Virtuelle Paläontologie

3D Modelling in palaeontology: a case study on Triassic ammonites

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An ammonite mass occurrence (*Orthoceltites* sp.), deposited during Carnian time within an intra shelf area at the western end of the Cimmerian terranes, 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). The section is situated in the southwest of Turkey, about 90 km northeast of Antalya and approx. 70 km southeast of Isparta, near a little village called Asagiyaylabel. Geologically the area is located on the Anamas Dağ carbonate platform or Anamas-Akseki Autochthonous. The main formations are the Middle to Late Triassic Formation (Early Carnian) and the Kasımlar Formation (latest Early Carnian to Late Carnian). The Carnian Pluvial Episode (CPE) is a well known phase during the Upper Triassic Carnian stage (approx. 225 ma) within the western Tethyan Ocean, well observed within different studies (Simms & Ruffell, 1989, Hornung & Brandner, 2005, Kozur & Bachmann, 2010), but main triggers of this demise are still under dispute.
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 will be essential to reach geodynamic, palaeooceanographic and palaeobiological conclusions. By 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 geopetal structures) and post-diagenetic calcite veins displacing several ammonites will complete the geometrical reconstruction. 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.

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Freies Thema

Palaeoenvironmental evolution of Lake Gacko (Southern Bosnia and Herzegovina): impact of the Middle Miocene Climatic Optimum on the Dinaride Lake System

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The Dinaride-Anatolian Island acted during Middle Miocene as a major paleogeographic barrier between the Paratethys and the proto-Mediterranean seas. The western part of that land mass comprised a large-scale freshwater lacustrine environment termed the Dinaride Lake System. Its deposits represent today sedimentary infills of numerous intra-mountainous basins distributed throughout the Dinaride Alps and attaining thicknesses greater than 2000 m. Our present study deals with one of those basins – the Gacko basin in the southern Bosnia and Herzegovina. The architecture of its about 360 thick sedimentary succession can be interpreted as a single, lacustrine transgression-regression mega-cycle. The sedimentation started with detritic deposits representing the initial flooding of the basin. The subsequent coal building phase marks the installation of swamp conditions, passing upward into limestones originating from hard-water lake deposition. Subsequently, dropping water levels triggered again the swamp and mire conditions in the terminal phase of the Lake Gacko.
Huge outcrop at Gračanica opencast coal-mine provided excellent insight into lake deposition on basin's paleomargin. Results from integrated Ar/Ar geochronology and magnetostratigraphy fixed the age of the lacustrine deposition into Langhian and Badenian implying its relation with the Middle Miocene Climatic Optimum. Furthermore, results from sediment petrography, geophysical logging and mollusk paleoecology indicated vivid changes of regional water budget. Indeed, the cyclostratigraphic analysis revealed the presence of two first order and seven second order transgression-regression cycles. These were orbitally tuned to ~400-kyr and ~100-kyr eccentricity cycles. The lake level high-stands were thereby related to eccentricity maxima, accompanied by environmental eutrophication events in consequence to enhanced denudation and terrestrial input into the basin. Dry climate intervals became related to ~400-kyr eccentricity minima. In the lower part of the succession they resulted in iterative swamp forest extension reflected by vast lignite accumulations. In the upper part of the succession they resulted, in contrast, in pedogenic and palustrine carbonate accumulation, secondarily distributed across the basin's margin.