The Oligocene surface of the Sesia Zone, its burial and re-exhumation: some consequences for near-surface tectonics

Alfons Berger[1], Ivan Mercolli[2], Notburga Kapferer[2] & Bernhard Fügenschuh[3]

[1] Institute of Geography and Geology, University of Copenhagen, Østervoldgade 10, DK-1350 Copenhagen, Denmark (ab@geo.ku.dk)

[2] Institute of Geological Sciences, University of Bern, Baltzerstr. 3, Switzerland

[3] Universität Innsbruck, Innrain 52, 6020 Innsbruck, Austria

The near-surface tectonic evolution is essential to understand paleotopography and morphotectonics. We will investigate near-surface tectonics in Oligocene/Miocene times. The tectonic analysis of a paleosurface has the great advantage to offer also information on the time evolution of the relevant large-scale processes. The study area is located along the Canavese Line, i.e. at the contact of the Sesia-Lanzo Zone with the Ivrea-Verbano Zone. In the studied segment, a well-preserved paleosurface of the Sesia-Lanzo Zone occurs in undisturbed stratigraphic sequence with volcanic rocks. This unique stratigraphic association allows the accurate dating of the paleosurface by precise U/Pb dating of juvenile zircons from the sub-aerial volcanic and epiclastic rocks. The emplacement age of the volcanic rocks has been determined at ~33 Ma. Structural data (deformation of some volcanic rocks) and the overprint at very low-grade metamorphic conditions demonstrate a post emplacement burial of these rocks and their subsequent re-exhumation to the surface. The steep attitude of paleosurface and volcanic rocks (60-80° towards the SE, mainly indicated by the layering in the epiclastic rocks) suggests a rotation of the paleosurface in the order of 50-70° [see also Schmid et al. 1989]. The present day geometry requires the preservation of small but coherent blocks during rotation. Block rotation of this surface together with their overlying volcanics can be best explained by an extensional setting during or just after the mentioned magmatic activity. The necessary block rotation occurs between normal faults and must include the surface at that time. Large rotations near the surface include also change in topography (e.g., half-graben structure close to basin contact). The extensional situation is consistent with the basin evolution in the direct adjacent Po basin [Fantoni et al. 2003]. Most likely, the investigated situation in the Early Oligocene is directly related to the transition of the evolving Alpine chain into its hinterland basin. After normal faulting and block rotation, the area underwent compression leading to the inversion of the normal faults towards thrust. These thrusts and related thickening are responsible for the metamorphic overprint of the volcanics. The inversion from normal faulting to thrusting is also documented in the Po basin, where at this time portions of South Alpine basement overrides in SE direction Paleogene sediments. Miocene sediments seal these allochthonous units [Fantoni et al. 2003]. The exhumation of the buried paleosurface and the volcanic rocks is related to the thrusting of the Sesia-Lanzo Zone (or a part of it) over the Ivrea-Verbano Zone. Future studies will constrain this evolution in more detail using apatite fission track data..

References:

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