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Low-angled detachment geometry and evolution based on a new geological map of Kea, W. Cyclades, Greece

A. H. N. Rice, Team ACCEL(1) & IGME(2)

(1) Bernhard Grasemann, Christoph Iglseder, Monica Müller, Konstantin Petrakakis, A. Hugh. N. Rice, Klaus Voit and Andras Zámolyi: University of Vienna, Department of Geodynamics and Sedimentology, Althanstrasse 14, 1090 Vienna, Austria. (2) Dimitris Mitropoulos, Konstantinos G. Nikolakopoulos & Panagiotis I. Tsombos: Institute of Geology and Mineral Exploration, 70 Messogion Avenue, Athens, Greece. (alexander.hugh.rice@univie.ac.at)

The W. Cyclades are known for their extensional tectonics. Recent studies have shown that this occurred bi-directionally, with top-to-NNE/NE movement on Tinos, Andros, Mykonos, Delos, Paros and Naxos and top-to-SW/SSW movement on Serifos, Kea and Kithnos. New 1:50,000 scale mapping on Kea has identified a two-fold tectonostratigraphy: footwall and fault-zone. No unequivocal hanging wall rocks have been identified. The footwall, which has a structural thickness of $>$380 m, predominantly comprises chloritic schists with lithologically lensoid variations in quartz, carbonate, epidote, actinolite, biotite and talc. Near the fault zone, talc is locally more common and is associated with small serpentinite bodies, dolomite and magnetite-garnet-glaucophane schists. The chloritic schists are interlayered with blue-grey calcitic marbles with thin quartz layers. Along the east and southern coast, the marbles are common, up to ca. 30 m thick and essentially continuous. The number of such layers is uncertain, due to possible large-scale fold repetitions. In central and western areas, calcitic marbles are rare (except at Pisses), up to 8 m thick and strongly boudinaged. Metamorphic conditions are constrained to mid-greenschist facies (T ca. 350-450° C).

The fault zone is preserved in klippen up to approximately one square kilometer in size. In the north, the fault zone comprises ca. 30 m of calcite ultramylonite, underlain in some areas by 6-7 m of protocataclastic dolomite which locally has been strongly ankeritised. The contact of both lithologies with the footwall is marked by 0.8-1 m

thickness of predominantly carbonate-derived cataclasites. In the south, the fault zone comprises up to 1 m of cataclastically deformed footwall schists overlain by ca. 30 m of calcite ultramylonite. These are overlain along a ca. 3 m thick cataclastic zone by 100 m of weakly deformed dolomite and limestone with occasional ultramylonitic calcitic shear zones. In the southern central part of the area, numerous small, (down to 10x7 m) weakly deformed dolomite klippen are underlain by a $<$ 1 m thick cataclastic zone and then a zone of brittle deformation in the footwall schists. Calcite ultramylonites occur within or beneath this dolomite. The microstructures constrain the fault zone metamorphism from 400˚C to near-surface conditions.

Mean foliation and fold axial surfaces are sub-parallel and dip shallowly northwards. The mean poles plunge 74-230˚ and 68-243˚ respectively (N=1658 & 409); the dip is slightly less in the south. The best-fit great circle, reflecting the major elongate antiformal structure of the island, indicates a regional fold axis orientation at 14-023˚, but is poorly defined (C=2.47). Minor folds are very variably orientated, with a mean plunging at 20-042˚ (N=452). Folds are predominantly close to tight, rarely isoclinal, and moderately inclined to recumbent. Excepting the rare isoclinal folds, these fold an earlier fabric. Some large-scale folds have been identified, in the SE; these are essentially recumbent, tight to isoclinal, and probably have ca. NNE-SSW oriented axes. A well-developed stretching lineation in quartz-rich rocks has a mean plunge of 15-045˚ (N=1126). This parallels a crenulation lineation in pelitic rocks (12-040˚, N=59), reflecting sub-horizontal shortening during extension. Mean plunges of stretching lineation and fold axes are less in the south. Shear criteria (S-C-C', σ and δ clasts) all indicate a top-to-south movement.