Geol. Paläont. Mitt. Innsbruck, ISSN 0378–6870, Band 25, S. 1–242, 2001

FABRIC EVOLUTION AND DOMINANT METAMORPHIC IMPRINT INTERACTION WHEN EXPLOITING THE ROCK MEMORY: EXAMPLES FROM THE ALPINE CHAIN

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When reconstructing mountain building processes crustal thickness variations are perceived as mechanically discontinuous translation processes of discrete crustal elements envisaged as kilometre-scale tectono-metamorphic units.

In this contribution we compare the P-T-d-t paths from various nappe belts of the Alpine chain, considering the influence of regional fabric distribution upon development of the metamorphic imprint which dominates locally within a metamorphic unit; subsequently we speculate on the physical significance of the metamorphic field gradient. This may be done on the ground of the evaluation of the spatial distribution of diagnostic equilibrium mineral assemblages and of their relationships with successive foliations by means of integrated mapping of structural and metamorphic signatures. The general scope is an approach to a physical definition of tectonic units on the ground of their tectono-metamorphic memory. An analysis of the metamorphic history together with the planar fabric evolution for several tectono-metamorphic units, from the Western Austroalpine and Central Southalpine domains, demonstrates that the dominant metamorphic imprint does not coincide with T_{max}-PT_{max} of each P-T-d-t loop; actually the dominant metamorphic imprint is that of the most pervasive fabric at the regional scale, provided the degree of granular scale reorganisation overstepped a critical stage. In addition our results point out that the regional distribution of dominant metamorphic imprints does not necessarily correspond to the "metamorphic field gradient" (e.g. ENGLAND and RICHARDSON, 1977; SPEAR, et al. 1984; SPEAR 1993; PEACOCK 1989) and therefore it cannot be used to distinguish tectono-metamorphic units in terrains that underwent polyphase deformation and metamorphism without considering the areal distribution of superposed syn-metamorphic fabrics. Indeed within a single tectono-metamorphic unit different metamorphic imprints can areally dominate or the same dominant metamorphic imprint can occur in different tectono-metamorphic units.

Where nappe belts are lacking tectonic intercalations of paleogeographically significant sedimentary units, the size of tectonic units that contributed to thickening of the metamorphic crust may therefore be derived from the full tectonometamorphic history.

References

ENGLAND, P.C. and RICHARDSON, S.W. (1977): The influence of erosion upon the mineral facies of rocks from different metamorphic environments. Journ. geol. Soc. London, 134, 201-213.

PEACOCK, S.M. (1989): Thermal modeling of metamorphic P-T-t paths. Short course in Geology - Am. Geoph. Union7, 57-102.

SPEAR, F.S. (1993): Metamorphic phase equilibria and Pressure-Temperature-time paths. Min. Soc. Am. monograph-Washington, 799 pp.

SPEAR, F.S., SELVERSTONE, J., HICKMOTT, D., CROWLEY, P. and HODGES, K.V. (1984): P-T paths from garnet zoning. A new technique for deciphering tectonic processes in metamorphic terrains. Geology12, 87-90.

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