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# Pluton emplacement along a large-scale detachment system: the example of the Serifos granodiorite (Cyclades archipelago, Greece)

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Plutons emplacement often interacts with the processes of shear localization in the continental crust, as well as the evolution of deformation from the magmatic stage to the sub-solidus stage in granitic magmas. Shear zones nucleation and their propagation are often coeval with the crystallization of magma. This interaction can be in both ways. On the one hand, shear zones can create a space for pluton emplacement. On the other hand, the partially crystallized magmatic bodies represent rheological heterogeneities that may trigger strain localization and shear zones nucleation that can become potential sources of high velocity displacements.
In order to evaluate the potential strain localization at different scales from the magmatic stage to the sub-solidus stage in granitic bodies, a study of the Serifos granodiorite was undertaken. Serifos Island, located in the western part of the Cyclades Archipelago (Greece), is a structural dome whose core is dominated by an I-type granitoid. This Miocene pluton (10Ma) intruded the Cycladic Blueschists during thinning of the Aegean Sea below a crustal-scale low-angle normal fault system, namely the West Cycladic Detachment System (WCDS). Thermo-chronological data suggest that metamorphism related to the ductile extension was active during Miocene. Based on a field study and petrological and AMS data, we describe (1) the geometrical relationships between the pluton, the host rocks and the large-scale detachments (2) kinematic indicators inside and outside the pluton (3) distribution and evolution of deformation in the pluton during emplacement and cooling.
Based on our field observations, we propose a cross section of Serifos Island, where the pluton shows a clear asymmetry related to the top-to-the South shear sense along the West Cycladic Detachment system. The large-scale structure of the pluton is entirely controlled by the top-to-the-south shearing associated with the WCDS and the shearing is distributed through the whole plutonic body while it is still soft and it tends to localize along narrow shear zones during cooling. One can indeed recognize a continuum of deformation from late-magmatic to brittle conditions within the magmatic body. This succession of deformation events from magmatic to sub-solidus is entirely kinematically compatible and coeval with the development of the WCDS. We finally propose a model of pluton emplacement during crustal extension in interaction with extensional shear zones.