External Dinarides. The Sava Fault, a branch of the Periadriatic fault system, separates the Julian Alps from the South Karavanke Mountains and the Kamnik-Savinja Alps.

The Julian Alps have classically been subdivided into the Tolmin nappes and the overlying Julian nappes. The Tolmin nappes consist of three superposed E-W trending south-vergent nappes. The sediments are typically deeper marine (shale, chert, pelagic limestone, calcareous turbidites) from the Middle Triassic volcano-sedimentary succession up to the Campanian-Maastrichtian flysch. These Mesozoic rocks exhibit a considerable thermal overprint.

The Julian nappes originated from various paleotopographic units that started to differentiate in the Late Carnian. Small scale half-grabens did exist in the Middle Triassic but the entire area was then uniformly covered by the Schlern Formation. From bottom to top (and from NW to SE) we distinguish three major tectonic units. (1) The Tamar Nappe is characterized by Upper Carnian to Rhaetian carbonates rich in organic matter and chert nodules. (2) The Krn Nappe has the largest areal extent and mainly consists of the Dachstein limestone. Middle Jurassic deposits are cherts and calcareous turbidites or condensed Rosso Ammonitico limestone. (3) The Pokljuka Nappe is composed of deep-water Upper Triassic to Lower Cretaceous deposits. The most distinguishing stratigraphic unit is the Valanginian-Hauterivian flysch-type deposits that suggest a correlation with relatively internal tectonic units of the Northern Calcareous Alps and Dinarides. The Zlatna Klippe in the central part of the Julian Alps is structurally well differentiated but stratigraphically less distinctive, because it is composed only of the Schlern Formation and older rocks. Its position on top of the Krn Nappe suggests that the Zlatna Klippe is part of the Pokljuka Nappe.

The Julian nappes are dissected by parallel reverse faults oblique to the Sava Fault. Fault-propagation folds are the most commonly observed structures along these faults. The NE-SW striking faults east of the Vrata-Trenta line are characterized by SE vergent folds, whereas the folds and the steepened beds west of this line have the same orientation but the opposite vergence. South of Bohinj, i.e. closer to the Tolmin nappes, the faults are NW-SE trending and the associated folds are S to SW vergent. This pattern suggests an overall pop-up structure and CW rotation of internal smaller-scale fault blocks. A number of later normal faults have been observed, with down throw ranging from a few meters to several hundred meters.

The three-stage Paleogene to early Neogene deformation history, generally postulated for the eastern Southern Alps, is well recognized in the Julian Alps. The Dinaric phase was characterized by nappe emplacement, presumably towards west, perpendicularly to the orogen. During the Insubric transpressional phase, doubly-vergent reverse faults and CW rotation of fault blocks characterized the rheologically stiffer Julian nappes. At the same time the entire stack of the Julian nappes may have been transported southward on top of the Tolmin nappes and individual slices of the Tolmin nappes were imbricated. The subsequent short-lasting extensional phase near the end of the Early Miocene caused subsidence along steep normal faults in the Julian nappes and exhumation of the deeply-buried Tolmin nappes.

Magnetic susceptibility and spectral gamma ray stratigraphy of the Tithonian – Berriasian limestones in the Carpathians of Poland and Hungary – paleoenvironmental implications

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Magnetic susceptibility (MS) reflects para- and ferromagnetic mineral content in sedimentary rocks and is often applied as a correlation tool and, integrated with geochemical methods, as a useful palaeoenvironmental proxy. Field gamma ray spectrometric measurements determine the content of radionuclides: ^{40}K, ^{238}U and ^{232}Th. Integrated MS and spectral gamma ray (SGR) logs are presented from several marine pelagic sections of Tithonian – Berriasian age from the Carpathian area of Poland (Tatra Mts, Pieniny Klippen Belt) and the Pannonian Basin (Transdanubian Range, Mecsek Mts). All sections are reliably dated by calpionellid stratigraphy. Sections in the Tatra Mts, and the Transdanubian Range are additionally calibrated with magnetostratigraphy. MS in the Polish sections correlate well with K, Th, Al, Ti and other lithogenic elements and therefore might be used as a measure of lithogenic influx into basins. MS low that occurs in the lower to middle Berriasian (magnetozones M18r to M17r) correlates with high sea level, while MS highs in the upper Tithonian/lowermost Berriasian (M20r to M19n2n) and upper Berriasian (M16n) match the low sea level. High sea level coincides with a slight oxygene deficiency evidenced by elevated U/Th ratio. Some second order changes might be interpreted as climatic events; for example subtle MS increase within M17n which might represent humidity increase. The same interpretation might be applied for the section studied in the Mecsek Mts (Tisza unit) which encompasses most of the Berriasian. Sections in the Transdanubian Range reveal a different MS pattern without significant MS contrasts around the Jurassic/Cretaceous boundary. These results suggest that instead of the eustasy, the climatic conditions might have been the main factors controlling MS and SGR signal in the studied sections.

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3D Modeling of the Fribourg Area - Western Swiss Molasse Basin

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This study focuses on the structural style of the western Swiss Molasse Basin near Fribourg (west of Bern, Switzerland). We are elaborating a 3D geological model with Move Software (Midland Valley) covering an area of 1700 km2 around the city of Fribourg. Based on 2D seismic line interpretations and deep borehole data (SOMMARUGA et al., 2012) three dimensional seismic horizons are built. Horizons correspond to the following stratigraphic boundaries: Near Base Tertiary, near Top Late Malm, near Top Early Malm, near Top Dogger, near Top Lias, near Top Trias, near Top Muschelkalk and near Base Mesozoic. Surface bed dip data from the Geological Atlas 1:25'000 (swisstopo) are included so as to improve orientations of geological strata. Fault surfaces in Tertiary and Mesozoic cover as well as in Pre-Mesozoic basement rocks are constructed based on seismic interpretations (SOMMARUGA et al., 2012), geological cross-sections (Geological Atlas 1:25:000, swisstopo) and hypocenter positions (VOUILLAMOZ & ABEDNEGO, in prep.). Due to the lack of continuous seismic reflectors in Tertiary Molasse sediments, an appropriate mapping of fault structures in the latter is difficult. As a consequence Mesozoic fault surfaces are extrapolated through Tertiary Molasse sediments based on mapped surface fault structures (Geological Atlas 1:25'000, swisstopo; IBELE, 2011). 3D seismic horizons are depth converted based on a 3D heterogeneous P-velocity model of the Fribourg area (ABEDNEGO, in prep.).