



STRAIN LOCALIZATION WITHIN A SYN-TECTONIC PLUTON IN A BACK-ARC EXTENSIONAL CONTEXT: the Naxos granodiorite (Cyclades, Greece)

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Naxos Island is part of the central Cyclades (Aegean Sea, Greece) where a series of migmatite-cored metamorphic domes were exhumed below large-scale detachment systems during a Cenozoic back-arc extension. On Naxos, the Miocene exhumation history of the high-temperature metamorphic dome was notably achieved through two anastomosing and closely spaced top-to-the-north detachments belonging to the Naxos-Paros detachment system. According to previous contributions, the late exhumation stages were accompanied by the emplacement of a syn-kinematic I-type granodiorite that intruded a ductile-then-brittle detachment. Later the detachment migrated at the interface between the pluton and the metamorphic unit under ductile-to-brittle conditions.

To clarify how extensional deformation was precisely distributed within the pluton, a multi-scale approach from field observations to laboratory investigations was undertaken. Through macro- to micro-structural observations, we show a continuous deformation history from magmatic to solid-state ductile/brittle conditions under an overall north-directed shearing deformation. The early magmatic or sub-solidus deformation is evidenced in a large part of the granodiorite, notably in its southern part where the original intrusive contact is still preserved. Solid-state deformation is recorded further north when approaching the detachment zone, highlighted by a thicker cataclastic zone and numerous pseudotachylite veins. From these field observations, we defined six strain facies, leading us to propose a qualitative strain map of the Naxos granodiorite. Based on field pictures and X-ray tomography of oriented samples collected along the strain gradient, we quantified the intensity of mineralogical fabrics in 2D and 3D. This step required the treatment of 600 rocks samples and pictures using SPO₂003 (Shape Preferred Orientation) and Intercepts2003. Measured shape variations of the strain ellipsoid thus corroborate the large-scale strain gradient highlighted in the field, showing a good correlation between qualitative and quantitative studies.

Like on Mykonos, Serifos and Ikaria Islands (Aegean Sea), the development of Naxos metamorphic core complexes and the emplacement of the Naxos pluton were therefore controlled by the asymmetrical conditions imposed by large-scale detachments. Conversely, syn-tectonic intrusions locally provided favorable conditions for strain localization.