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Low angle fault zone characteristics on Serifos (Cyclades, Greece)

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A number of scientific sources contribute several ideas to the discussion of the Neogene geodynamics of the Aegean region. 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) are widely accepted. The Metamorphic Core Complexes and extensional basins in the Aegean started to form in the Late Oligocene. 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). 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 M2-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).

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 lithol-

ogy 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 table boudinage) with stretching directions NW - SE and NE – SW, respectively. The shear sense of the main ductile shear zone is top to the SSW, also indicated by SCC' fabrics. Subsequent brittle deformation overprinted certain layers of the 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.

Summarizing the above observations, the shear zone deformation history can be divided into two main phases: (i) a phase of ductile to brittle-ductile deformation represented by the decameter thick interlayered marble-gneiss shear zone and (ii) 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.

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