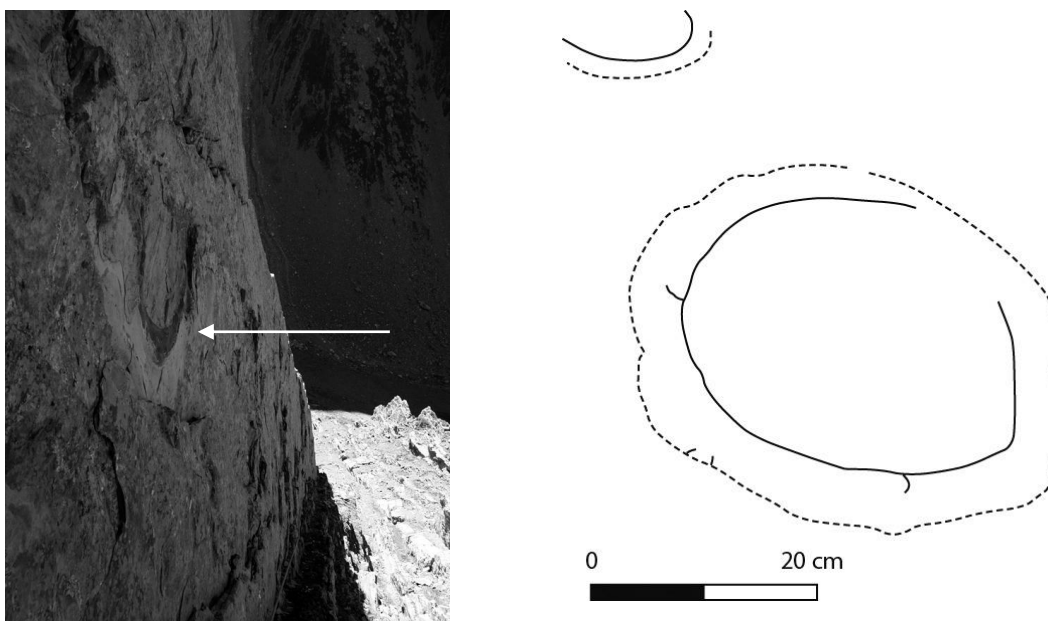
The integrated approach to combine the body and ichnofossil record has led to new insights into the early evolution of dinosaurs. For instance, the temporal overlap of sauropod and prosauropod dinosaurs led to the conclusion that the latter are not the direct ancestors of sauropods. However, the question still remains, how old are the oldest true sauropod body and trace fossils?

Antenonitrus from the Norian of South Africa is regarded as the earliest quadrupedal sauropod body fossil (Wilson 2005). A slightly younger record is *Isanosaurus* from the Nan Phong Formation (Late Norian – Rhaetian) of Thailand. The oldest trackways that display sauropod synapomorphies are known from the Lower Late Triassic (Carnian) Portozuelo Formation of Argentina, but their identification remains tentative. So far the oldest sauropod ichnotaxon is *Eosauropus* from the Chinle Formation (Norian/Rhaetian) of Western North America (Lockley et al. 2001). The presence of *?Pseudotetrasauropus* (ichnotaxon assigned to prosauropods) in Early Norian strata of South Eastern Switzerland (Diavel Formation; Furrer 1993; Lockley & Meyer 2000) seems possible but needs to be confirmed. The Chinle tracks show manual and pedal unguis traces and were attributed to sauropods. In the Portozuelo trackway segment pedal unguis traces can be seen, the manus appears to be irregularly present. The oldest sauropod tracks with slightly reduced manual phalanges (more advanced) are known from an Early Jurassic (Hettangian/Sinemurian) site in Italy (Lockley & Meyer 2000).

We report here on the presence of unequivocal sauropod footprints from the lowermost part of the Kössen Formation (Alplihorn Member; Late Norian) from the Central Austroalpine Elnappe (Southeastern Switzerland). They have been discovered in 2006 by the junior author, southwest of Filisur (Canton Graubünden). The surface comprises approximately 96 m² and shows so far an incomplete 19 m long trackway with a total of fourteen footprints. The best-preserved left manus-pes couple displays a distinct heteropody with a small manus. They are digitigrade, show no manual phalangeal impressions and pedal unguis traces are absent. The present tracks are very different from the North American, the Brazilian and the Diavel trackways. So far they represent the oldest record of advanced sauropod tracks - in respect to unguis and phalangeal reduction - in the world. The tracks occur as negative epichnia on a micritic limestone in the lowermost part of the Alplihorn Member and display very well developed mud rims. The steeply inclined surface (75°) allows only extremely limited access even with ropes; future studies will allow a more detailed description. A few meters below the tracklayer an almost complete skeleton of a crested pterosaur has been recovered (Stecher in review). Other faunal elements include remains of placodons, sharks, fishes and a rich invertebrate fauna (e.g. brachiopods, bivalves).

During our field visit in August 2007 several deep pes prints in the higher part of the Schesaplana Member (Kössen Formation, Early Rhaetian) have been discovered. They occur towards the top of a shallowing-upward sequence on a dolomitic limestone. Their morphology and outline, as well as the missing pedal phalangeal impressions furthermore corroborate the presence of advanced sauropods in the area.

Taking into account the purported prosauropod trackway from the Norian (Diavel Formation) and the Hettangian site in Northern Italy, we think that the whole area, together with the new sites reported herein, will greatly enhance our knowledge of the early evolution of sauropods in the near future.



Left: *In situ* view of best preserved manus-pes couple (arrow). Right: Outline drawing of left manus and pes track of an early sauropod from the basal Alplihorn Member (Kössen Formation; Norian), Filisur (Canton Graubünden).

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