Geophysical Research Abstracts,
Vol. 11, EGU2009-3086, 2009
EGU General Assembly 2009

Neogene transtensional brittle tectonics in the Lepontine Dôme (Central Swiss Alps)

C. Allanic (1), C. Sue (2), and J.-D. Champagnac (3)

(1) Geological Institute, Neuchâtel University, (2) IUEM - UMR 6538 place Nicolas Copernic F-29280 Plouzané - France , (3) Universität Hannover, Institut für Mineralogie, Hannover, Germany

The Lepontine Dome is investigated regarding faulting and paleostress, which allows to constrain the late brittle deformation of this gneissic core. Its tectonic evolution under brittle conditions was determined using fault mapping and paleostress inversions. Three brittle phases were reconstructed. The older phase is a NW-SE extension restricted to the eastern parts of the Dome. The second phase (major signal) is an upper Miocene transtension with stable orogen-parallel sigma3 axes (NE-SW), which is found from the Mont-Blanc to the Bergell massifs. The late phase is a N-S extension, expressed north of the Dome, and probably linked to the current collapse of the belt.

The stress fields we determine for the Lepontine Dome are very similar to the stress fields determined by Champagnac et al (2006) westward in the South-Valais area, with a major signal in orogen-parallel extension and a minor signal in orogen-perpendicular extension. In the close vicinity of the Simplon fault, Grosjean et al (2004) only reported the orogen-parallel extensional stress field. Eastward, in the Bergell area, Ciancaleoni and Marquer (2008) also found a very regular NE-SW extensional paleostress field, using similar methods. Indeed, the main paleostress field determined in the Lepontine Dome is very homogeneous from a regional viewpoint. It is largely dominated by the NE-SW brittle extension, described in the whole northwestern Alps. The Lepontine Dome also bears witness of two minor extensional signals (N-S and WNW-ESE directions of extension).

The absolute dating of this orogen-parallel extensional phase is based on the occurrence of pseudotachylytes locally injected in the related fault system. Pseudotachylyte development is directly linked to frictional heating due to earthquake and faulting. The Ar/Ar dating of three pseudotachylytes samples of the Lepontine Dome provided ages in the range of 9-11 Ma ± 1 (Allanic, et al., 2006). Thus, one can attribute a global 10 Ma age for the orogen-parallel extensional phase, at least in the Lepontine Dome.

We propose a kinematic model for the Central Alps in which the emplacement of the Lepontine Dome is driven by a pull-apart-like process controlled by the counterclockwise rotation of the Apulian indenter. This model refers to the paleostress field we documented and to kinetics of the main faults bounding the dome. Associated to these processes, lateral escape linked to the Apulia indentation/rotation would have enhanced the global extensional scheme of the Lepontine Dome.

REFERENCES

Allanic, C., et al. (2006), A paleo-seismogenic Lepontine dome? New insights from pseudotachylytes-generating faults, Geochimica et Cosmochimica Acta, Vol. 70 (18), Suppl. 1, p9 Goldschmidt conf. Melbourne.

Bistacchi, A., and Massironi M. (2000), Post-nappe brittle tectonics and kinematic evolution of the north-western Alps: an integrated approach, Tectonophysics, 327, 267-292.

Champagnac, J. D., Sue, C., Delacou, B., Burkhard, M. (2006), Miocene orogen-parallel extension in the inner Western Alps revealed by dynamical fault analyses, Tectonics, 25, 1-26.

Ciancaleoni, L., and Marquer D. (2008), Late Oligocene to early Miocene lateral extrusion at the eastern borders of the Lepontine dome of the Central Alps (Bergell and Insubric areas, Eastern Central Alps), Tectonics, 27, TC4008, doi:10.1029/2007TC002196, 2008.

Grosjean, G., Sue, C., Burkhard, M. (2004), Late Neogene brittle extension in the vicinity of the Simplon fault zone, central Alps, Switzerland., Eclogae Geologicae Helvetiae, 97, 33-46.