Geophysical Research Abstracts,
Vol. 11, EGU2009-12116, 2009
EGU General Assembly 2009

Thermal structure of the Piedmont-Ligurian and Valaisan units in the Western-Central Alps

F. Negro (1), C-M. Pellet (1,2), R. Bousquet (2), O. Beyssac (3), A. Lahfid (3), I. Guerra (1), and J-P. Schaer (1)

(1) Institut de Géologie, Université de Neuchâtel, Switzerland (francois.negro@unine.ch), (2) Institut für Geowissenschaften, Universität Potsdam, Germany, (3) Laboratoire de Géologie, Ecole Normale Supérieure, Paris, France

The Western-Central Alps, located between the Simplon and the Aosta-Ranzolla faults, represent a "transition" zone where many paleogeographic domains were continuously accreted within the alpine orogenic wedge. Within this orogenic wedge, the Piedmont-Ligurian and Valaisan oceanic domains recorded blueschist to eclogite metamorphic conditions during the Alpine orogeny. The first oceanic domain, the Piedmont-Ligurian zone, is classically divided, according to their metamorphic evolution, into a LP (greenschist to blueschist facies) unit (Combin zone), and a HP to UHP unit (Zermatt-Saas nappe). The contact between both zone is supposed is a major detachment fault (Combin fault). Although P-T conditions are quite well known in the Zermatt-Saas nappe, quantitative constraints are lacking in the Combin zone. The existence of the second oceanic domain, the Valaisan, has been recently questioned. It is sometimes interpreted as thrusted part of the Piedmont ocean towards the North. Precise P-T conditions are also lacking in the Valaisan units of the Sion-Courmayeur zone along the Rhone valley. We investigated the temperature record in the oceanic metasediments in both domains (Piedmont-Ligurian and Valaisan) using Raman spectroscopy of carbonaceous material. This method allows quantifying the maximum temperature, and therefore the peak of metamorphism, without being affected by the retrograde evolution. The aim of this study was to (1) estimate the peak temperature reached within each unit (2) compare the temperature record between the different units. Samples were first collected in the metasediments of the Combin zone north and south of the Dent Blanche massif, and in the Zermatt-Saas nappe in the area of Zermatt to estimate the temperature gap across the Combin fault. We also collected samples in the Valaisan domain in the Rhone valley to compare with the Piedmont-Ligurian samples.
In the Combin nappe, temperatures range between 430-500°, and are very coherent in the northern and southern parts of the Dent Blanche. In the Zermatt-Saas nappe, temperatures are similar to the ones obtained in the Combin nappe, also in the range 450-530°C, and the temperature gap is significantly lower than it is proposed in the literature.
In the metasediments from the Sion-Courmayeur zone, temperatures are in the range 360-400°C for the subduction history and up to 460°C in the vicinity of the Lepontine dome, corresponding to the collision history.
These data show that (1) there is no major gap of the peak temperature between Combin and Zermatt-Saas nappes, despite different pressures and (2) the Piedmont-Ligurian units recorded higher peak temperatures than the Valaisan units. We compare these temperatures with the metamorphic assemblages observed in the different units and discuss these results in the frame of the tectono-metamorphic evolution of the high-pressure low-temperature oceanic units from the Western-Central Alps.