The Roboré microcontinent, SW Amazonian Craton: new insights on the Orosirian-Ectasian crustal evolution from U-Pb geochronology and isotopic constraints

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We present new and compiled U-Pb zircon ages and Nd and Hf zircon constraints for rocks of the Roboré microcontinent, the Eastern Precambrian Shield of Bolivia, located in the SW of the Amazonian Craton. The database together with updated geologic information provides new insights into the Proterozoic evolution. This microcontinent, subdivided into the San Diablo and Paraguá terranes, comprises the following lithostratigraphic units: The oldest San Diablo terrane comprises amphibolite facies gneissic rocks (1941 ± 40 Ma), intruded by the Correreca, Santo Corazon, and Santa Terezita plutons with documented ages between 1874 and 1849 Ma. The Paragua terraine comprises the Lomas Maneches Granulite Complex (1820 Ma), the Chiquitania Gneiss Complex (1750-1690 Ma), and the San Ignacio Schist Group (1690 Ma). This basement was intruded by the Yarituses suite (1683-1610 Ma) and the Pensamiento Granitoid Complex (1440-1270 Ma) which consists of the syn- to late-kinematic granites and the late- to post-kinematic granites.

Seven zircon U-Pb datings determine that the continental crust underwent a long-lived tectonic-magmatic history, during three successive events: 1941-1849 Ma, 1690-1610 Ma, and 1430-1340 Ma. Eventually, the Roboré microcontinent experienced crustal shortening, magmatism, and overprints due to the Sunsás/Greenville (1100-1000 Ma) orogeny that marks the Amazonia-eastern Laurentia collage. The oldest San Diablo terrane comprises amphibolite facies gneissic rocks (1941 ± 40 Ma), which were intruded by plutonic bodies of 1874 and 1849 Ma. The country rocks yield Sm-Nd T_{DM} ages and ε_{Ndt} values from 1.96 to 2.29 Ga, and +1.76 to -2.73 respectively, suggestive of derivation from short-lived protoliths. The Correreca intrusion is as young as 1874-1862 Ma with zircon Hf model ages (T_{DM}) of 2.68 Ga and 2.29 Ga with ε_{Hft}values varying from -4.63 to +2.76. The bulk isotopic signatures for the San Diablo crust are consistent with magma genesis in a juvenile-like accretionary arc, have a calc-alkaline character, and it shows a subduction-related tectonic.

The northern Paraguá terrane contains a granulitic crust dated at 1820 Ma. The available Sm-Nd T_{DM} model ages spread from ca. 1.7 to ca. 2.2 Ga and ε_{Ndt} values range from +3.0 to -2.9, with Paleoproterozoic protoliths. The basement rocks are crosscut by the Yarituses Suite (1683-1610 Ma) located to the west. The latter includes the following granites: La Cruz, Refugio, San Pablo, San Miguel, and Rosario. These granites exhibit Sm-Nd T_{DM} model ages of 1.8 to 2.5 Ga and ε_{Ndt} of +4.06 to -3.8. From a tectonic point of view, these units characterize the Suruquiso accretionary orogeny characterized here that coalesced the San Diablo and Paraguá terranes. Eventuallly, the Paraguá crust is crosscut by the San Ignacio granitoids, collectively known as the Pensamiento Granitoid Complex (1440-1270 Ma). These rocks show Sm-Nd T_{DM} model ages between 1.6 and 2.4 Ga, and predominantly crustal-like isotopic signatures of +5.2 to -4.0 akin to a convergent arc setting. On a broader scale, the granitoids are products of the Alto Guaporé orogeny in the Brazilian counterpart, distinguished by an accretionary phase (ca. 1440 Ma) and a collisional one (ca. 1330 Ma). The San Ramón and Coronación granodiorites (1429-1423 Ma) are pre- to synkinematic to the collisional phase, whereas the La Junta (ca. 1380 ± 17 Ma) and San Martin (1409 ± 17 Ma) granites are syn-to late kinematic. The Diamantina granite (1357 ± 19 Ma) is coeval with the collisional phase, while the San Andrés granite (1289-1275 Ma) is a post-kinematic pluton. The Pensamiento Granitoid Complex documents the Roboré microcontinent collision against the active margin of the proto-Amazonia at the Ectasian. The polycyclic evolution of the Microcontinent ends with the Sunsás/Grenville collision leading to the tectonic stability of the Amazonian Craton.

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