

Tectonic Evolution of Portuguese Variscan Granites: Insights from Anisotropy of Magnetic Susceptibility (AMS) Data

Helena Sant'ovaia¹, Cláudia Cruz¹, Ana Gonçalves¹, Pedro Nogueira², Fernando Noronha¹

¹ Earth Science Institute, Department of Geosciences, Environment and Spatial Planning, Faculty of Sciences of Porto University, Rua do Campo Alegre, 4169-007 Porto, Portugal (ICT, FCUP) – Portugal

² Earth Science Institute, Departamento de Geociências da Universidade de Évora, Colégio Luís António Verney, Rua Romão Ramalho, 59, 7000-671 Évora. (ICT, University of Evora) – Portugal

The anisotropy of magnetic susceptibility (AMS) data from 19 Portuguese Variscan granite plutons, spanning 320–296 Ma, has been consolidated and reinterpreted. This comprehensive dataset, including 876 sampling sites and over 7,080 AMS measurements, provides new insights into the tectonic evolution of the region. Magnetic susceptibility (Km) values range from 30 to $10,436 \times 10$ SI, with most granites exhibiting Km below $1,000 \times 10$ SI, indicating a predominantly paramagnetic nature due to biotite as the primary iron carrier. This suggests reduced conditions during granitic melt formation in the Variscan Orogeny.

The AMS fabrics preserve the strain imprinted in the magma, reflecting the temporal evolution of the regional stress field. Between 330 and 315 Ma, granite emplacement occurred in an extensional regime, exemplified by the Borralha pluton's AMS fabric. Plutons dated between 315 and 305 Ma display shortening AMS fabrics, indicative of emplacement under a compressional tectonic regime associated with the Variscan collision. Post-305 Ma plutons reveal AMS fabrics consistent with a tectonic transition, marking a shift from a wrench regime to an extensional setting toward the final stages of the orogeny.

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