

Introduction

The post-collisional period of gravitational collapse suggests that differential amounts of exhumation of deep-seated metamorphic rocks occurred between the hotter, central portion of the orogen versus its flanks.

In hot orogens the protracted thermal evolution has major effects on the **rheology of the orogenic crust**, on **strain partitioning** across the belt, and thus on the tectonic evolution of the orogeny (Vauchez, et al., 2019).

Here, we use the magnetic fabric of intrusions in the north and south sectors to track the kinematics and rheological changes across the Araçuaí Orogen (AO), SE Brazil. In the northern part we studied the Padre Paraíso Charnockite and Caladão granite, while in the northern portion, the Conceição de Muqui and Santa Angélica plutons.

Magnetic mineralogy

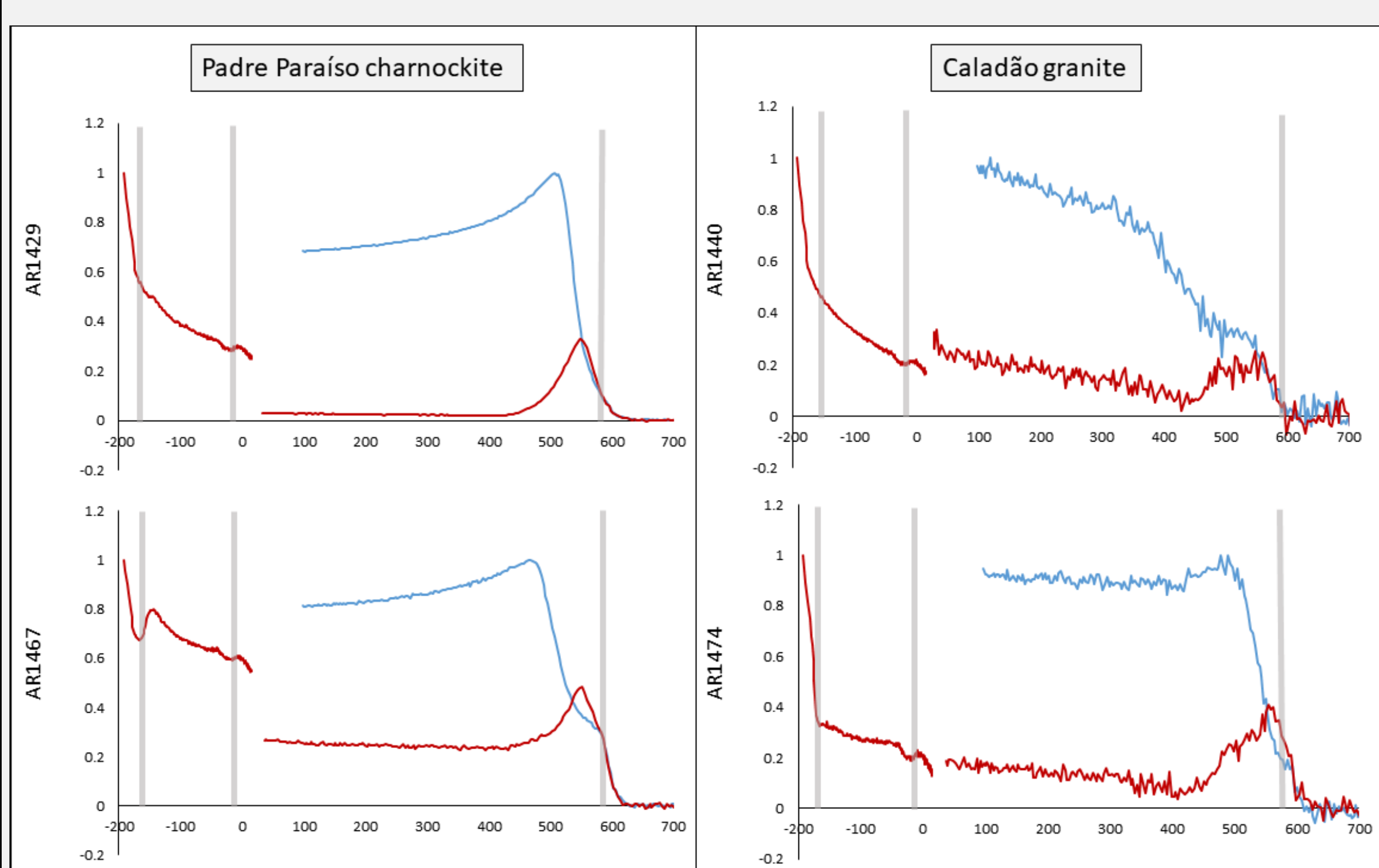


Figure 5. Representative thermomagnetic curves for four samples of the Padre Paraíso charnockite and Caladão granite. The y-axis is the bulk of magnetic susceptibility and the x-axis is the temperature in degrees Celsius. The red lines represent the heating and blue lines represent the cooling.

Geological setting

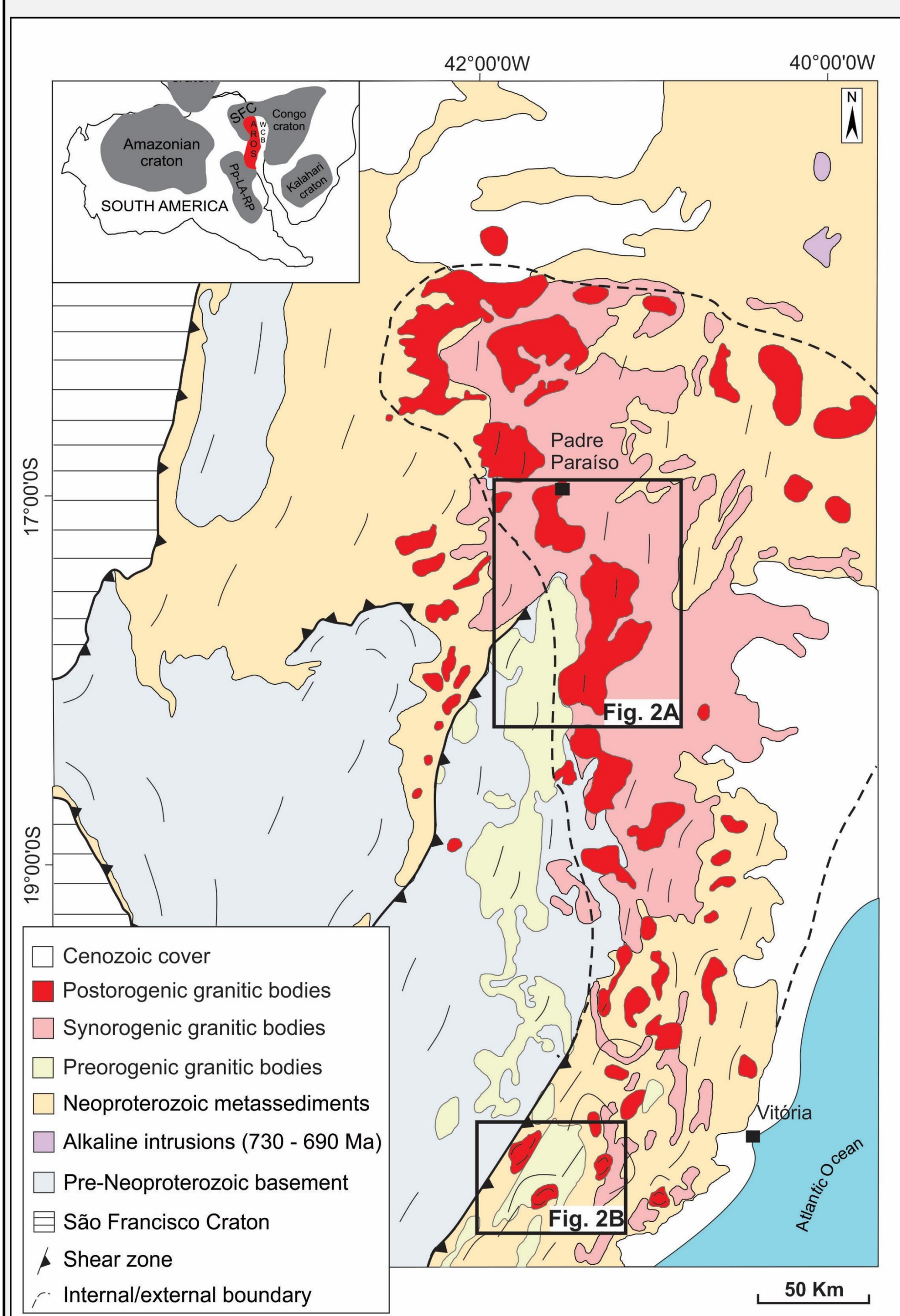


Figure 1. Simplified geological map of the Araçuaí orogen and its location in Western Gondwana with emphasis on the Neoproterozoic magmatic supersuites (modified from Silva et al., 2005; Pedrosa-Soares; and Wiedmann-Leonardos, 2000). Field foliation trends were compiled from the Geological Survey of Brazil (CPRM). The squares delimit the study area of the Caladão granite and Padre Paraíso charnockite (Figure 2A) to the north, and the Conceição de Muqui and Santa Angélica plutons (Figure 2B) to the south. Pp-La-Rp: Parapanema, Luíz Alves and Rio de la Plata cratons; SFC: São Francisco craton; AROS: Araçuaí-Ribeira Orogenic System.

- The Araçuaí Orogen (AO) represents the Brazilian counterpart of the Araçuaí-West-Congo orogenic system (Almeida, 1977).
- The Ribeira, Araçuaí and Western Congo belts (AROS) form an orogenic system >1000 km long and ~ 500 km wide resulting from the final amalgamation of the Gondwana super-continent (Almeida, 1977).
- The connection with the Araçuaí and Ribeira belt is characterized by a curvature of the orogenic fabric from NE-SW to N-S (to the north).

Anisotropy of magnetic susceptibility

- Padre Paraíso charnockite** shows mostly low-angle NS to NE-trending magnetic foliation plane bearing a down-dip magnetic lineation that varies in orientation from orogen-perpendicular (E-W) to orogen-parallel (N-S).
- Caladão granite** shows gently dipping NE to NW-trending foliation planes. Dominantly sub-horizontal NNE-trending field lineation sporadically variates orientation, trending N-S and E-W, with a minority of measurements and with sub-vertical plunges.
- Conceição de Muqui and Santa Angélica plutons** show a concentric distribution of magnetic foliations, in starking contrast with the general NE-SW trend of the belt in the south.

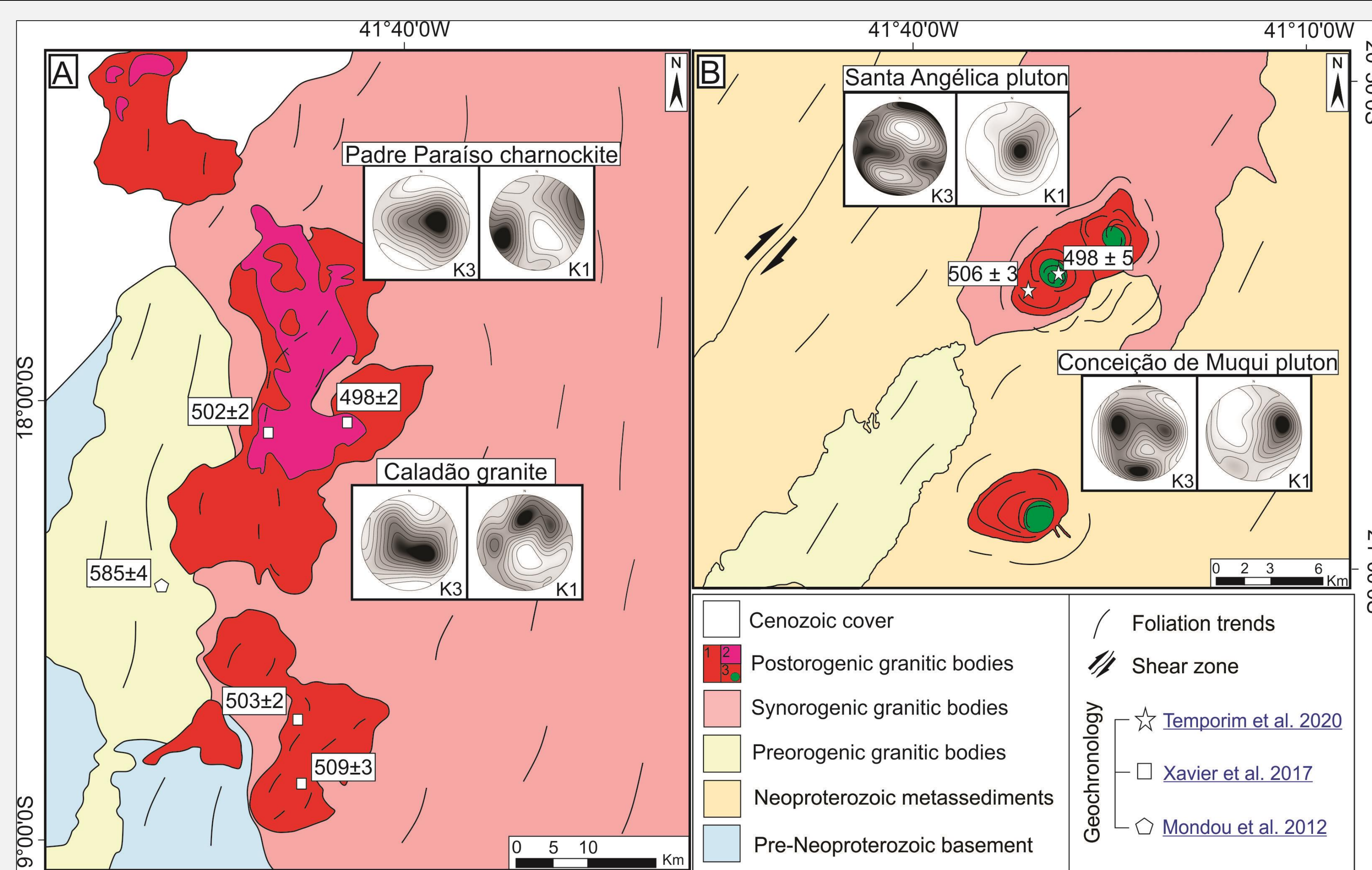


Figure 2. Map showing AMS, field foliation trends and geochronology data across both study areas. AMS diagrams are displayed for each studied pluton. K3 represents the pole of the magnetic foliation and K1 stands for magnetic lineation. Padre Paraíso charnockite: this study; Xavier et al. (2017); Cavalcante et al. (2013); Angelo et al. (2019). Caladão granite: this study; Mondou et al. (2012); Xavier et al. (2017); Angelo et al. 2019. Santa Angélica pluton: Temporim et al. (2020). Conceição de Muqui pluton: Silva et al. (2019). (A) Northern portion displaying the hot internal portion of the AO. (B) Southern portion of the AO. Postorogenic granitic bodies: 1. Caladão granite; 2. Padre Paraíso charnockite; 3. Post-collisional bimodal plutons (Santa Angélica and Conceição de Muqui plutons). U-Pb zircon geochronology data: Temporim et al. (2020); Xavier et al. (2017); Mondou et al. (2012).

Strain partitioning at the extensional phase

- At 500 Ma the northern sector remained warm enough to allow a coherent deformation of intrusions and host rocks.
- At the same time, the southern sector was cooler and allowed the intrusion of diapire-like plutons which were dominantly controlled by the forces of magma ascent and emplacement

Extension?



Figure 3. Schematic cross-sectional illustrations of the extensional collapse phase of the Araçuaí orogen at 500 Ma (modified from Fossen et al., 2017). Red and pink drops represent the post-collisional magmatism.

Conclusions

- The Padre Paraíso charnockite has a coherent magnetic fabric, with magnetic foliations planes trending N-S, following the general structure of the belt in that sector.
- In turn, Conceição de Muqui and Santa Angélica plutons show a concentric distribution of magnetic foliations, in starking contrast with the general NE-SW trend of the belt in the south.
- This contrasting structural pattern for coeval plutons along the belt reveal the **strain partitioning at the scale of the orogenic belt** during the cooling of the AO.

References

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