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Building up of a nested granite intrusion: magnetic fabric, gravity modelling and fluid inclusion planes studies in Santa Eulália Plutonic Complex (Ossa Morena Zone, Portugal)

[H. SANT'OVAIA](#) ^(a1), [P. NOGUEIRA](#) ^(a2), [J. CARRILHO LOPES](#) ^(a3), [C. GOMES](#) ^(a4) ...<https://doi.org/10.1017/S0016756814000569>

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Abstract

The Santa Eulália Plutonic Complex (SEPC), located in the Ossa Morena Zone (south Portugal), is composed of a medium- to coarse-grained pink granite (G0-type) and a central grey medium-grained biotite granite (G1-type). Available Rb–Sr data indicates an age of 290 Ma. An emplacement model for the SEPC is proposed, taking into account magnetic fabric, 2D gravity modelling and fluid inclusion planes studies. The G0 and G1 types demonstrate different magnetic behaviour: G0 is considered a magnetite-type granite and G1 is an ilmenite-type granite. The formation of G0 required oxidized conditions related to the interaction of mafic rocks with a felsic magma. The 2D gravity modelling and subvertical magnetic lineations show that the feeder zone of the SEPC is located in the eastern part of the pluton, confirming the role of the Assumar and Messejana Variscan faults in the process of ascent and emplacement. The magma emplacement was controlled by ENE–WSW planar anisotropies related to the final brittle stages of the Variscan Orogeny. The emplacement of the two granites was almost synchronous as shown by their gradational contacts in the field. The magnetic fabric however suggests emplacement of the G0-type first, closely followed by emplacement of the G1-type, pushing the G0 laterally which becomes more anisotropic towards the margin. The G1-type became flattened, acquiring a dome-like structure. The SEPC is a nested pluton with G0-type granite assuming a tabular flat shape and G1-type forming a rooted dome-like structure. After emplacement, SEPC recorded increments of the late Variscan stress field documented by fluid inclusion planes in quartz.

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Corresponding author

†Author for correspondence: hsantov@fc.up.pt

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