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Year: 2015

Palaeontology

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ZORA URL: <https://doi.org/10.5167/uzh-113739>
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Originally published at:

Klug, Christian; Scheyer, Torsten M; Cavin, Lionel (2015). Palaeontology. In: Swiss Geoscience Meeting, Basel, 20 November 2015 - 21 November 2015.

4.12

The Norian and Rhaetian dinosaur tracks of eastern Switzerland in the light of sequence stratigraphy

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Prosauropod and theropod footprints from the middle and upper part of the Hauptdolomit Group (HDG; Mid to Late Norian) from the Upper Austroalpine Ela Nappe in the Parc Ela nature park (Canton Graubünden; southeastern Switzerland) and the Swiss National Park (Engadin Dolomites) provide important information on the paleobiogeographic distribution of the early dinosaurs (Meyer et al. 2010). Up to now, seven levels with dinosaur tracks have been detected in a stratigraphic range spanning the Norian to Late Rhaetian (Fig 1; Meyer et al. 2013). The large theropod tracks from Parc Ela attributed to the ichnotaxon *Eubrontes* (UPM:Uglix Plattenkalk Member of the HDG Group) and those from the Swiss National Park (Diavel Formation) together with the record from the coeval Dolomia Principale of the Tre Cime di Lavaredo (Dolomites, Italy) are the oldest unequivocal evidence of very large theropod dinosaurs. Furthermore trampled surfaces in the upper part of the HDG (Fig.1, 1; Ela Park; Late Alaunian to Early Sevatian) at three different locations indicate the presence of large dinosaurs. At the boundary between the HDG and the Kössen Formation (Aelplihorn Member) a trackway with deep quadradactyl pes prints as well as tridactyl manus prints can be attributed to a facultative bipedal prosauropod (Fig.1, 3; Fig. 2) In the youngest part of the Kössen Formation (Fig 1, 7; Silvaplana Member) sauropod tracks are also present.

The UPM contains at least 3 different levels with tracks (Fig. 1,2-4) the lowermost is a laterally persistent surface that is heavily trampled, these are probably associated with a 4th order sequence boundary. The exact sequence stratigraphic position of the trackbearing levels in the Swiss National Park remains to be determined. The levels in the Diavel Formation are most likely time equivalent with the trampled levels in the middle part of the HDG of the Ela Park. It seems quite possible that the highest levels in the Murtèr Formation and Murteret Dolomite are coeval with those in the UPM. The uppermost track level in the UPM corresponds to the No2 third-order sequence boundary (Gianola & Jacquin, 1998; McCann 2008; Alaunian/Sevatian boundary). This stratigraphic unit is time equivalent with the Knollenmergel of the Keuper that has yielded numerous skeletons of the prosauropod *Plateosaurus*. The sauropod tracks in the Silvaplana Member appear to be situated close to the Rh 2 third-order sequence boundary at the end of a shallowing upward cycle.

The track levels that have been detected in the Dolomites seem to be slightly older than previously suggested by Belvedere et al. (2014). According to our own field observations, the tracks that have been found in the Tre Cime di Lavaredo (Capella Alpini, Cima Piccola, Cima Ovest) and the Averau area are most likely situated at the No1 third-order sequence boundary (Lacian/Alaunian boundary) and therefore older than those from the Swiss sites.

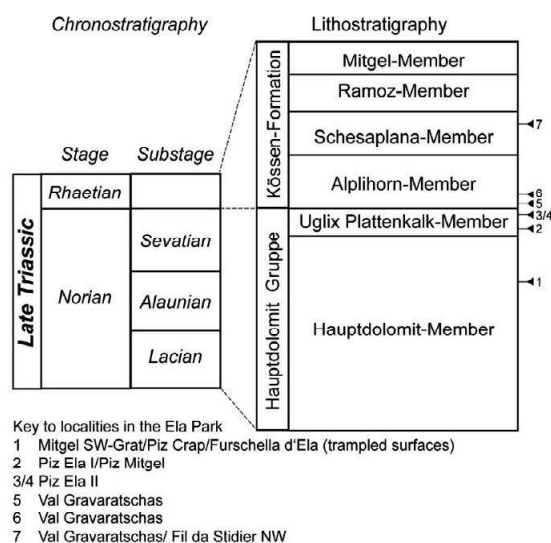


Fig.1 Stratigraphy of Late Triassic sequence of the Ela Park

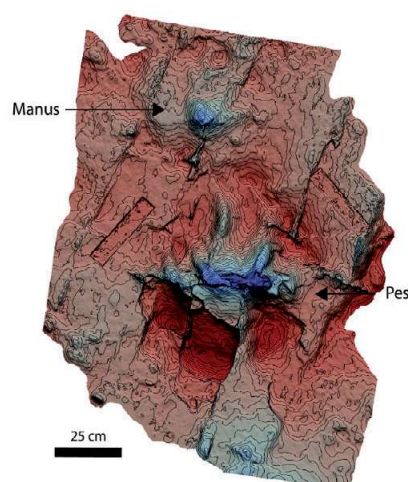


Figure 2. 3D contour model of a prosauropod manuspes couple (Uglix Plattenkalk Member, Hauptdolomit Group; Val Gravaratschas, Ela Park)