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3D modelling in palaeontology – a case study on the Triassic ammonite Orthoceltites (Carnian, Taurus, Turkey)

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While the Carnian Crisis, also known as the Carnian Pluvial Event, took place within the western Tethys, an ammonite mass occurrence was deposited within an intrashelf area on the western end of the Cimmerian System with intermediate connection to both, the Neo-Tethys and the Palaeo-Thetys Oceans. This ammonite mass occurrence (Orthoceltites sp.), now located at the boundary from Kartoz and Kasimlar Formation (e.g. Asagiyaylabel, Anatolia, Turkey), can act as proxy for the environmental activities and biotic crisis in the Carnian time (Upper Triassic).
A case study in 3D modelling on the ammonite genus Orthoceltites is presented. The latter studies are essential for palaeooceanographic and palaeobiological conclusions. Statistical analysis of the orientation and relative position (e.g. imbrication) of the ammonite shells can hint to current or transport directions. 3D modelling of ammonites will lead to a geometrical reconstruction and shed light on the biostratinomic and additional diagentic processes.
The proposed research integrates well established 3D visualisation and geometrical modelling techniques in an exciting palaeontological task of reconstructing the distribution and alignment of ammonites in a Triassic mass-occurrence from Turkey. The 3D reconstruction of ammonites, calcite cement and calcite veins from digitized polished sections will be performed, using the commercial software package GOCAD. Individual objects can be created from imported 2D sections by combining matching line features to a surface object. Statistical analysis of the orientation and relative position (e.g. imbrication) of the fossils, but also calcite cement distribution (representing geopedal structures) and post-diagenetic calcite veins displacing several ammonites will complete the geometrical reconstruction. Moreover, 3D surface laser scan data will be visualized in GOCAD, and by further processing size, orientation and distribution can be extracted. Expected 3D modelling results will be essential to reach geodynamic, palaeooceanographic and palaeobiological conclusions. Investigations, undertaken at sections (e.g. Asagiyaylabel) possessing this time interval, can work as proxy for the major Upper Triassic Tethyan crisis. Environmental changes as displayed by the sea level and climate can become clearer and the ‘motor’ behind the demise better understood.