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Dichte und Schwere der Oberkruste im Ostalpenraum

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Seismische Großexperimente in den Ostalpen und den umliegenden geologischen Provinzen [z. B.: TRANSALP, CELEBRATION 2000, ALP 2002] brachten eine Fülle neuer Daten und Erkenntnisse über die Struktur der Lithosphäre. Parameter, mit deren Hilfe die geologischen Körper charakterisiert werden sind die seismischen Geschwindigkeiten. Diese werden u. a. durch den Mineralgehalt der Gesteine, den Druck und die Temperatur bestimmt. Sie weisen auch eine Korrelation mit der Gesteinsdichte auf. Die Integration von Daten über die Schwere in die Modellbildung ermöglicht weitere Aufschlüsse über Struktur und physikalische Parameter der Lithosphäre. Eine neue Karte der Bouguer-Schwere in Östereich und den benachbarten Ländern bietet für derartige Untersuchungen eine ausgezeichnete Basis. Schweredaten stellen eine tiefenabhängig gefilterte, integrale Information, über die Dichteverteilung im Untergrund dar. Ein Weg, um aus der 2D-Verteilung der Daten an der Oberfläche zu 3D-Modellen zu gelangen, ist das „gravity stripping", d.h. das sukzessive Abziehen der Schwerewirkung von Schichten, zumeist unter Einbeziehung zusätzlicher Daten. Im vorliegenden Beitrag soll über Vorgangsweise und Ergebnisse des gravity strippings der obersten 10 km der Erdkruste berichtet werden.
Folgende Informationen über die Gesteinsdichten in den obersten 10 km wurden verwendet: (a) Dichte von Gesteinsproben an der Oberfläche, (b) „apparent density" abgeleitet durch Filterung and Inversion der Bouguer-Schwere, (c) 3D-Verteilung der Dichte ermittelt aus Korrelationen mit der seismischen Longitudinalwellengeschwindigkeit. Kriterien zur Beurteilung der Wirklichkeitsnähe der mit diesen drei Verfahren berechneten Dichte-Modellen waren die Reduktion des kurzwelligen Anteils der gestrippten Schwere, die Korrelation mit der aus der Seismik bekannten Tiefe der Moho-Diskontinuität, sowie die geologische Plausibilität. Die Untersuchungen ergaben, dass Methode (a) von (b) und (c) stark abweichende Ergebnisse brachte und den Bewertungskriterien am wenigsten entsprach. Die Methoden (b) und (c) lieferten ähnliche Ergebnisse, wobei (b) den kurzwelligen Anteil (z.B. Dichtedefizit im Tauernfenster) besser wiedergab, (c) jedoch einen durch den großräumigen geologischen Aufbau bedingten, langwelligen Anteil (z.B. Molassezone und Kalkalpenüberschiebung) in den obersten 10 km nachzuweisen im Stande war. Die Elimination des nach der Anwendung von (c) verbleibenden kurzwelligen Anteils führte zu einer gestrippten Bouguer-Schwere, die für eine Dichte-Modellierung der tieferen Lithosphäre hervorragend geeignet ist. Dieser Interpretationsschritt soll nach Vorliegen des teleseismischen Modells ALPASS erfolgen.

Miocene dinoflagellate cysts of Austria: an ongoing study

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Material from several surface outcrops and exploratory drill holes from the Styrian, Vienna and Molasse basins covering most of the Miocene stages have been selected to study dinoflagellate cysts. Most of them are productive with fair to very good preservation state and give information about the palynoflora in the Central Paratethys during the Miocene. The dinoflagellate assemblages are highly diversified, about 135 taxon belonging to 46 genera -in situ- have been identified. Many of the Miocene marker taxa have been recorded which could allow to construct a zonation based on dinoflagellate cysts for the Central Paratethys. Among them are *Exochosphaeridium insigne* de VERTEUIL & NORRIS, 1996, *Labyrinthodinium truncatum* PIASECKI, 1980 and *Unipontidinium aquaeductum* (PIASECKI) WRENN, 1988. Such proposed zonation is age-controlled with other tools and correlated with well constrained zonations in the Mediterranean, north-western Atlantic and other regions. In addition, dinoflagellates provide extra evidence for the stage boundary of the Karpatian/Badenian in the Wagna outcrop, Styrian basin, based on the FO of *Operculodinium? borgerholtense* LOUWYE, 2001.
Palaeoenvironmentally, dinoflagellates provide information on the depositional environments in the studied sections which vary from shallow marine in Retznei to open marine in Waltersdorf (Styria Basin) and from full marine in the Lower and Middle Miocene sections to brackish in the Upper Miocene in Hennersdorf, Vienna Basin. However, the presence or absence of some taxa as *Tuberculodinium vancampoae* (ROSSIGNOL) WALL, 1967, *Melitasphaeridium choanophorum* (DEFLANDRE & COOKSON) HARLAND & HILL, 1979 and *Tectatodinium pellitum* WALL, 1967 is very helpful to determine the prevailed climatic condition during the deposition of the studied sections. Moreover, the considerable occurrences of heterotrophic dinoflagellate taxa in samples of Ottnang-Schanze (Molasse Basin) and Hainburg (Vienna basin) is a good indication of nutrient rich water.
In sections like Ottnang-Schanze, Wagna, Retznei and Hainburg (all of Lower to Middle Miocene) the dinoflagellate assemblage is similar to that of the Mediterranean and different from that recorded from the Upper Miocene sections such as Mataschen and Hennersdorf. This change in dinoflagellate assemblages and appearance of many new morphotypes which are considered to be endemic to the Upper Miocene (Pannonian) is interpreted as a result of the formation of Lake Pannon and considerable change in water chemistry.

A Miocene dinoflagellate cyst biozonation for the Central Paratethys: preliminary results

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The application of dinoflagellate cysts for biostratigraphic purposes in the Miocene of the Central Paratethys is promising due to high productivity and occurrence of many marker taxa. A new dinoflagellate cyst zonation for the Miocene of the Western Central Paratethys, is under construction. This zonation is based on biostratigraphic information from several surface outcrops and exploratory drill holes from the Styrian Swell, Vienna and Molasse basins, including some stratotype sections of regional stages. The new zonation is based on the first occurrences (FO) and last occurrences (LO) of selected dinoflagellate cyst species such as *Nematosphaeropsis downiei, Cousteaudinium aubryae, Tityrosphaeridium cantharellus*, *Exochosphaeridium insigne, Cannosphaeropsis passio, Sumatradinium soucouyantiae, Sumatradinium druggii, Cerebrocysta poulsenii, Palaeocystodinium striatogranulosum, Distatodinium paradoxum, Labyrinthodinium truncatum/modicum, Unipontidinium aquaeductum* and *Selenopemphix armageddonensis.*
This zonation is tied to the chronostratigraphic framework by other biostratigraphic data and by correlation with magnetostratigraphy and sequence stratigraphy of the Central Paratethys (Piller et al. 2007). It is correlated to well constrained dinoflagellate cyst zonations in the Mediterranean (Zevenboom 1995), Northwest Atlantic (De Verteuil & Norris 1996) as well as global (Williams et al. 2004).

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Extensional Tectonics at Tendaho Dam and Irrigation Site; Afar Depression, NE Ethiopia

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The Afar depression is known for its tectonic regime and typical extensional triple junction of the Red Sea, the Gulf of Aden and the Main Ethiopian Rift. Stretching and opening in the area was due to a far field stress exerted as a result of the convergence of the Eurasian and the Arabian Plates along the Zagros Orogenic Front and an upwelling mantle plume over the past 30 million years. Extension commenced with the separation of the Arabian-Nubian plate, the Arabian-Somalian plate and the Nubian-Somalian plate. Then rifting of the Red Sea propagated towards the center of the Afar depression by cutting across the Main Ethiopian Rift. The Gulf of Aden Rift propagated towards NW along the Manda Inakir rifting axis. The propagation of these two active rifts forms a 15,000 km^2 wide overlapping zone referred to as the East Central Block (ECB). The Tendaho, Dabbahu, Dobi, Karbahi, Immino, and Guma grabens are part of this block and provide an indication of recently active tectonic structures.
Interpretation of remote sensing data (LS-ETM+ satellite image and aerial photography) significantly aided the present study, by suggesting the extent of different lithological boundaries and geomorphological structures. Lack of vegetative cover and spare soil development provided an advantage for the interpretation. Brittle tectonic structures including fault zones, open joints and fissures and their associated kinematic indicators were mapped in the field.
The NE-SW trending Main Ethiopian Rift (MER) structures are cross cut by the younger NW-SE trending Red Sea Rift structures which strike toward the SE along the Tendaho Goba'ad Discontinuities (TGD). A basaltic dyke intruded at the center of the Gesye graben during extension of the MER. The Tendaho graben is an impressive rift structure within the ECB, of extension in the range of 2-3 mm/year. NW-SE trending structures, recent fissural basalts and Quaternary sedimentation are the major features found in the graben.

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Advanced multi-sourced structural 3D modeling in unconsolidated sediments (Vienna basin, Austria)

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Along a W-E striking outcrop wall, in a gravel pit 5 km SSE of St. Margarethen, several generations of conjugate sets of WSW and predominantly ENE-dipping normal faults are exposed in unconsolidated sediments. These sediments are represented by meter-thick successions of conglomerates and sand layers which were deposited during the Sarmartian and Pannonian (Sauer et al. 1992). The investigated area is part of the Eisenstadt-Sopron Basin, a sub-basin of the Vienna pull-apart basin. The Vienna basin developed during the Oligocene/Miocene extrusion of the Eastern Alps towards the Pannonian region in the east. The extraction took place along sinistral NE-SW trending strike slip faults and roughly N-S trending normal faults. Part of this regional geodynamic setting is recorded in extensional tectonic in unconsolidated sediments of the researched area. The length of the faults range from several decimetres to several tens of meters - investigations included nearby major fault structure, trending NNE-SSW. Measured offset of marker layers along exposed faults ranges from centimetres up to several meters. Three different types of host rock deformation due to normal faulting can be observed: (i) Normal fault drag, (ii) Reverse fault drag and (iii) tilting of blocks between closely spaced normal faults or conjugate sets of normal faults.
To combine several data sources (geological maps, field observations, topography, etc) we started with the preliminary data compilation in ArcGIS. Further we used GPR to collect shallow subsurface data. Several tens of GPR sections were