Late stage evolution of the Serifos Metamrophic Core Complex (Cyclades, Greece)

Poster

András Zámolyi[1] Bernhard Grasemann[1] Erich Draganits[2] Konstantin Petrakakis[3] Christoph Iglseder[1] Christian Rambousek[1] Ulrike Exner[1] Klaus Voit[1] Monika Müller[1]

Introduction

The island of Serifos is located in the Western Cyclades within the Attic-Cycladic metamorphic belt. It represents the westward continuation of an arcuate belt of Metamorphic Core Complexes with intrusions of late syn-post tectonic intrusions younging from East (e.g. Naxos main activity ca. 12 Ma) to West (e.g. Serifos with 9–8 Ma). In scientific discussions the dominance of probably continuous extension since ca. 30 Ma (e.g. Jolivet & Faccenna, 2000) and the presence of Metamorphic Core Complexes (Lister et al. 1984) is accepted. The speculated roll-back of the subducting plate possibly started due to the slowing down of absolute plate convergence rate between Africa and Eurasia. This model is attractive, because it would also explain the shift from a compressional Andean-type regime to an extensional Mariana-type regime (Jolivet & Faccenna 2000). Contrary to the kinematic directions reported from the Central and Eastern Cyclades, the movement of the hanging wall of the Serifos Metamorphic Core Complex is south directed. The island's main part is occupied by an undeformed granodiorite. Early granitic intrusions intruded into low-grade M_2-crystalline rocks that have been overprinted to as high as amphibolite facies conditions due to contact metamorphism. Parts of these rocks (gneisses and amphibolites) as well as the early intrusions are deformed to mylonites (Grasemann et al. 2004).

Structural observations

A striking feature is found in the southwestern part of the Serifos Metamorphic Core Complex, where a SW-dipping brittle surface cuts through the gneiss-marble lithology forming a prominent morphological fault scarp. During higher greenschist facies metamorphic deformation, the marbles acted as a weak layer between deforming areas of more rigid gneisses. They show a fine-grained homogenous recrystallized microstructure with crystal-preferred orientation. Structures indicating high strain like sheath folds are recorded within the marble with south dipping fold axes. In contrast to the marble-ultramylonites, centimeter to meter scale gneiss lenses act as boudins within the marble-ultramylonite. Deformation is characterized by overall extension (chocolate-tablet boudinage) with stretching directions NW–SE and NE–SW, respectively. Carbonatic meta-conglomerate layers with oblate components and pressure solutions indicate a considerable amount of pure shear. The shear sense of the main ductile shear zone is top to the SSW, also indicated by SCC′ fabrics and sigma clasts. Subsequent brittle deformation overprinted certain layers of the

[1] Department of Geodynamics and Sedimentology, Structural Processes Group, University of Vienna, Austria [2] Institute for Engineering Geology, Vienna University of Technology, Austria [3] Department of Geodynamics and Sedimentology, University of Vienna, Austria

marble-ultramylonite, forming a continuous, decimeter to meter thick marble layer immediately below the prominent morphologic brittle fault scarp, showing a mature stage of cataclastic reworking and high content of mica and silica. We find two generations of cataclasites: subvertical and low angle cataclasites. The subvertical generation grades into decameter thick non-cohesive cataclasites. In the hanging wall of the brittle surface block rotations can be observed, whereas in the footwall horst and graben structures occur.

Conclusion

Two main phases can be recognized from the above mentioned:

1. a phase of ductile to brittle-ductile deformation represented by the decameter thick interlayered marble-gneiss shear zone and

2. a purely brittle phase represented by thick cataclasite horizons and an ankeritic dolomite surface forming the prominent morphological scarp.

This shear zone likely represents the final stage in the evolution of the Serifos Metamorphic Core Complex and is an excellent outcrop rarely found on the islands of the Cyclades.

Literatur

Grasemann B, Petrakakis K, Iglseder C, Rambousek C, Zámolyi A & Draganits E (2004) The Serifos Metamorphic Core Complex (Western Cyclades, Greece). 5th International Symposium on Eastern Mediterranean Geology, Thessaloniki, Greece, 14–20 April 2004

Jolivet L & Faccenna C (2000) Mediterranean extension and the Africa–Eurasia collision, Tectonics, 19-6, 1095–1106

Lister GS, Banga G & Feenstra A (1984) Metamorphic core complex of Cordilleran type in the Cyclades, Aegean Sea, Greece, Geology, 12, 221–225