
Metamorphic petrology unveils the connection between magnetization and late-Variscan extension in the Lugo Dome (NW Iberian Massif)

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Résumé

The Eastern Galicia Magnetic Anomaly (EGMA) is a significant feature of the Iberian Massif. It is situated in northwest Spain, overlapping the Variscan gneissic domes of Lugo and Sanabria. The Lugo Dome deforms the Mondoñedo Nappe, a large Variscan thrust sheet, and allows the outcropping of its relative autochthon in the Xistral tectonic window, where extensional detachments caused by late-Variscan tectonics crop out. On the western limb of the Lugo Dome, the Viveiro Fault, a further significant detachment, formed. The comparison of detailed ground-based magnetic and geological maps highlights a direct spatial relationship between the magnetic maxima and the extensional structures. Paleomagnetic analyses of rocks from the detachments reveal that many of them have induced magnetization, but also carry remanent magnetization coherent with the extension, and show a very distinct anisotropy of the magnetic susceptibility related with late-Variscan extensional fabrics.

Three pairs of metasedimentary samples in equivalent structural positions (Figs. 1,2), display variously developed medium-pressure Barrovian parageneses attributed to the early compressional phases of the Variscan orogeny, and low-pressure Buchan-type parageneses associated with the late Variscan extension. Our phase diagram-based petrological study suggests that the non-magnetic sample (MF) preserves the Barrovian conditions of 560-640°C, 6.5-8.7 kbar. Magnetite/hematite-bearing mineral assemblages that are at the origin of the induced and remanent magnetizations in the lithologically and structurally equivalent magnetic sample (MFm) crystallized during decompression and cooling to 580-620 °C, 4.2-5.2 kbar. These data are in agreement with previous (paleo)magnetic, geophysical, and cartographic research that links the magnetic anomaly in the Lugo Dome to the late Variscan extension.

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Mots-Clés: Metamorphic Petrology, Lugo Dome, magnetization, extension, Variscan orogeny

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