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Granite emplacement in a transpressional setting: an AMS study of the peraluminous Butiá Granite, southernmost Brazil

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The post-collisional stage of the Brasiliano/Pan-African Orogenic Cycle in Southern Brazil is marked by metaluminous and peraluminous granites controlled by a transcurrent shear zone system. In southernmost Brazil, the sinistral, NE-trending Dorsal de Canguçu Transcurrent Shear Zone (DCTSZ) is the best known structure that conditioned these peraluminous granites (ca. 634 – 610 Ma). However, the NNW-elongate Butiá Granite (BG – 629 Ma) is emplaced to the northwest of the DCTSZ in the high-grade Várzea do Capivarita Complex (ca. 650 Ma), and despite its poorly-developed linear fabric, BG emplacement is interpreted to have been controlled by a dextral transcurrent shear zone. Thus, anisotropy of magnetic susceptibility (AMS) study was performed in the BG aiming to constrain its emplacement mechanism and the relation of the granite with the regional shear zone system. A total of 492 specimens (180 drill cores) were obtained through 16 sites distributed along the BG main body. Magnetic mineralogy was investigated by hysteresis loops, thermomagnetic and IRM acquisition curves, and a complementary SEM analysis. These experiments show a dominant contribution of paramagnetic phases and a small content of low-coercivity (e.g., magnetite and titanomagnetite) and high-coercivity (e.g., hematite) remanence-carrying minerals. In spite of the presence of minor ferromagnetic grains, the BG magnetic anisotropy fabric is interpreted as dominantly controlled by paramagnetic biotite crystals. Magnetic susceptibility ranges between 0.1 and $8.0\times10-5$ SI. Shape parameter (T) ranges from 0.272 to 0.908, and anisotropy degree (P) ranges from 1.073 to 1.266, increasing from the inner portion of the pluton to its margins. Magnetic fabrics, microstructures and field relations suggest that magma ascent and emplacement were controlled by a NNW-trending dextral transcurrent shear zone. The presence of S-C magmatic fabric and high temperature (ca. 650 °C), solid-state deformation at the margins confirms that the pluton was deformed during its cooling process. Close to the host-rocks, magnetic foliation dips steeply towards W or E, and magnetic lineation plunges steeply to moderate, displaying strongly-oblate ellipsoids. This is interpreted as a result of the significantly pure-shear component of deformation operating close to the host-rocks. Shallow-plunging lineation parallel to the NW- to NNW-striking foliation is found away from the pluton margins, which is related to where the simple-shear component of deformation was more effective. Foliation becomes less steep towards the BG northeastern portion and the presence of roof pendants in this area suggests the proximity to the roof zone. The combination of buoyancy forces and the partitioning of regional strain into simple and pure shear are in accordance with a transpressive regime. These results also suggest a time-space relationship between the NNW-dextral shear zone that controlled the emplacement of the Butiá Granite and the sinistral, NE-trending DCTSZ, responsible for the emplacement of peraluminous granites during the early post-collisional stage of the Brasiliano/Pan-African Cycle in southernmost Brazil.