Alternative models to explain the evolution of Alpine-type collisional orogens: the importance of rift inheritance

Manatschal, G.[1], Beltrando, M.[2], Decarlis, A.[1], Haupert, I.[1], Masini. E.[1] & Mohn, G.[3]

[1] IPGS-EOST, CNRS-UdS, 1 67084 Strasbourg, France
(manat@unistra.fr)
[2] Dipartimento di Scienze Mineralogiche e Petrologiche, 10125 Torino, Italy
[3] Département géosciences et environnement, 95031 Cergy-Pontoise, France

Many plate kinematic and tectonic models proposed for the evolution of the Alps in Western Europe are deeply inspired by present-day SW Pacific-type subduction systems. However, key features characterizing the upper plate of Pacific-type margins, such as high temperature-low pressure metamorphic overprint associated with volcanic arcs and back arc basins are not found in the Alpine domain, despite the fact that the upper plate (Adriatic plate) is very well exposed. This significant difference questions the validity of the supposed similarity between the Alpine Tethys and Pacific-type systems, especially with respect to the nature of the subducted lithosphere and the original basin width.

In our presentation we will first explore the most recent insights on rifted margins architecture and dynamics from the southern North Atlantic, Pyrenean and Alpine domains and discuss how these results may impact the plate kinematic reconstruction and geodynamic evolution of the Alpine system. Based on these observations we will propose an alternative scenario for the pre-Alpine rift evolution. Furthermore, we will show that the rift architecture exerted a major control on the structural and sedimentary evolution of the Alpine system during plate convergence (tectono-sedimentary evolution of Flysch and Molasse sequences) as well as on the final architecture of the orogen (evolution of the external massifs and along strike variations of the Alpine orogenic structure). A key result of our studies is that rift inheritance strongly controlled the final architecture of the interal parts of the orogen. The intimate link between ophiolites and remnants of thinned continental crust and the strong segmentation and diachronous evolution of the mountain belt are largely a result of rift-related tectonics and do not need to be explained by “ad hoc” models. The observation that the Alps in Western Europe developed from a complex paleogeographic domain and represent a collage of different orogenic belts and accretionary prisms that were formed diachronously along different parts of the convergent African-European system questions the comparison with classical steady-state Pacific-type subduction systems.

The structure and P-T evolution of the Dent Blanche Tectonic System (Austroalpine Domain, Western Alps): from the Permian lithospheric thinning to the Alpine subduction and collision

Manzotti, P.[1], Zucali, M.[2], Ballèvre, M.[1] & Engi M.[3]

[1] Géosciences Rennes, UMR-CNRS 6118, Université de Rennes 1, 35042 Rennes Cedex, France
(paola.manzotti@univ-rennes1.fr, michel.ballevre@univ-rennes1.fr)
[2] Dipartimento di Scienze della Terra “Ardito Desio”, Università degli Studi di Milano, Via Mangiagalli, 34-20133 Milano, Italy
(michele.zucali@unimi.it)
[3] Institute of Geological Sciences, University of Bern, Baltzerstrasse 1+3, 3012 CH-Bern
(engi@unibe.ch)

The Dent Blanche Tectonic System (DBTS) is a composite thrust sheet consisting of superimposed units of polycyclic basement, i.e. Arolla and Valpelline Series, both derived from the Adriatic continental margin. These units preserve a polyphase structural and metamorphic history, comprising both pre-Alpine and Alpine cycles.