Biostratigraphy and Invertebrate Paleontology

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Biochronology, paleobiogeography and plate tectonics of the Tethyan Triassic

Research

Our group is active in a field with a long standing tradition in Vienna. The Triassic period is a 50 million years time interval (from 250 to 200 my before present) with some of the most distinct extinction events which ever happened on earth. The background of this events is still not well understood. A refined geological time documentation as well as the increased knowledge of the paleoclimatic and plate tectonic history of the Triassic world, however, could help to create a better database for their understanding.

Integration of high-resolution biostratigraphy and magnetostratigraphy

In cooperation with members of the Institut de Physique du Globe (University Paris VII) we develop a geomagnetic polarity time scale (GPTS) for the Triassic. During joint studies of pelagic rock sequences from regions of the former Tethys ocean between Austria and the Near east we integrate biostratigraphic and paleomagnetic data. Refined zonations of relevant pelagic fossil invertebrate groups (ammonoids, conodonts) will improve the stratigraphic resolution of the individual time slices (=zones) from currently 1.5 million years to about or less than 500.000 years. This high resolution biochronological framework provides relatively precise ages for the dating of the observed reversals of the earth's magnetic field and allows the establishment of a well-calibrated Triassic magneto-stratigraphic time scale.

Paleobiogeography of the Tethys ocean

We are contributing to the reconstruction of the former tropical ocean which separated Laurasia from the megacontinent Gondwanaland during the late Paleozoic and Mesozoic time. This ocean has been closed completely in Tertiary times thereby losing its ocean floor through subduction whereas the tectonically highly deformed and displaced margins are now exposed in many mountain ranges between the Alps and the Himalayas. Turkey and Iran for example are composed both of a series of distinct tectonic blocks (=terranes) which originally have formed pieces of the northern and southern margin of the Tethys ocean. To separate between these very different origins paleontology in the way of recognition of distinct faunal or floral realms is an excellent method of reconstructing the original paleogeography. We have centered our studies on certain benthic invertebrates (brachio-

pods) which are known for their marked faunal provincialism. As a recent example we could demonstrate through distinct brachiopod associations that the different tectonic blocks forming today the territory of Iran must have considerably changed their geographic position to each other since the early Mesozoic (In cooperation with Istanbul Technical University and Isfahan University)

Teaching

Paleontology with special reference to biostratigraphy and facies analysis and supervision during paleontological field and laboratory courses.

International Cooperations

Institut de Physique du Globe & Institut de Sciences de la Terre- Université de Paris VII; Isfahan University- Iran.

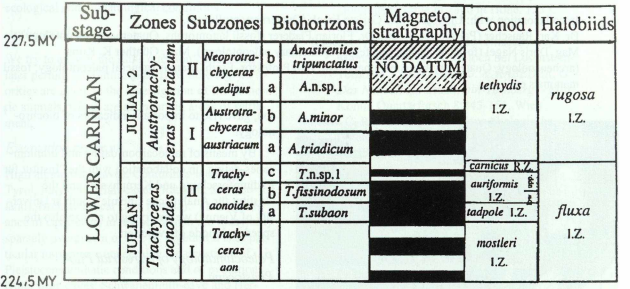

Fig. Biochronology and magneto-stratigraphy of the Lower Carnian (Upper Triassic).

REE in biogenic apatite

In a multidisciplinary study in cooperation with the Atominstitut der Österreichischen Universitäten (Vienna) we are analyzing Triassic conodonts and fish teeth by instrumental neutron activation analysis (INAA) for their concentrations of rare earth elements (REE). Our basic philosophy is the belief that in a stable sedimentary and diagentic environment such as the pelagic Hallstatt facies fossil REE concentrations can record long-term trends of the ancient ocean water chemistry. REE are transferred into the ocean from continental weathering and for volcanic activity (outgassing) of intraplate or spreading ridge (=MORB) origin. The expected REE concentration patterns of spreading - near deposited biogenic apatite could reflect changes in plate motions (velocity, direction) and in this case could record plate tectonic events. Until now, plate tectonics as one of several postulated causes of global biotic extinctions is deduced in the geological record only from rapid and drastic sea level changes. If we can demonstrate that Triassic biotic crisis intervals are marked by changes in the REE concentrations we see a chance to link them with more confidence to a plate tectonics-related background (co-worker: Y. Haunold).

Selected References

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