Tectonic map and cross sections of the Tauern Window (Eastern Alps, Austria)

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A new tectonic map of the Tauern window was compiled for three reasons: (1) we felt that the traditional nomenclature using terms such as “Zentralgneise”, “Altes Dach”, “untere Schieferhülle” and “obere Schieferhülle” is nowadays totally outdated and needs to be replaced by more adequate terminology in order to reflect the progress made in geology since the last 100 years and to better understand orogenic processes, (2) we needed a unified basis for understanding the complex 3-dimensional architecture of the Tauern window and surrounding Austroalpine units in order to construct a series of profiles, and, (3) we felt that map and profiles are useful for a better understanding of the kinematics and dynamics of deformation in a first class natural laboratory.

The tectonic map of the Tauern window provided by Kurz et al (1998), introducing the concept of nappes rather than “Schieferhüllen”, was instrumental for attempting a new map compilation and provided a solid basis. The number of published articles and maps is by far too long to be mentioned and here we can only point out the most important ones, namely the Salzburg map and explanatory notes (Pestal et al. 2005, 2009), together with all the detailed maps freely available from the Geologische Bundesanstalt (http://www.geologie.ac.at/).

The major tectonic units are, from top to bottom (1) the Austroalpine nappe system that was subdivided according to the scheme proposed by Schuster et al. (2001, their Fig. 1) and Schmid et al. (2004); (2) the Matrei Zone and Nordrahmenzone, remnants of the Alpine Tethys (Piemont-Liguria Ocean) accreted to the Austroalpine already in Cretaceous times; (3) the Glockner nappe comprising units deposited on oceanic lithosphere of the Valais branch of Alpine Tethys, not accreted to the upper plate before Eocene times; (4) units derived from the European distal margin that entered the Alpine subduction zone early on and which are currently found above a roof thrust of the crustal-scale Venediger duplex that formed later (Seidlwinkel - Rote Wand nappe, Eclogite Zone and Wolfendorn nappe) and finally (5) the Venediger duplex subdivided into three major thrust sheets, from top to bottom the Zillertal-Riffl-Sonnblick-Storz nappe, the Tux-Granatspitz-Hochalm nappe, and the Ahorn & Göss nappes forming horse-type imbricates above a sole thrust that remained buried at depth.

Analysis of the 3D geometry, together with literature data, reveals the following sequence of kinematic steps during the Cenozoic (we do not discuss pre-Cenozoic suturing between Austroalpine and Matrei-Nordrahmenzone). **D1: early subduction**: eclogite facies metamorphism in parts of the Glockner nappe, within the eclogite zone and parts of the Seidlwinkel - Rote Wand nappe (Kurz et al. 2008) documents subduction of an ocean-continent transition zone below Austroalpine and Matrei-Nordrahmenzone units during the onset of collision, as the Alpine Tethys closes at around 42 Ma (Ratschbacher et al.2004). **D2: Isoclinal folding of the contact between Glockner nappe and Seidlwinkel - Rote Wand nappe**: This event is only preserved in the central part of the Tauern window that escaped significant overprint during the final stages of exhumation. It is linked to the gradual exhumation of high-p rocks to a depth where amphibolite grade conditions prevail and during a first Cenozoic event of nappe emplacement (Kurz et al. 2008). D2 structures are restricted to units located above the roof thrust of the Venediger duplex. **D3: formation of the Venediger duplex**: During the mature stages of collision massive volumes of Europe-derived upper crust entered the subduction zone and, due to buoyancy forces, were accreted to the upper plate before reaching the critical depth for high-p metamorphism. Massive accretion of continental provides the heat source for still ill dated Barrow-type metamorphic overprint). **D4: predominantly ductile components of Final Exhumation:** the activity of the Katschberg and Brenner kinematic systems at around some 25 Ma ago leads to contemporaneous orogen-perpendicular compression, orogen-parallel extension and strike-slip motions that shape the final geometry of the Tauern window and are driven by the indentation of the Adriatic plate (Rosenberg et al. 2007) as well as by a component of orogen-parallel extension due to roll-back in the Carpathians. **D5: brittle components of final exhumation:** these heavily affect the western Tauern window where they lead to a through-going brittle component of normal faulting, also across parts of a pre-existing Brenner line, while the dextral Mölltal fault develops as a Riedel shear of the dextral Periadriatic line; brittle faulting within and outside the window is strike-slip dominated.

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