hundred kilometers agrees with field observations and reconstructions of the necking zones in the passive margins of the Alpine Tethys. The application of the presented analytical and numerical solutions for necking to the passive margin evolution of the Alpine Tethys is discussed.

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Strain partitioning in the crust during continental collision: Insight from 2D numerical modeling

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In the central Alps, crustal shortening during the post-collision process varies along strike (Rosenberg and Kissling, 2013). Shortening pattern is gradually changed from upper plate crustal shortening (UPCS) in the east (e.g. Engadine profile in Rosenberg and Kissling, 2013) to lower plate crustal shortening (LPCS) in the west (e.g. Simplon profile Rosenberg and Kissling, 2013). The addressed question here is to a first order what controls UPCS or LPCS? Does it more depend on geological structure or physical parameters? We use a 2D thermo-mechanical coupled numerical model (Gerya and Yuen, 2007) to investigate the crustal strain partitioning during collision. Several important model parameters are tested, such as the lithospheric rheological structure, the lithospheric thermal structure, the convergence rate and the weak zone (decoupling two continental plates) geometry. Particular attention is paid on the influence of crustal strength (i.e. strength contrast between two continental plates) on shortening partitioning.

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Crustal structure of the Alps from Ambient Noise Tomography

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The ambient noise method has become very popular in the last two decades. With a growing number of seismic stations and easy availability of long records, it has become applicable in many regions of the world. Especially projects like the USArray create ideal conditions for Ambient Noise tomography. The signal for this method is created by microseisms, which originate from the permanent interaction of atmosphere, ocean swell and solid ground. In comparison with classical earthquake tomography, Ambient Noise is most energetic in the short period band. This means, it allows to image very shallow structures, from the surface to the upper mantle. In combination with the high lateral resolution of surface wave tomography, we are able to resolve the crustal structure underneath the Alps. We show extensions and depth of sedimentary basins at the border of the Alpine orogen, as well as variations in the crustal thickness. In this context we aim to resolve wave speed differences between the Adriatic and European Plate in the Eastern Alps and trace their signature at depth.
By using all the available stations and inverting both for Love- and Rayleigh waves, we stabilize our results further. The processing is largely automated and will highly profit from all future efforts like the AlpArray project. This study is an extension of earlier efforts by Molinari (2011), Verbeke (2012), Boschi (2009) and co-workers, and represents the next step to close the gap between very localized seismic studies and largescale earthquake tomography.

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The Pleistocene Mitterberg deposits: Tectonic control, provenance analysis and depositional processes (Upper Enns Valley, Austria)

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The ENE-trending Salzach-Enns-Mariazell-Puchberg (SEMP) fault is an orogen-parallel (sinistral, then dextral) strike-slip fault facilitating eastward lateral extrusion. Up to now, no releasing nor restraining bends were reported although the fault obviously curved. Here, we present the Mitterberg, which likely formed on a right-stepping releasing bend on the late-stage (Pleistocene) dextral activation of the SEMP fault. Quaternary glaciations combined with neotectonic activity formed the landscape of the Upper Enns Valley (Eastern Alps). The SEMP fault separates the Niedere Tauern block with amphibolite- and greenschist facies grade metamorphic rocks from the Northern Calcareous Alps. The Mitterberg lies between the paleosurfaces south and north of the Upper Enns Valley. It counts as a relic of a continuous Pleistocene valley bottom, now 850 meters above the present-day Enns Valley. As the Ramsau plateau farther west is supposed to have formed a continuous valley bottom with the southern paleosurfaces as well, a comparison of the conglomerates suggests varying sources of sediment deposition. Provenance analysis of the Ramsau Conglomerate results in a predominant percentage of crystalline clasts, indicating primarily the provenance from the medium and low-grade metamorphic gneissic terrain of the Niedere Tauern to the south (61% crystalline rocks, 24% unmetamorphic carbonates, 15 % Permian to Lower Triassic sandstones). Provenance analysis from Mitterberg shows a slight variation (60% crystalline rocks, 26% unmetamorphic carbonates, 13% sandstones); however, there is a significant difference in clast composition. High-grade metamorphic diorite-gneiss is not present in the Ramsau Conglomerate; frequently appearing orthogneiss on Mitterberg is present scarcely in the former. Significant for the conglomerate on Mitterberg is the occurrence of carbonates derived from the Northern Calcareous Alps like Gutenstein and Hallstatt Limestone Fms. as well as Fellerbach Formation from the base of the Northern Calcareous Alps. The dearth of fine fractions identifies the Mitterberg as an older deposit and not as a "Niederterrasse" as suggested by other authors before. We conclude that the sedimentary pattern has undergone a change between Pleistocene and Holocene, and that the northern side of the Mitterberg represents a wind gap. The Holocene Enns River dissected the Pleistocene valley infill later. At Mitterberg, cross bedding indicates clearly bipolar transport directions, whereas in the Ramsau Conglomerate the directions of sediment flow vary widely. The conglomerate on Mitterberg also records tectonic deformation indicated by normal faults and photolineaments. A prominent NW-trending fault cuts the Mitterberg block in the west, geomorphic evidence argues for a dextral displacement. An interesting result is that there is no evidence for sinistral strike-slip along steeply NNW-dipping normal faults as could be expected from the mostly sinistral nature of the SEMP fault.

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From Jurassic accretion to Cretaceous back-thrust: tectonic consequences of 220 Ma rhyolite clasts from Neotethyan melanges

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Middle to early Late Jurassic coarse-grained (meta-) sedimentary units were investigated in NE Hungary and SE Slovakia. They show similar lithological character, but according to present knowledge, they thrust onto different margins of the Neotethys Ocean during Late Jurassic – Early Cretaceous. At present, these siliciclastic rocks form different nappe units. The Mónosbél nappe is sandwiched between a Dinaridic Palaeozoic – Mesozoic succession (Bükk) and the Western Vardar ophiolite nappe. On the other hand, the Meliata nappe is part of the Western Carpathian nappe stack, which presumably formed the northern margin of the Neotethyan Ocean.
Geochemical analysis and U-Pb age dating of rhyolite clasts deriving from different nappe units indicate potential common source area: the Dinaridic – South Alpine margin. The supposed source area gives a possibility to question certain plate tectonic reconstructions and suggest new speculations. While the ofiolite obduction onto the southern (Dinaridic) margin is proved to be Late Jurassic, only Cretaceous nappe contacts have been documented on the northern (Western Carpathian) margin, although subduction also started in the Middle Jurassic. It can be interpreted in two ways:
a) All the siliciclastic, sedimentary mélange units (both Meliata and Mónosbél) first accreted onto the Dinaridic margin during the Late Jurassic, then later, thrust on top of the northern margin during the Cretaceous deformation.
b) Alternatively, the Western Carpathian Meliata unit did not take part in the first, Dinaridic thrust phase, but was cut from its original sedimentation area by a strike-slip fault. Such a fault has been postulated in the Eastern Alps by seveal authors (Stüwe & Schuster 2010) to explain subduction process of the Austroalpine units. This postulated strike-slip fault would have late Jurassic age, which would post-date sedimentation and pre-date early Cretaceous metamorphism. In this scenario, Meliata unit might have experienced one major thrusting deformation onto Carpathian units, possibly during the early(?) Cretaceous.

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The deep structure of the Pamir and Hindu Kush mountains, central Asia – about the fate of continental lithosphere during collision

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