The cooling, deformation and exhumation history of the late Miocene syn-tectonic Porto Azzurro pluton in a regional transfer zone (Elba Island, Italy)

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In extensional tectonic settings, stretched terrains are often associated to lithosphere partial melting and widespread magmatism with plutons emplaced in the thinned crust. Emplacement of felsic magmas, at upper crustal levels, represents the final stage of the magma transfer from profound to shallow depth. In this framework, a mostly vertical permeability controls the magma uprising migration, as induced by dominant transcurrent crustal structures. Nevertheless, the interplay between extension and prolonged heat transfer favors uplift and progressive exhumation of the magmatic bodies, during their cooling.

In this presentation, we show an example of a felsic magmatic intrusion, the Porto Azzurro pluton (inner northern Apennines), emplaced in an extensional tectonic setting and mainly controlled by a regional transfer zone related to the opening of the Tyrrhenian Basin. This is exposed in the eastern Elba Island (Tuscan Archipelago). The hosting rocks of the Porto Azzurro pluton are mainly represented by micaschist, paragneiss and quartzite, affected by contact metamorphism and intense fluid circulation. We have analysed the structures that assisted the pluton emplacement and the ones that deformed the pluton itself during its cooling, from melt-present to brittle conditions, based on the integration among fieldwork, micro-structural, petrological and EBSD analyses. Furthermore, new U/Pb geochronological data on zircons and (U-Th)/He on apatite fission track refined the age of the pluton emplacement and its cooling, adding new data about the pluton history. Existing petrological analyses of the hosting rocks allowed us to better constrain the time-evolution of the thermal perturbation, permitting to frame the deformation and exhumation history of the Porto Azzurro monzogranite in the context of the Neogene extensional tectonics affecting the inner Northern Apennines.