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Syntectonic magma emplacement and crustal flow at different levels in the middle crust: the case of the Patos-Seridó shear zone system (Borborema Province, NE Brazil)

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The Patos-Seridó shear zone system comprises an E-W high-grade ductile shear zone (Patos shear zone) in structural continuity with a low grade NE trending metasedimentary belt (the Seridó belt). Foliation and lineation patterns at the junction between these two structures show a progressive reorientation from E-W to NE, with steep dipping foliations and shallow plunging lineations in the Patos shear zone grading to moderate foliation dips and shallow lineation plunges in the Seridó belt. Inside these two units, partially molten rocks (migmatites) can be divided into stromatic metatexites (Patos migmatites) parallel to the main elongation axis of the Patos shear zone, as well as a diatexite dome (Santa Luzia dome) enveloped by metasedimentary rocks of the Seridó belt. In the Patos shear zone, the metatexites display a steep dipping E-W migmatitic foliation and are emplaced into high grade granitic gneiss. The Santa Luzia diatexite dome is characterized by a shallow to moderate dipping NE trending migmatitic foliation in contact with shallow dipping metasedimentary rocks. As no visible lineation is recognizable in the field given the complex structural pattern of migmatites, anisotropy of magnetic susceptibility (AMS) was applied in order to recover flow fabrics and deduce magma emplacement mechanisms and flow in partially molten middle crust. The Patos migmatites are marked by moderate to strong K values (2.7 x 10-3 SI), suggesting that bulk magnetic susceptibility is carried mainly by magnetite. The anisotropy factor is high (up to 30%) and the AMS ellipsoid has a prolate shape. The Santa Luzia dome displays stronger susceptibility values (5 x 10-3 SI), a similar anisotropy factor (20-30%) and AMS ellipsoid shape (prolate). The magnetic fabric of the Patos migmatites exhibits an oblique pattern, trending SSW in relation to the main E-W orientation of the Patos shear zone foliation, suggesting that stromatic metatexites were deformed by dextral simple shear. In the Santa Luzia diatexite dome the magnetic foliation displays intermediate to steep dips to NW and moderate to shallow dips to SE, associated with a shallow N-S plunging magnetic lineation. Therefore the magnetic fabric trajectories are oblique in relation to the dome main axis (NE trending) indicating that the dome was also emplaced in a bulk dextral shear regime. Magmatic flow patterns recovered by AMS point out to syntectonic magmatic emplacement at different structural levels in the Patos-Seridó shear zone system: in the Patos shear zone, the obliquity of magnetic/tectonic fabrics suggests that the metatexites were emplaced synchronously as dikes and small sheets in a deeper level. Further northeast, in the Seridó belt, the diatexites were emplaced forming a dome elongated parallel to the belt stretching direction. The high-temperature shearing event occurred at c. 575 Ma as shown by recrystallized zircon rims dated by U-Pb (SHRIMP) method. The results evidence the continued interplay between magmatism and deformation in a branched HT shear zone system operating at the final stages of an orogenic cycle.