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Neogene tectonics during granite emplacement in Northern Apennines: the case of the Gavorrano monzogranite (southern Tuscany, Italy)

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The tectonic setting of Neogene is under debate, being interpreted as a contractional, pulsing or extensional framework. On the key-areas to unravel this issue is the Gavorrano monzogranite, located nearby the Tyrrhenian seacoast, in the inner zone of the Northern Apennines (southern Tuscany), where a Neogene monzogranite body (estimated in about 3 km long, 1.5 km wide, and 0.7 km thick) emplaced during early Pliocene. This magmatic intrusion is partially exposed in a ridge bounded by regional faults delimiting broad structural depressions. A widespread circulation of geothermal fluids accompanied the cooling of the magmatic body and gave rise to an extensive Fe-ore deposit (mainly pyrite) exploited during the past century. Data from a new fieldwork dataset, integrated with information from the mining activity, have been integrated to refine the geological setting of the whole crustal sector where the Gavorrano monzogranite was emplaced and exhumed. Our review, implemented by new palynological, petrological and structural data pointed out that: i) the age of the Palaeozoic phyllite (hosting rocks) is middle-late Permian, thus resulting younger than previously described (i.e. pre-Carboniferous); ii) the P-T conditions at which the metamorphic aureole developed are estimated at about 660 °C and at a maximum depth of c. 5 km; iii) the tectonic evolution which determined the emplacement and exhumation of the monzogranite is constrained in a transfer zone, in the frame of the extensional tectonics affecting the area continuously since Miocene.