STRATIGRAPHY AND TECTONIC AND METAMORPHIC EVOLUTION OF THE PORTO AZZURRO UNIT IN THE MONTE CALAMITA PROMONTORY (SOUTHEASTERN ELBA ISLAND, TUSCANY)

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ABSTRACT

The Elba Island has a key role in the reconstructions of the stratigraphic, tectonic, metamorphic and magmatic evolution of the Northern Tyrrhenian Sea and of the inner part of the Northern Apennines chain. The Porto Azzurro Unit, cropping out in the SE part of the Island, is the deepest tectonic unit of the central-eastern Elba structural pile of Tuscan, Ligurian and Ligurian-Piedmontese Nappes, which were intruded by Late Tortonian-Lower Pliocene granitoids and mainly acidic dikes. Moreover, in this part of the Island, the relationships between the uplift of the plutonic bodies and the final deformations of the tectonic stack are well exposed. To improve the geological knowledge of SE Elba, the authors carried out a 1:10.000 geological survey of the Calamita Promontory (mostly made up of the Porto Azzurro Unit) and performed petrographic and meso-/micro-structural studies on its rocks. The Porto Azzurro Unit consists of a Paleozoic, likely pre-Carboniferous basement (Mt. Calamita Fm.), which is unconformably overlain by the ?Triassic Verrucano metasiliciclastics (Barabarca Quartzites) and ?Upper Triassic-?Hettangian metacarbonates. In the Mt.Calamita Fm., five main lithofacies were recognized and mapped. In particular, garnet-bearing, albite micaschist (lithofacies a) geometrically underlie a phyllitic-quartzitic unit (lithofacies b); Porphyroids-like rocks (lithofacies e), metabasite bodies (lithofacies d) and graphite-rich siliciclastics (lithofacies c) are also present. The rocks of the lithofacies a are similar to those of the ?pre-Paleozoic-?Paleozoic Micaschist Complex of the Larderello Geothermal Field, whereas the other lithofacies can be probably correletable with the ?Ordovician formations of the Tuscan Metamorphic Units. The complex deformation-metamorphic evolution of the Porto Azzurro Unit consists of the following events: a) a Variscan tectono-metamorphic event (Dx), recognized in the Mt.Calamita Fm., which is defined by pre-Alpine schistosity and mineralogic relics (garnet); b) two Alpine tectono-metamorphic folding events (D1 and D2) in the Greenschists facies, which deformed also the Mesozoic covers; c) a following folding event (D3) which probably occurred during or immediately after the strong thermometamorphic imprint (including the magnetite-rich skarn bodies), due to the Neogene magmatic intrusions; d) Subsequently, the uplift of the magmatic bodies caused low-angle detachments within the Porto Azzurro Unit (between the Mt.Calamita Fm. and the Mesozoic cover) and between the latter and the overlying tectonic Units (e.g. Zuccale Fault between the Porto Azzurro Unit and the Cretaceous Flysch). A final weak antiformal folding (D4) of the whole promontory took place before the development of NW-SE and N-S trending high –angle normal fault systems, locally sealed by hydrothermal, sometimes Fe-rich mineralizations. The lithostratigraphic, tectonic, metamorphic and magmatic evolution of the Porto Azzurro Unit is similar to that defined for the Larderello geothermal region. Thus, the Mt.Calamita area can be considered as a little older, but similar geological model for all the future interpretations of the deep structure of southern Tuscany crossed by the Crop 18 profile.

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