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The Sjelset granitic complex: a tectonic marker of the late evolution of the Sveconorwegian (Grenvillian) orogen in SW Norway

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Granitoids emplaced at 0.99-0.92 Ga occupy an important volume of the Sveconorwegian (Grenvillian) orogen of Southern Norway and SW Sweden. They are widely regarded as reflecting extensive crustal partial melting during the post-collisional evolution of a continent-continent collision orogen, in a context of gravitational collapse. In Southern Norway, this plutonism is represented by two distinct suites of A-type affinity: a geographically widespread hornblende + biotite ferro-potassic granitoid suite (HBG suite; 970-932 Ma) and an orthopyroxene-bearing or anorthosite-mangerite-charnockite suite (AMC suite; 933-916 Ma) restricted to the southwesternmost part of Norway. Structural studies of some AMC and HBG bodies, based on the anisotropy of magnetic susceptibility (AMS) technique, have evidenced various modes of emplacement and deformation of the plutons, including channelling along a major shear-zone and syn-folding emplacement.
We have conducted an AMS study of the Sjelset granitic complex (SGC), a Sveconorwegian post-collisional pluton that crops out in SW Norway. The SGC forms, in map view, a N-S elongated body of ca. 43 km2. Its country rocks consist of granulite-facies migmatitic gneisses that have been affected by several phases of folding. The pluton is partly covered by Caledonian nappes to the west. Two contrasted rock types can be distinguished in the SGC: a quartz mangerite, with or without fayalite, and a porphyritic biotite granite, that occupy distinct portions of the complex. Field relationships, available Rb-Sr geochronological data and U-Pb datings in progress demonstrate that the biotite granite corresponds to a first magmatic pulse intruded, possibly some tens of million years after its emplacement, by the quartz mangerite. An ongoing geochemical investigation further suggests that the two components of the SGC show affinities with the AMC suite.
The bulk magnetic susceptibility (Km) in the SGC varies from 0.04 to 64.2 x 10-3 SI, which indicates a magnetic susceptibility ranging from paramagnetic (magnetic mineralogy dominated by Fe-Mg silicates and ilmenite) to ferromagnetic (magnetic mineralogy dominated by magnetite). Km values in the quartz mangerite are, in average, higher than in the biotite granite (0.40-64.2 x 10-3 SI for the former vs. 0.04-10.3 x 10-3 SI for the latter), pointing to an increase of the magnetite contribution. The magnetic fabric would therefore be controlled by the shape-preferred orientation of magnetite grains and/or the crystallographic-preferred orientation of Fe-Mg silicates and ilmenite.
The pattern of the magnetic foliations and lineations reveals cylindrical folding of the SGC around an axis that is gently plunging (ca. 20°) to the SE (best-fit π-axis of the foliations and average orientation of the lineations). This observation is consistent with the fact that magnetic lineations in the northern part of the complex are parallel to a sub-horizontal, NNW-SSE trending fold axis measured in the high-grade gneisses. It supports a hypothesis of deformation of the SGC during one of the youngest, possibly the latest, phase of folding evidenced in the high-grade basement of southern Norway and coeval with the waning stage of the Sveconorwegian orogeny.