folds, which in turn are cut by later faults. The later faults that cross-cut the Eo-Himalayan folds developed in already cemented Muth Formation at much higher temperature and pressure conditions by crystal plastic deformation mechanisms, indicated by quartz crystals with undulatory extinction, abundant kink bands, dislocation glide, elongated subgrains, slightly curved deformation lamellae and pronounced shape preferred orientation. These two completely contrasting deformation mechanisms on the microstructural scale characterize two distinct fault sets which are unrelated in space and time. The deformation bands are of pre-Himalayan origin and therefore represent a set of rare pre-Himalayan deformation structures. The age of the deformation bands in the Muth Formation is bracketed by an early Devonian sedimentation age of the Muth Formation and a middle Cretaceous age of considerable cementation as deduced from compiled burial histories. We suggest the deformation bands are due to either the Neo-Tethys rifting event beginning in the early Carboniferous or the extension related to Late Carnian/Early Norian rapid subsidence, although a hitherto unknown deformation event can not be excluded. Our example from the NW Himalayas shows that the deformation bands can be separated from other, frictional deformation structures by their characteristic microstructural properties, spatial architecture and stratigraphic position. Their correct interpretation, in combination with studies on the stratigraphy and sedimentology, essentially contributes to the reconstruction of the tectonic complex areas, even in severely folded and faulted orogens like the Himalayas.

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Prospektion auf Thermalwasser führende Störungszonen bei Wildbad Einöd/Stmk.

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Das durch den Europäischen Fonds für regionale Entwicklung (EFRE) und das Land Steiermark finanzierte Projekt zielte auf die Entwicklung/Erprobung von Untersuchungsverfahren ab, die geeignet sind, in komplexen alpinen Tal- und Beckenlandschaften von mächtigeren Sedimenten verborgene Austritte von Thermalwässern zu orten. Die dafür einzusetzende Methodik (geologisch/strukturgeologisch Aufnahme, seismische Untersuchungen, Infrarot-Temperatur- und Bodengasmessungen) wurde im Raum von Wildbad/Einöd getestet.
Die Korrelation der Aufnahme-/Messergebnisse mit der Position der derzeit in Wildbad/Einöd fördernden Quellen (Calcium-Hydrogencarbonat-Sulfat-Thermalsäuerlinge) bestätigt die Brauchbarkeit der gewählten Methodik. Darüber hinaus wurden mit refraktionsseismischen Messungen der Tiefgang des Sedimentbeckens und die Struktur der unter der Sedimentfüllung verborgenen Felsoberkante dargestellt. Mit Infrarot-Temperatur- und CO_2-Bodengasmessungen war es möglich, den thermal beeinflußten Mischungsbereich im Grundwasserfeld abzugrenzen. He-Bodengasanomalien deuten auf verborgene Bruchstrukturen im Untergrund. Die strukturgeologischen Arbeiten definieren das Thermalwasserfeld von Wildbad-Einöd über einer tektonisch kontrollierten Zone im Überschneidungsbereich NNE-SSW streichender Teiläste der Olsastörung, E-W orientierter und nur im Bereich von Wildbad-Einöd auftretender Kluftscharen und Auflockerungszonen im Bereich der Überschiebungsfläche des oberostalpinen Murauer Paläozoikums auf das mittelostalpine Kristallin.
Die in Wildbad/Einöd genutzten Wässer sind Mischwässer höher temperierter Primärwässer, die entlang von Störungen in den quartären Sedimentkörper des glazial übertieften Tales aufsteigen und sich dort mit kühlem, nicht mineralisierten Talgrundwasser mischen. Eine nachhaltige Nutzung erfordert einen verbesserten Aufschluß und eine Fassung der primären Thermalwässer im Felsuntergrund vor ihrem Austritt in den Sedimentkörper, der zusätzlich durch eine postglaziale Gleitmasse kompliziert wird. Vor Bohrungen, die auf einen verbesserten Aufschluss der Thermalwässer im Felsuntergrund des Beckens abzielen, wird jedoch eine ca. 130 m tief abzuteufende Struktur-Kernbohrung im Bereich des östlichen Kurparks empfohlen.

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Late and post-Variscan sedimentary evolution in the ALCAPA-region

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The Circum-Pannonian region is composed of mega terranes which amalgamated from the Middle Jurassic till the Early Miocene. One is ALCAPA (Eastern **Al**ps, Central West **Ca**rpathians, basement of the northern **Pa**nnonian Basin with isolated outcrops of the Pelso Composite Terrane). Significantly the Late Paleozoic sedimentary environments are individually affected by the Variscan orogeny suggesting that diverse elements were amalgamated during the Alpine cycle. Regarding Devonian – Permian sedimentation and Variscan metamorphism/deformation the following zones can be distinguished (Ebner et al. 2008, Vozárová et al. 2008):
(1) Variscan metamorphic zone (Mediterranean Crystalline Zone) in the Eastern Alps and Western Carpathians.
(2) Veitsch-Nötsch-Szabadbattyán-Ochtiná zone where sedimentation began in foreland/remnant basins in front of (1) within the late Early Carboniferous.
(3) Oceanic and volcanonosedimentary units in parts of the Upper Austroalpine and Gemeric units affected by a Mid-Carboniferous orogeny/low grade metamorphism and with an unconformable continental cover.
(4) Variscan Flysch zone - Viséan - Bashkirian syn-orogenic flysch (?) in the Eastern Alps and the Western Carpathians Turòa unit.
(5) Siliciclastic turbiditic or pelagic carbonate environments until the Bashkirian without evidence of Variscan deformation/metamorphism (parts of the Graz Paleozoic; Szendrö, Uppony Mts.).
(6) Late Pennsylvanian - Permian shallow marine sediments concordantly following (5) (Bükk, Uppony Mts.).

(7) Continental molasse environments above (1-4).
During the Late Paleozoic NE parts of the Pelso Block („Bükkium“ auct.) without any Variscan deformation/metamorphism reveal strong relationships to the Medvednica Complex, Jadar Block and Sana-Una Terranes of the Dinarides from which they were separated by Mesozoic movements. This domain is characterized by a Late Pennsylvanian - Permian shallow marine clastic/ carbonate facies above older pelagic and sililciclastic turbiditic sediments. The highest nappes of the Graz Paleozoic, without a Variscan break until the Westphalian, are exotic for the Eastern Alps. All the other domains include Variscan deformation/low grade metamorphism and unconformable continental molasses of different geodynamic settings. Syn-orogenic Carboniferous flysch sedimentation is problematic for the Eastern Alps and Western Carpathians, but well established for the W-Carpathian Turòa unit. The Carboniferous siliciclastic sequences of the Szendrõ and Bükk Units of Pelso C.T. are not regarded as syn-orogenic flysch because they are devoid of any Variscan tectonic deformation, metamorphism and post-orogenic molasse sediments.

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A giant fossil termite from the Late Miocene of Austria

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Modern climates supporting „giant“ insects are tropical or warm xeric environments, while such hotter conditions along with hyperoxic atmospheres were conducive to enormous arthropods in Paleozoic and other palaeofaunas. Among the ecologically pervasive and highly social termites, such giants are exceptionally rare.
Recently, however, a giant termite, representing a new taxon, which belongs to a primitive, basal grade of termites near the Hodotermitidae s.l. and Termopsidae s.l, was recovered from Late Miocene (Lower Pannonian, c. 11.3 mya) sediments of the Styria Basin. This prodigious species, with its wing length of 33.5 mm (and possible wing span of nearly 80 mm, when thoracic width is also considered), was discovered in floodplain deposits of a meandering river system at Paldau. Palaeobotanical investigations point to a warm-temperate, or even subtropical climate.
Certainly the cold-temperate environs of modern Europe have proved unsuitable for a diversity of termite lineages, and have been unable to sustain populations of large termite species such as those seen in the tropics. Nonetheless, such larger species are actually few in number. The largest winged reproductives being those of the genus *Syntermes* (Termitidae: Syntermitinae) from the tropics of South America, with individual wings up to 35 mm in length. Among more primitive termite families, several species of the family Termopsidae and the sole survivor of the Mastotermitidae, *Mastotermes darwiniensis*, are all robust and can have wing lengths up to 26 mm. The new discovery was certainly a giant among living and fossil termites and, by comparison, most other species of termites, living or extinct, were relative dwarves.

The Steinbrunn sand pit revisited: Tectonic or gravitational forcing of soft sediment folds?

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The Steinbrunn sand pit 7 km WNW of Eisenstadt, Burgenland, represents a spectacular example of deformed unconsolidated/ partly consolidated sediments (SAUER et al. 1992). The exposed series of SW-verging, tight folds within virtually unconsolidated sand and silt layers have been attributed to a Pannonian E-W compressional phase of basin inversion which interrupted the main E-W extensional phase in the early and middle Miocene (PERESSON & DECKER 1997). However, the recent re-excavation of the outcrop facilitates several new observations that question the previous interpretation.
Most of the calcareous sand-sized sediment is unconsolidated, only some layers show cementation, often decreasing laterally within one layer. The basal parts of the exposed sediment shows cm to m thick beds of more cohesive silt and silty clay, which form conspicuous flame-shaped geometries in the fold cores typical for soft sediment deformation. Conjugate sets of normal faults in parts of the NE-dipping fold limbs cut through sandy layers and terminate within silt layers. Markers within the sand layers display only few cm of normal offset, but the fractures are filled with up to 2 cm thick clay fed from the overlying clay layer. This observation suggests that the sediment was even more unconsolidated during the formation of these structures. Most of the observed folds have a tight fold geometry with straight fold limbs and amplitudes of several meters. In the westernmost part of the outcrop, some fold axial planes are refolded, forming type 3 (hooks-and-crescent) fold refold structures with high angles between the axial planes and parallel fold axes. These fold shapes indicate either polyphase folding, which seems unrealistic for a short phase of basin inversion, or high strain during progressive folding and shearing of soft sediments in gravitational slump structures.
Regionally, outcrops within the same stratigraphic level do not display any comparable structures with E-W shortening kinematics. In contrast, exclusively E-W extensional structures (faults and deformation bands with normal offset) can be observed. Area balancing suggests a detachment horizon roughly 2m below the present level of exposure. Line-length restoration of the deformed succession indicates roughly 50% of E-W shortening. Clearly, an extrapolation of this estimation to a basin-wide shortening is inappropriate, as already suggested by PERESSON & DECKER (1997). However, even a local area of tectonic shortening in the E part of the Vienna basin seems unrealistic considering the restriction of this observation to this single outcrop. Thus we propose an alternative interpretation of the deformation features as the frontal zone of a gravitational slump, where contractional strain leads to the formation of tight folds.

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