

Zircon U-Pb SHRIMP dating of a Neoproterozoic overprint in Paleoproterozoic granitic-gneissic terranes, southern Brazil

**LUIZ CARLOS DA SILVA,^{1,2,3} LÉO AFRANEO HARTMANN,^{2,*} NEAL J. MCNAUGHTON,³
AND IAN FLETCHER³**

¹ Geological Survey of Brazil (CPRM), Avenida Brasil, 1731, 30140-002 Belo Horizonte, MG, Brazil

² Instituto de Geociências, Universidade Federal do Rio Grande do Sul, Avenida Bento Gonçalves, 9500, 91500-000 Porto Alegre, RS, Brazil

³ The Centre for Strategic Mineral Deposits, The University of Western Australia, Nedlands 6907, WA Australia

ABSTRACT

The Neoproterozoic Florianópolis batholith provides the major clue for unraveling the pre-Brasiliano Cycle evolution of Santa Catarina State, southern Brazil, because it contains septa of basement units such as the Camboriú and Águas Mornas complexes reactivated during the younger Brasiliano orogeny at about 600 Ma. We establish precise U-Pb zircon SHRIMP ages and Nd isotopic evolution of four key samples from the septa.

The zircon population displays complex internal structures in three of the four dated samples. The complex crystals have well-preserved magmatic cores and altered rim domains. The core populations were dated at about 2180 Ma (Águas Mornas complex), about 2160 Ma (Camboriú complex amphibolite xenolith), and 2000 Ma (Camboriú complex orthogneiss), whereas the ages of the measured rims and altered domains are about 590 Ma in all three samples. On the other hand, the Presidente Nereu tonalite has a simpler zircon population without core/rim separation, and yields magmatic ages about 2200 Ma.

The Nd isotopic analyses of the three samples emphasize the polycyclic evolution of the batholith, which is much more complex than previously realized. The evolution is marked by two successive Paleoproterozoic accretionary orogenic events at about 2200–2175 Ma and by a crustal melting event at about 2000 Ma, which had an Archaean source (Sm-Nd depleted mantle model age, $T_{DM} = 2860$ Ma). These orogenic events were followed 1.4 billion years later by a Neoproterozoic hydrothermal/metamorphic overprint at about 590 Ma. This time gap permits us to identify a long intracratonic period—the Atlantica supercontinent. The unraveling of the Proterozoic evolution and the precise characterization of the basement remnants show that the Paleoproterozoic was a crust-building, orogenic interval and was the major source of the much later Neoproterozoic granites. The integrated use of back-scattered electron and cathodoluminescence imaging with SHRIMP spot dating and Nd isotopes provide a clear understanding of the timing of crustal generation and deformation in southern Brazil, including strong evidence for a long-lasting supercontinent cycle.