Geophysical Research Abstracts, Vol. 9, 08842, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08842

Metamorphic structure of the Alps: contribution from studies on metasediments and consequences on the geodynamic evolution

R. Bousquet(1), B. Goffé(2), R. Oberhänsli(1), F. Koller(3), S.M. Schmid(4), R. Schuster(5), M. Wiederkehr(4), M. Handy(6), M. Engi(7)

(1) Institut für Geowissenschaften, Universität Potsdam, Germany, (2) Laboratoire de Géologie, ENS Paris-UMR 8538, France, (3) Department für Lithospärenforschung, Universtät Wien, Austria, (4) Geologisches Institut, Universität Basel, Switzerland, (5) Geological Survey, Vienna, Austria, (6) Institut für Geologische Wissenschaften, Freie Universität Berlin, Germany, (7) Institute für Geologie, Universität Bern, Switzerland

Major discoveries in metamorphic petrology, as well as other geological disciplines, have been made in the Alps. For example the first description of eclogites in the Eastern Alps (Haüy, 1822), or more recently the discovery of coesite in Dora Maira (Chopin, 1984) proving that the continental crust can be buried to and returned from great depths. Many other, apparently less spectacular yet important petrological discoveries were also made in the Alps. For instance, since the beginning of the 1970s, studies of metapelites in the Alps have revealed a specific mineralogy for high-pressure conditions. The most emblematic minerals of these rocks are ferro- and magnesiocarpholite (Goffé et al., 1973).

We present the regional distribution of metamorphic conditions documented in metasediments across the whole Alpine belt from Corsica-Tuscany in the West to Vienna in the East. In view of the uneven distribution of information, we concentrate on type and grade of metamorphism; and we elected to consider metamorphic conditions where either the pressure and temperature peaked simultaneously, or where the maximum temperature was reached at lower pressures, after a significant temperature increase on the decompression path.

The results clearly show which type of process caused the main metamorphic structure: A subduction process in the Western Alps, a collision process in the Central

Alps, and complex metamorphic structures in the Eastern Alps, owing to a complex geodynamic and metamorphic history involving the succession of the two types of processes. The Western Alps clearly show a relatively simple picture, with an internal (high-pressure dominated) part thrust over an external greenschist to low grade domain, although both metamorphic domains are structurally very complex. Such a metamorphic pattern is generally produced by subduction followed by exhumation along a cool decompression path. In contrast, the Central Alps document conditions typical of subduction (and partial accretion), followed by an intensely evolved collision process resulting in a heating event during the decompression path of the early subducted units. Subduction-related relics and (collisional/decompressional) heating phenomena in different tectonic edifices characterize the Eastern Alps. This complex picture results from a dual - Cretaceous and Tertiary - metamorphic evolution related to a complex tectonic history. The Tuscan and Corsica terrains show two different kinds of evolution, with Corsica resembling the Western Alps, whereas the metamorphic history in the Tuscan domain is complex owing to the late evolution of the Apennines.

This study confirms that careful analysis of the metamorphic evolution of metasediments at the scale of an entire orogen may change the geodynamic interpretation of such a belt.