

# U–Pb TITANITE AND MONAZITE DATING OF THE PALEOPROTEROZOIC METAMORPHISM IN THE SOUTHERN SÃO FRANCISCO CRATON (BRAZIL)

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**ABSTRACT:** New U–Pb geochronological data obtained in the Southern São Francisco Craton (SSFC; southeastern Brasil) suggest that titanite and monazite underwent a complex history of new growth, recrystallization (dissolution/precipitation) and/or partial lead-loss to isotopic resetting during the Paleoproterozoic metamorphic event. In some cases distinct age populations are clearly identified, whereas in other cases the data exhibit a wide age range that probably represent partial recrystallization and incomplete isotopic resetting. For instance, early titanite and monazite growth were preserved, registering ages that correspond to the magmatic crystallization ( $2772 \pm 14$  Ma) or older metamorphic events ( $2731 \pm 4$  Ma and  $2613 \pm 11$  Ma, respectively). However, brown titanite with dark and light zones observed in an orthogneiss from the southwestern part of the Bação Complex show two different age populations, reflecting a period of growth at around 2687 Ma followed by recrystallization and/or partially resetting at around 2048 Ma. Furthermore, two different colored grains were analyzed in an amphibolite dike from the central part of the Bação Complex, indicating that the yellow grains represent new growth or complete recrystallization, and the brown grains as older titanite that were partially reset at *ca.* 2039 Ma. Therefore, pre-existing titanite was distinguished from newly grown or recrystallized titanite based on its different color and zoning. This information has never been extracted before for the rocks of the SSFC due to previous analyses were obtained by whole-grain U–Pb ID-TIMS method.

In summary, the old ages derived from dark parts or brown grains clearly indicate that titanite growth took place during early magmatism at *ca.* 2772 Ma or metamorphism between *ca.* 2731 to 2613 Ma. Combining with previous U–Pb zircon data, these early events overlap the Mamona magmatic and metamorphic event at 2760–2680 Ma. Subsequent metamorphism and intrusion-related heat/fluid flow events during the Transamazonian orogeny between *ca.* 2080 to 1940 Ma resulted in the regional-scale recrystallization and isotopic resetting of the pre-existing titanite and monazite. The preservation of Neoproterozoic ages suggests that the Transamazonian metamorphism did not reach the temperature required and/or did not produce pervasive fluids to reset completely titanite and monazite. In addition, these Paleoproterozoic data are well correlated with the metamorphic ages determined for the neighboring areas of the southern and northeastern sectors, indicating that the entire continental Archean crust was affected by a long-lived metamorphic event. However, the absence of Paleoproterozoic magmatic data in the SSFC indicates that this area underwent a different geodynamic evolution than both the surrounding Mineiro and Mantiqueira belts in the southern sector as well as the Archean blocks of the northern sectors of the craton, which were interpreted as a massive magmatic arc. Therefore, we interpret the SSFC as an hinterland basin formed behind the active Archean margin, which suffered closure of the Minas Basin and exhumation of domes during the Paleoproterozoic event.

**KEYWORDS:** recrystallization; isotopic resetting; Transamazonian metamorphism.