The basement of the Rio Apa Craton in Mato Grosso do Sul (Brazil) and northern Paraguay: a geochronological correlation with the tectonic provinces of the south-western Amazonian Craton

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The poorly exposed Rio Apa cratonic fragment, in the central part of South America, is covered by extensive Phanerozoic sedimentary sequences. It forms the basement of the Neoproterozoic carbonate deposits of the Corumbá Group at the Bodoquena Range, and extends to the south into Paraguayan territory, where it is covered by the Itapocumi Group. The position of this craton in Proterozoic times is important for the reconstruction of Rodinia and Gondwana (Cordani et al. 2003). For instance, in the work of Almeida (1967), the Neoproterozoic Paraguay-Araguaia belt was marginal to both the Amazonian and the Rio Apa cratonic masses, suggesting a complete continuity.

Previous geochronological data for the basement units of the Rio Apa Craton are found in Araujo et al (1982), and in this work several additional determinations by the Rb–Sr, Sm–Nd and Ar–Ar methods were obtained on several granitoid rocks. In the Porto Murtinho region of Brazil, and within the so-called "Northern Precambrian" area of Paraguay, granitoid rocks largely predominate. Slightly foliated homogeneous orthogneisses are widespread, and are intruded in many places by undeformed granitic bodies. The mineralogical composition of all of these granitoid rocks is very simple, with quartz, microcline, oligoclase and biotite as main components. Schists, amphibolites and paragneisses occur locally, and the felsic volcanic rocks of the Amoguijá Group are found near the Apa River, at the Brazil-Paraguay border.

Including the samples dated by Araujo et al (1982), about 40 Rb-Sr whole-rock analyses are available. They were made either on the granitoid rocks or on the felsic volcanic rocks, but because the samples were collected from different outcrops, they cannot be considered strictly cogenetic. Many samples exhibit high Rb/Sr ratios.

A few whole-rock samples of pinkish leucocratic gneisses from the northern part of the region yielded a best-fit line in a Rb-Sr isochron diagram corresponding to about 1730 Ma. In the same area, samples of undeformed granitic bodies, belonging to the Alumiador intrusive suite of Araujo et al (1982), with high Rb/Sr ratios, showed apparent ages between 1650 and 1700 Ma. In Paraguay, a few samples of undeformed porphyroidal granites indicated an age of about 1730 Ma, while two other samples of slightly deformed granitoids showed older apparent ages of ca. 1840 Ma.

Six Sm-Nd whole-rock determinations were obtained. All of them, regardless of age and tectonic setting of the analysed sample, yielded very old Sm-Nd T_{DM} model ages, between 2200 and 2530 Ma, as well as negative values of $\varepsilon_{Nd(T)}$, indicating that they originated by reworking of ancient crustal material.

Eight Ar–Ar determinations were obtained on the regional rocks. Five biotites indicated very precise and concordant ages close to 1300 Ma. Two amphiboles gave slightly older ages, and one of them showed signs of excess ^{40}Ar. Only one biotite yielded a younger apparent age of about 1060 Ma.

The similarity in the geochronological pattern is very suggestive of a correlation of the basement of the Rio Apa Craton with the Rondonia-Mato Grosso region of the Amazonian Craton. In Rondônia, Mesoproterozoic rocks of the Rio Negro tectonic province, with ages between 1600 and 1800 Ma, are reworked by the Rondonian-San Ignacio orogeny, with a strong metamorphic imprint at about 1300 Ma. In addition, the south-western border of the Amazonian Craton was also affected by a younger tectonic imprint, the Sunsas-Aguapeí orogeny, active at about 1000–1100 Ma. If the Amazonian and Rio Apa cratonic masses were united, the Neoproterozoic Tucavaca basin should be considered as a rift or aulacogenic-type basin, formed over continental basement.

Almeida, F.F.M. de, 1967, Origem e evolução da Plataforma Brasileira, Brasil: Depto. Nacional Produção Mineral, Div. Geol. Mineralogia, Rio de Janeiro, Bol. 241, 36 pp.

Araujo, H.J.T., and 7 authors, 1982, Geologia, *in* Folha SF 21, Campo Grande. Projeto Radam, Brasil: Min. Minas e Energia. Levantamento de Recursos Naturais, v. 28, p. 23-124.

Cordani, U.G, Brito-Neves, B.B., D'Agrella-Filho, M.S., and Trindade, R.I.F., 2003, Tearing-up Rodinia: the Neoproterozoic paleogeography of South American cratonic fragments: Terra Nova, v.15, p. 343-349.