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CGC-04 Neoproterozoic ice ages: Quo vadis?

U-Pb SHRIMP ages on detrital zircons from glaciogenic diamictites of the Puga Formation, Southern Paraguay Belt, Brazil

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The Paraguay belt comprises a thick sedimentary succession of glacially-influenced deposits covered by carbonates deposited on the southern border of the Amazonian craton (North Paraguay belt) and at the eastern border of the Rio Apa block (South Paraguay belt). The sedimentary successions in the North and South branches of the Paraguay belt (more than 1000 km apart) have been correlated and considered coeval, in spite of striking differences in their sedimentary evolution and the lack of geochronological data. In fact, the only age constraint on these successions is a tentative correlation of the carbonate cover of the basis of their carbon isotope signature suggesting a late Neoproterozoic (Marinoan: 635 Ma) age for the succession. Here we present the first U-Pb SHRIMP geochronological data on these rocks. These results were obtained on detrital zircon grains separated from the matrix of six samples of glacially-influenced diamictites from the southern part of the Paraguay belt. Four of these samples were collected at the Bodoquena area, and the other two were collected at the Puga Hill, corresponding to the central and north sectors of the southern Paraguay belt, respectively, and about 50 km apart.
U-Pb ages (ca. 130 grains) from the Puga Hill show a large variation, ranging from759 Ma to 2128 Ma, with clusters at 996 Ma, 1218 Ma, 1538 Ma, 1749 Ma, 1782 Ma, 1843 Ma, and 1900 Ma, and only one Archean grain (2.7 Ga). U-Pb ages (ca. 230 grains) from samples of the Bodoquena area range from 706 Ma to 1990 Ma, with clusters at 729 Ma, 1223 Ma, 1411 Ma, and 1758 Ma, and only one grain of Archean age (3.0 Ga). A maximum depositional age for the glacial sediments can thus be derived from the age of the youngest zircon at 706 Ma. Considering the triad of glacial events of Neoproterozoic age (Sturtian: 720 Ma, Marinoan: 635 Ma, and Gaskiers: 580 Ma), the Puga diamictites could thus be either Marinoan or Gaskiers. This assumption is reinforced by the presence of Cloudina fossils (appearance at ~543 Ma) in the area. The detrital zircon data can also be used to infer the provenance of sediments. The large spectra of ages indicate that many sources have contributed to the initial sedimentation of the Paraguay basin. The major clusters in both collections fit the age of different orogenic belts in the nearby Amazonian craton or the Rio Apa block. However, the younger cluster at 730 Ma must be explained by other sources, probably in other cratonic units of the supercontinent Rodinia beyond the Amazonian craton.