

NEOPROTEROZOIC AND LATE MESOPROTEROZOIC SEDIMENTARY AND VOLCANIC SEQUENCES IN THE BORBOREMA PROVINCE, NE BRAZIL

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The Borborema Province (B.P.) of Northeast Brazil comprises the central part of a wide Pan-African-Brasiliano orogenic collage that formed as a consequence of late Neoproterozoic (ca. 600 Ma) assembly of West Gondwana. Most of the province is Paleoproterozoic to Archean basement blocks with late Paleoproterozoic and late Mesoproterozoic metasedimentary and metavolcanic sequences forming major fold belts within the central and southern part of the province (Van Schmus et al., 1995). New Sm/Nd and U/Pb geochronologic results demonstrate the presence of several Neoproterozoic metasedimentary and metavolcanic sequences that formed in older terranes at ca. 700 to 800 Ma, prior to the Brasiliano orogeny, and show that the Seridó Group is also late Proterozoic in age (late Mesoproterozoic to Neoproterozoic).

The Seridó Fm. is a biotite-rich schist in the upper part of the Seridó Group, which overlies Paleoproterozoic to Archean basement of the Rio Piranhas and Caldas Brandão massifs in the NE part of the B.P. Although some workers have regarded the Seridó Fm. as late Proterozoic, it has commonly been interpreted as part of a Paleoproterozoic fold belt formed during the Transamazonian orogeny. New Sm/Nd results from Seridó Fm. schists (Fig. 1) show conclusively that they were derived primarily from much younger provenance, with many of them having $\epsilon_{Nd}(600)$ near 0.0 and corresponding T_{DM} ages of 1.2 to 1.3 Ga. Preliminary U/Pb data for zircons from several units within the schists indicate an age of 750 to 800 Ma, but it is not clear at this time if the units dated are syn-depositional (tuffs or sandstones) or post-depositional (sills or dikes) because of deformation in the schists. If the units dated were syndepositional with the protolith of the schist, then the Seridó Fm. must be younger than 800 Ma; if the units are post-depositional, then the combination of zircon data and Nd data allow deposition of the Seridó Fm. in the range 800 to 1200 Ma. In any case, the Nd data alone argue for a maximum depositional age of ca. 1200 Ma, assuming the source of the detritus came from a depleted mantle source and the $^{147}\text{Sm}/^{144}\text{Nd}$ ratios (which are normal continental crust values of ca. 0.12 to 0.13) were not affected significantly by 600 Ma Brasiliano metamorphism and deformation. Therefore we suggest that the Seridó Fm. was originally a graywacke (turbidite) deposited upon older cratonic basement of the Rio Piranhas-Caldas Brandão massifs, in a basin receiving detritus from a largely juvenile late Proterozoic volcanic or magmatic terrane. The provenance of the Seridó Fm. has not yet been found, but petrologic and isotopic data suggest that this terrane could have been either magmatic arc complexes ($\epsilon_{Nd}(t) > 0$) being accreted to the craton or a large domain of intracratonic flood basalts ($\epsilon_{Nd}(t) \approx 0$).

Age results on the lower unit of the Seridó Group, the Jucurutu Fm., are still somewhat ambiguous with some data suggesting young provenance and depositional ages, while other data suggest older provenance or depositional ages. Several typical Jucurutu Fm. gneisses from the Jucurutu region and Rio Potengi have $\epsilon_{Nd}(600)$ near -5.0 and corresponding T_{DM}

ages of 1.5 to 1.6 Ga (Fig. 1). These values argue for a maximum depositional age of ca. 1.6 Ga, assuming the source of the detritus came from a depleted mantle source and the $^{147}\text{Sm}/^{144}\text{Nd}$ ratios (which are normal continental crust values of ca. 0.12 to 0.13) were not affected significantly by 600 Ma Brasiliano metamorphism and deformation. These Sm/Nd results are similar to those found for rocks in the Pajeú-Paraíba, Piancó-Alto Brigida, and Sergipano fold belts, which also contain 1.0 Ga volcanic units (Van Schmus et al., 1995). Thus, we believe that the depositional age of the Jucurutu Fm. is probably closer to 1.0 Ga than 1.5 Ga, and it could be Neoproterozoic if Paleoproterozoic to Archean crust contributed a significant amount of material to the sediment.

Some units mapped as Jucurutu Fm, such as those at Fazenda da Lapa near the Pernambuco-Paraíba boundary east of Patos, have much older Nd isotopic signatures, similar to those from the Transamazonian basement (Fig. 1). However, single detrital zircons from one of these units have well-defined 2.2 Ga and 1.75 Ga populations (Van Schmus et al., 1995), indicating that the different Nd signatures at this locality are probably due to differences in provenance rather than depositional ages or stratigraphic assignment to Jucurutu Fm. In any case, refinement of the ages and stratigraphy of the Seridó Group may be necessary as more isotopic data are obtained.

U/Pb data for a meta-tuff interlayered with metabasalts and mafic meta-tuffs of the Irajai Complex in central Pernambuco State, within the domain of the 1.0 Ga Pajeú-Paraíba fold belt, yield an age of ca. 720 ± 30 Ma, and a post-kinematic granitic pluton within the same fold belt yields a U/Pb age of 750 ± 20 Ma. Preliminary U/Pb data for zircons from a metafelsite within the Canindé Complex in NW Sergipe State are also consistent with an age of ca. 700 to 750 Ma for this complex, showing that Neoproterozoic volcanism and sedimentation occurred within the central part of the province. In northwestern Ceará State a metarhyolite from the Martinópole Fm. in the Médio Coreau foldbelt yields a U/Pb zircon age of 808 ± 8 Ma and shows a young Nd isotopic signature ($T_{\text{DM}} = 1.2$ to 1.3 Ga), similar to that for the Seridó Fm. Nd data for metasedimentary rocks of the Ceará Group in northern Ceará State also require young provenance ages, but it is not clear yet if they are Neoproterozoic (ca. 0.7 to 0.8 Ga) like the units described above or late Mesoproterozoic (ca. 1.0 Ga) like several of the foldbelts elsewhere in the province. In addition, large parts of "basement" in northern Ceará, east of Sobral, also yield late Mesoproterozoic T_{DM} ages, arguing that the crust is late Mesoproterozoic to Neoproterozoic, not a Brasiliano nappe of Archean basement as proposed by Caby and Arthaud (1986).

It is now clear that there was at least two major episodes of sedimentation and volcanism from late Mesoproterozoic to late Neoproterozoic throughout the Borborema Province. These results help to define the post-Transamazonian, pre-Brasiliano history of this part of West Gondwana. This history includes intracratonic volcanism and sedimentation at ca. 1700 to 1800 Ma, partial rifting of pre-existing continent about 1.0 Ga with associated sedimentation and volcanism (followed by local compressive deformation about 950 Ma) and intracratonic volcanic activity and sedimentation about 0.7 to 0.8 Ga. In both cases isotopic data indicate substantially juvenile sources for the sedimentary rocks, but in neither case has that source been identified.

REFERENCES

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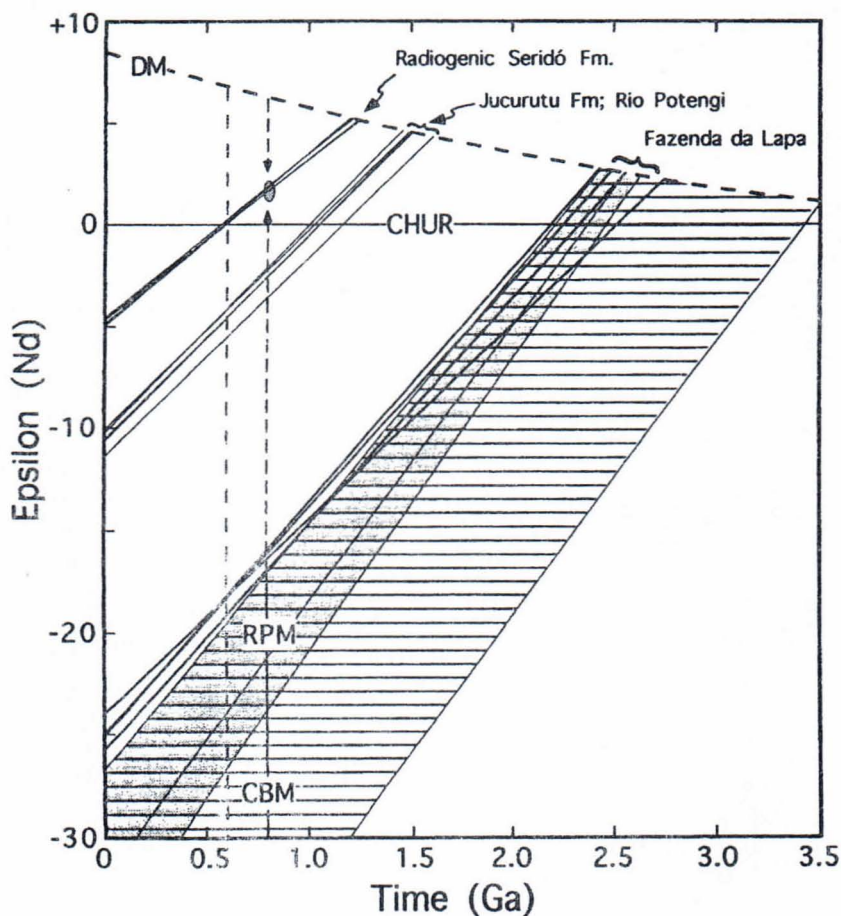


Figure 1: Plot of Sm/Nd data for rocks of the Seridó Fm. and Jucurutu Fm, with fields for typical Transamazonian and Archean rocks of the underlying Rio Piranhas massif (RPM) and Caldas Brandão (CBM) massif for reference. Only most radiogenic Seridó Fm. samples shown; several others have less radiogenic Nd, ranging down to $\epsilon_{Nd}(0) = -10$ (similar to Jucurutu Fm. samples plotted).