

MID-OCEAN RIDGE ENVIRONMENT AND AGE DETERMINATION OF THE CERRO MANTIQUEIRAS OPHIOLITE, SOUTHERN BRASILIANO OROGEN

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ABSTRACT: The Cerro Mantiqueiras ophiolite is a significant geotectonic register in the Neoproterozoic crustal evolution of the southern Brasiliano Orogen. The clarification of the geotectonic environment and age of the ophiolite have significant implications for the understanding of events and tectonic processes during the Brasiliano orogenic cycle. The ophiolite is located 15 km SW of Lavras do Sul town, Rio Grande do Sul state, and forms a 9 x 0.3 km large body near E-W direction. The ophiolite is commonly included in the Cambaí Complex, which is a major part of the juvenile São Gabriel Terrane. The three main units of the ophiolite are the harzburgite, the magnesian retrogressive mylonite and the amphibolite. The variously serpentinized harzburgite is coarse-grained and contains the assemblage olivine, orthopyroxene, tremolite and chlorite, typical of middle-amphibolite facies metamorphism. This ultramafic rock is interpreted as a deformed fragment of the mantle. The amphibolite unit is extensive and makes direct contact with the harzburgite over a large area. The composition of the protolith basalt is similar to oceanic basalt. Immersed in the harzburgite, two small (0.5 m) pods of albitite display granoblastic texture. The albitite is here interpreted as an altered plagiogranite that was formed originally at the mid-ocean ridge. U-Pb SHRIMP isotopic analyses were performed at USP-SHRIMP on euhedral to subhedral zircon grains (n = 24) from the albitite. As observed in BSE images, all grains have an outstanding internal structure of a homogeneous to incipiently zoned core and a wide, fractured, bright rim. The rim is richer in U than the core. Aspect ratio of the crystals is 3:1 to 2:1 with length between 70-140 μm . Two distinct Tonian ages are registered in the albitite zircons, 923.2 ± 3 Ma in the cores and 786.5 ± 13 Ma in the rims. Th/U = 0.2-0.4 are present in the cores, interpreted as magmatic compositions, and Th/U = 0.1 in the rims, corresponding to metamorphic compositions. Lu-Hf isotopes and trace elements were determined at Universidade Federal de Ouro Preto. Hf isotopes and trace elements suggest derivation of the albitite zircons from depleted mantle. The geological data suggest a geotectonic scenario for the Cerro Mantiqueiras ophiolite comparable to a mid-ocean ridge. The age of formation of the oceanic crust is set at 923.2 ± 3 Ma and its deformation at 786.5 ± 13 Ma. The deformation probably occurred during incorporation into the juvenile São Gabriel Terrane. The duration of the Wilson Cycle was therefore near 137 Ma in this portion of the Brasiliano Orogen.

KEYWORDS: OPHIOLITE, ALBITITE, NEOPROTEROZOIC, ZIRCON.