Far-reaching Ediacaran-Cambrian hydrothermal alteration of the São Francisco Craton – Evidence from zircon U-Pb SHRIMP, trace elements, Lu-Hf and $\delta^{18}O$

F. SILVEIRA-BRAGA[1,2], C. A. ROSIÈRE[1]*, J. O. S. SANTOS[3,4], V. K. ROLIM[5], M. P. ROBERTS[3], N. EVANS[4], S. HAGEMANN[3]

[1]Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil
[2] Universidade do Estado de Minas Gerais, João Monlevade, MG, Brazil
[3] University of Western Australia, Perth, WA, Australia
[4] Curtin University, Perth, WA, Australia
[5] PRCZ Consultores Associados Ltda, MG, Brazil

The Guanhães Block is an exposed fragment of the reworked basement of the Espinhaço Basin upthrusted on the Statherian metasediments of the Lower Espinhaço Supergroup during the Ediacaran-Cambrian Brasilian Orogen. Detrital zircon grains from Orosirian-Statherian sandstones, zircons from the Archean Guanhães Gneissic Complex and from the Statherian meta-granitoids of the Borrachudos Suite display a <5µm to 50µm thick high-U, low-Th rim with characteristics of hydrothermal or hydrothermalized zircon, that provided ages between 490 to 560Ma. Anatectic pegmatite intrusions contain zircons of similar ages that exhibit Statherian cores inherited from the Borrachudos granites. The rims display a ZrO, SiO_2 and Th depletion, and common U, Pb, Hf, Mg, Ca, Fe, Yb and P enrichment. There is a decreasing trend in the εHf(t) values and an increase of the $^{176}Hf/^{177}Hf_{(t)}$ ratio. Slightly higher $\delta^{18}O$ values, above 7‰, were found in the detrital and pegmatite zircon rims, approximately 1‰ higher than the core, indicating interactions with low-temperature fluids. These results suggest a tectonic uplift of the Guanhães Block during the late- and post-collisional collapse stages of the Brasiliano Orogeny (560–480Ma), causing decompression, the partial melting of the Borrachudos granite and discharge of pegmatite melts and magmatic-hydrothermal fluids contemporaneous with the pegmatite swarm of the Eastern Pegmatite Province. Granite-inherited zircons from the pegmatite exhibit anatectic overgrowth but the grains from the wall rocks have undergone recrystallization at sub-solidus conditions by the interaction with the medium to low-temperature hydrothermal fluid. The concentric porous fabric of the grains tracks the fluid path during crystal alteration that affected its chemical and isotopic composition.