Alps to test if active tectonics is reflected in the shape of the channel profiles. In our approach we compare channel profiles measured from digital elevation models with numerically modelled channel profiles using a stream power approach. The impact of the Pleistocene glaciations is explored by comparing properties of rivers that drain in proximal and distal positions relative to the ice sheet during the last glacial maximum. It is shown that most knick points, wind gaps and other non-equilibrium features of the rivers may be correlated with features related to the last glacial maximum and appear unrelated to the young tectonic activity. Conversely, the largest drainage of the Alps which was never glaciated - the Mur drainage basin - (except or a broad uplift) is largely in morphological equilibrium with constant stream power over much of its catchment. Only the Adige and the upper Rhine / Danube catchment show dramatically perturbed channel profiles, probably due to the fact that these two rivers are the only Alpine rivers responding to a base level different from the Black Sea (i.e, the Mediterranean during the Messinian for the Adige and the Rhine graben for the upper Rhine / Danube catchment). We conclude that the rate of erosion of most rivers in the Eastern Alps is rapid compared to the rate of uplift so that their channels may be considered antecedent. As such, we suggest that morphological evidence from Alpine rivers - including those from the tectonically less active Western Alps - may not be conclusive to derive information on the state of tectonism.

Uplift of the Styrian Basin: Caused by crustal or mantle processes?

Stüwe, K.[1], Wagner, T.[1], Fritz, H.[1], Schreilechner, M.[2] & Gross, M.[3]

[1]Institut für Erdwissenschaften, Universität Graz, Universitätsplatz 2, A-8010 Graz, Österreich; [2]Joanneum Research, Steyrergasse 17-19, 8010 Graz; [3]Landesmuseum Joanneum, Abteilung Geologie und Paläontologie, Raubergasse 10, Graz; kurt.stuewe@uni-graz.at

The evolution of the Pannonian Basin is known to have ended with the termination of subduction underneath the Carpathian arc. Since then, the sedimentation largely ceased and the basin was inverted. In the Styrian basin along the western margin of the Pannonian basin, this inversion has produced some 200-300 m of uplift and a complicated topography that appears to be produced by a strong coupling of tectonically driven tilting and uplift versus erosion driven dissection. Several studies have attempted to unravel the tectonic component of the topography by investigating river terraces, valley asymmetries and planation surfaces.
However, seismic interpretations of the Miocene sedimentary pile in the basin do not appear to show any evidence of substantial convergent, post inversion tectonism and are well interpretable in terms of transgressive and regressive sedimentological cycles in the Miocene. Moreover, many of the morphological features in the Styrian basin appear to be easier interpreted by extension than by compression: The asymmetry of topographic ridges in the Central Styrian Basin is best interpreted by shallowly west dipping listric detachments, tilting individual blocks. Finally, the few brittle structures known to displace young terraces are usually extensional or displace units vertically. As such, it appears that upper crustal structures does not record the compressional stress field of basin inversion and allow the possibility that the topography may be unrelated to basin inversion.
In this contribution we discuss the idea that the uplift of the Styrian basin since its inversion is unrelated to compression, but relates to ongoing extension in the mantle part of the lithosphere. Then, uplift is caused by reducing the negatively buoyant part of the lower lithosphere and near-surface extension may simply be caused by potential energy contrasts at shallow crustal levels. Ongoing extension in the mantle part of the lithosphere may be caused by a series of processes already suggested for the Pannonian basin (e.g. Houseman, Hrovath) but implies a decoupling between crust and mantle at the present time.
Pliocene volcanism in the Styrian basin has been interpreted to be derived from deep seated mantle sources. We therefore suggest that this volcanism may provide constraints on this idea and ultimately may bear information on the causes of topographic development in the region.

Drowning and block tilting of Middle Anisian carbonate platform in the Middle Jurassic Zlatibor mélange of the Dinaridic Ophiolite Belt (SW Serbia)

Sudar, M.[1], Gawlick, H.-J.[2], Lein, R.[3], Missoni, S.[2], Jovanovic, D.[4] & Krystyn, L.[3]

[1]University of Belgrade, Faculty of Mining and Geology, Department of Palaeontology, Kamenicka St. 6, P.O. Box 227, 11000 Belgrade, Serbia; [2]University of Leoben, Department for Applied Geosciences and Geophysics, Prospection and Applied Sedimentology, Peter–Tunner–Strasse 5, 8700 Leoben, Austria; [3]University of Vienna, Centre for Earth Sciences, Althanstrasse 14, 1090 Vienna; [4]Geological Institute of Serbia, Rovinjska St. 12, 11000 Belgrade, Serbia; sudar@eunet.yu, hans-juergen.gawlick@mu-leoben.at, s.missoni@daad-alumni.de, richard.lein@univie.ac.at, leopold.krystyn@univie.ac.at, djdivna@gmail.com

In the Middle Jurassic mélange of the Dinaridic Ophiolite Belt (DOB) in the Zlatibor Mt. area olistoliths of Triassic carbonates and radiolarites occur frequently. These slices differ in age, facies and paleogeographic origin. The carbonate rocks are thought to have originated from a zone that is now part of the Drina-Ivanjica Unit (DIU) whereas the radiolarites formed the basin floor and the ophiolitic rocks of the DOB the oceanic crust of the Neotethys Ocean. Originally, these different blocks were interpreted as derived from a former completely sedimentary sequence on top of DIU (Dimitrijevic 1997). The carbonate blocks reaches sizes of several tens to hundreds of metres and include predominantly rocks of Triassic age.
In one of these blocks, whithin the so called Klisura quarry, a Middle Anisian shallow-water sequence (Ravni Formation, Dedovici Member) is exposed. A drowing of this platform is proved as Late Pelsonian by means of conodonts and ammonites in the overlying hemipelagic sequence (Bulog limestone). The Dedovici Mb. consists of Steinalm limestone type shallow-water limestones with calcareous algae in the upper part and contains neptunian dykes filled with reddish hemipelagic sediments which indicate an extensional tectonic regime. In analogy to similar tectono- sedimentary features reported by Füchtbauer & Richter (1983) from the Pelsonian Eros Limestone in Greece we interpret this together with the following section as tilted blocks due to detachment faults. Conodonts (*Paragondolella bulgarica*) from these fissure fillings and from the lowermost part of the Bulog limestone indicate a Late Pelsonian age. Upsection follows the 17 m thick, red Bulog limestone of Early Illyrian age (*Paragondolella bifurcata*, *Paragondolella cornuta* and *Paragondolella excelsa*). The Bulog section is characterized by some condensed horizons with ammonite accumulations (Mudrenovic 1995) and a significant angular unconformity in the upper part of the interval. The Bulog limestone is tectonically overlain by Late Langobardian to Early Carnian grey cherty limestones (Klisura Member of ?Grivska Formation) with allodapic intercalations proved by means of conodonts (*Budurovignathus langobardicus* and upsection *P. polygnathiformis)*. In former times this hemipelagic sequence with allodapic layers was interpreted as a part

of the true shallow-water sequence of Wetterstein-type (Dimitrijevic & Dimitrijevic, 1991). The decollement surface below is characterized by grey-greenish tuffitic layer and nearly the whole Ladinian and the highest part of Bulog are missing below this low angle normal fault.
In the wider surrounding of the quarry different blocks and shallow-water limestones of Upper Triassic age (Dachstein limestone) are present separated by the radiolaritic-ophiolitic matrix of Middle Jurassic age, also incontaining Carnian radiolarites.
This drowing of the Steinalm carbonate platform is contemporaneous in the whole western Neotethys realm from Hellenides, over the Dinarides to the Eastern Alps. This process was governed by tectonic events like rapid subsidence, followed by rapid sea–level rise and other processes which are known by now (paradox of carbonate platform drowing). This drowing led to an overall change of the shallow-water conditions the whole western Neotethys realm to hemipelagic, extremely condensed sedimentary sequences. Crustal extention firstly led to the formation of neptunian dykes and to the end of the shallow-water production. Due to the beginning of the block tilting and new topographic relief was formed. On topographic highs very reduced sedimentation rate occurs where as in the newly formed asymetric basins accumulations of several metres occur. In comparison with other Late Pelsonian to Illyrian hemipelagic sequences, similar to Bulog limestone (e.g. Schreyeralm limestone in the Eastern Alps), in the western Neotethys realm, the investigated sequence in the Klisura quarry reaches a thickness up to 17 m. Continuous block tilting is mirrord in the accumulation of ammonites layers and the occurence of condensed sections.
The slides in Zlatibor mélange show identical facial stratigraphic and tectonic evolution as known in complete sequences from the Hellenides to the Eastern Alps. The sedimentary evolution in this whole realm follows overall geodynamic phases. Therefore, they belong to the same shelf, the Western Neotethys continental margin.

Dimitrijevic M.D. (1997): Geology of Yugoslavia. - Geological Insitute Gemini, Special Publication, Barex, Belgrade, 1-187.
Dimitrijevic M.N. & Dimitrijevic M.D. 1991: Triassic carbonate platform of the Drina–Ivanjica element (Dinarides). - Acta Geologica Hungarica, **34**: 1-2, 15-44.
Füchtbauer, H. & Richter, D.K. (1983): Carbonate internal breccias: a source of mass flows at early geosyncline platform margins in Greece. - SEPM spec. Publ., **33**: 207-215, Tulsa
Mudrenoviæ V. (1995): Cephalopods from the Bulog Limestones of Sirogojno. - Geoloski anali Balkanskoga poluostrva., **59**/2: 203-214 (in Serbian and English).

Radiolarian dating in the Middle Jurassic radiolaritic-ophiolitic wildflysch (= ophiolitic mélange) of the Dinaridic Ophiolite Belt, SW Serbia

Sudar, M.[1], Gawlick, H.-J.[2], Suzuki, H.[2], Missoni, S.[2], Lein, R.[3] & Jovanovic, D.[4]

[1]University of Belgrade, Faculty of Mining and Geology, Department of Palaeontology, Kamenicka St. 6, P.O. Box 227, 11000 Belgrade, Serbia; [2]University of Leoben, Department for Applied Geosciences and Geophysics, Prospection and Applied Sedimentology, Peter-Tunner-Strasse 5, A-8700 Leoben; [3]University of Vienna, Centre for Earth Sciences, Althanstrasse 14, A-1090 Vienna; [4]Geological Institute of Serbia, Rovinjska St. 12, 11000 Belgrade, Serbia; sudar@eunet.yu; hans-juergen.gawlick@mu-leoben.at, hsuzuki 2005@d1.dion.ne.jp, s.missoni@daad-alumni.de, richard.lein@univie.ac.at, djdivna@gmail.com

The Dinaridic Ophiolite Belt with its widespread mélange areas is an important link within the Alpine–Dinaridic–Albanide–Hellenic orogenic system. The Dinaridic Ophiolite Belt forms as northward continuation of the Mirdita ophiolites from northern Albania into Kosovo and Serbia through Bosnia to Croatia together with the Western Hellenic ophiolites in Greece and southern Albania a relatively continous ophiolitic belt. The Dinaridic Ophiolite Belt of western and southwestern Serbia is made of ophiolites and widespread mélanges containing different components up to nappe–size and is now interpreted as radiolaritic–ophiolitic wildflysch. The matrix of the components and blocks consists mainly of fine- to partly coarse–grained, partly radiolaritic, ophiolitic siliciclastics, further of shales, radiolaritic marls and rare radiolarites. Direct datings of these radiolaritic matrix-sediments in the Dinaridic Ophiolite Belt are missing. Westnorthwest of Sjenica in the central Dinaridic Ophiolite Belt occur an albite granite olistolith together with various ophiolitic material, spilite olistoliths, Late Triassic radiolarite olistoliths, and various very small still undetermable carbonate components.
From the radiolaritic matrix, which is in the surrounding of the albite granite olistolith we, isolate a radiolarian fauna of Middle Jurassic age, e.g.: *Archaeodictyomitra amabilis*, *Archaeodictyomitra mitra*, *Archaeodictyomitra rigida*, *Archaeodictyomitra* sp. B, *Dictyomitrella kamoensis*, *Eucyrtidiellum circumperforatum*, *Eucyrtidiellum semifactum*, *Eucyrtidiellum unumaense pustulatum*, *Eucyrtidiellum unumaense dentatum*, *Eucyrtidiellum unumaense unumaense*, *Hsuum maxwelli*, *Helvetocapsa* cf. *matsuokai*, *Hiscopaspsa magnipora Parvicingula spinata*, *Parvicingula* sp., *Praezhamoidellum buekkense*, *Praezhamoidellum yaoi*, *Protunuma lanosus*, *Protunuma turbo*, *Pseudodictyomitra* cf. *venusta*, *Quarticella ovalis*, *Stichocapsa convexa*, *Stichocapsa japonica*, *Striatojaponocapsa* cf. *conexa*, *Striatojaponocapsa* cf. *synconrexa*, *Tetracapsa himedarum*, *Tricolocapsa* aff. *fusiformis*, *Tricolocapsa fusiformis*, *Tricolocapsa* sp. S, *Tricolocapsa tetragona*, *Triversus hungaricus*, *Williriedellum dierschei*, *Williriedellum marcucciae*, and *Zhamoidellum exquisita*. This late Middle Jurassic dating of these matrix sediments proves directly the sedimentary emplacement of the different blocks. Therefore the ophiolitic mélange is interpreted to be formed originally as a primary synorogenic sediment (radiolaritic wild-flysch sequence) formed simultaneously during west-directed thrusting of ophiolite and sediment-cover nappes representing ocean floor and underplated fragments of the western continental margin (Drina-Ivanjica Element), later overprinted by contem-poraneous and younger tectonics forming a typical mélange.
The age range of the Sjenica mélange and the sedimentary emplacement of the olistoliths in the Dinaridic Ophiolite Belt seems to be similar to the radiolaritic-ophiolitic wildflysch in the Mirdita Ophiolite Zone of Albania to the south and the ophiolitic mélange areas in Medvenica and Kalnik Mts. to the northwest. The age of the ophiolitic-radiolaritic wildflysch is also similar to the radiolaritic carbonate-clastic flysch in the Northern Calcareous Alps (Hallstatt Mélange) and the Western Carpathians (Meliata Mélange) as well as to the ophiolitic–radiolaritic wildflysch in the Mirdita zone.
The situation in the Dinaridic Ophiolite Belt conform that of the Albanides („Mirdita mélange“) and Medvednica and Kalnik mountains in Croatia. To clearify the palaeogeographic derivation of the different blocks and the time span of their emplacement in detail, widespread investigations in a larger regional scale are necessary in future. Only a detailed component analysis of the „mélange“ with dating of the matrix allows a reconstruction of the source area.

Bioorganic particles as transport vehicles for iron in the continental runoff

Süphandag, S.A., Kammer, F.v.d. & Hofmann, T.

Department of Environmental Geosciences, Althanstrasse 14,