

C, O and Sr-isotope stratigraphy of Neoproterozoic amphibolite-facies cap carbonates, NE Brazil

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Occurrence of Neoproterozoic glacial diamictites and cap carbonates are known in the São Francisco and Amazon cratons and surrounding belts, in Brazil.

Banded iron formations of the Ferro do Bonito Mine and Serra da Formiga localities in the Seridó Belt, state of Rio Grande do Norte, northeastern Brazil, probably associated to Neoproterozoic glaciations are overlain by Jucurutu marbles (cap carbonate). Diamictites at Ouro Branco and Serra dos Quintos localities contain clasts up to 0.6 m long (augen-gneisses, quartzites and bi-gneisses) in a fine-grained clay matrix. These diamictites, stratigraphically situated between gneisses/ marbles of the Jucurutu Formation (older) and bishchists/marbles of the younger Seridó Formation (both of the Seridó Group) are regarded as of glacial origin. At Cruzeiro da Maniçoba locality, relatively pure pink dolostones of the Seridó Formation with fining- and thinning upward succession probably represent a second, younger, cap carbonate.

Marbles from the Jucurutu Formation (drill cores from Ferro do Bonito Mine) exhibit $\delta^{13}\text{C}$ values from -8 to -5‰ in the first 20 m. A shift to positive values (+4 to +10‰) is seen upsection while $\delta^{18}\text{O}$ values vary from -8 to -5‰PDB. At Cruzeiro da Maniçoba, pink dolostones show $\delta^{13}\text{C}$ values around -4‰. Positive $\delta^{13}\text{C}$ values (~ +9‰) in marbles of the Seridó Formation have been observed elsewhere. Sr-isotope ratios are mostly between 0.7074 and 0.7077.

Highly metamorphosed carbonates may have C and Sr isotope patterns severely complicated by the level of recrystallization. Seridó belt marbles, however, seem to make a case where it was possible to obtain near primary C and Sr isotope data. Isotope chemostratigraphy suggests Neoproterozoic age for Seridó belt carbonates (635–580 Ma interval).

Selective dissolution of Co or Cd-doped hydrous ferric oxide

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Trace metal mobility and bioavailability in aqueous regimes is necessarily dependant on metal speciation. For example, adsorbed trace metal species display distinctly different transport behavior compared to coprecipitated species bound within crystal lattices. Suboxic conditions can result in the reduction of Fe(III) oxyhydroxides (FeOx) through both biotic and abiotic pathways producing more soluble Fe(II). This process can also effectively liberate metals adsorbed or coprecipitated with FeOx into solution. The difficulty in distinguishing pools of trace metals (adsorbed to bacteria, adsorbed to FeOx, coprecipitated with FeOx, precipitated with other solids) hinders current efforts to quantify changes in trace metal speciation, particularly during microbial reductive dissolution of FeOx. The long-term goal of this study is to formulate a selective dissolution scheme capable of differentiating metals adsorbed on HFO, lattice-bound metals in HFO and metals adsorbed on the model Fe(III) reducing bacteria *Shewanella putrafaciens*. To achieve this, experiments are being conducted with the following substrates: 1) pure HFO, 2) HFO coprecipitated with 1% or 10% Co or Cd, 3) HFO with adsorbed Co or Cd, and 4) *Shewanella* with adsorbed Co or Cd. Each substrate will be extracted utilizing a palette of reagents adopted from Tessier *et al.* (1979, Anal Chem 51, 844) as a function of time to optimize methods for differentiating metal speciation during microbial reduction of FeOx. Initial reagents to be tested include: 1) 0.5 M and 2 M HCl, 2) 1 M HNO₃, 3) 1 M MgCl₂, 4) 1 M Na acetate, 5) 0.04 M hydroxylamine HCl (room T and 95°C), and 6) 30% H₂O₂ in 0.02 M HNO₃ (room T and 95°C). Initial results indicate that 1 M HNO₃, 0.5 M HCl and 2 M HCl rapidly dissolve undoped HFO or HFO doped with 1 or 10% Co with Co and Fe released congruently in less than 60 minutes; dissolution of Cd-doped HFO is somewhat slower. MgCl₂ does not release detectable levels of Fe into solution, but rapidly (within 30 minutes) releases 25-30% of Cd and ~10% of Co from the metal-doped HFO. Up to 45% of Co and 50-60% of Cd is released after 50 hrs. Sodium acetate releases ~25% or 30% of Co (10% and 1% Co doped HFO, respectively) in 90 min with 50 or 58% of Co liberated after 4 days. Fe is mobilized much more slowly: 0.6 to 0.9% of Fe is released in 90 min and only 9-10% of Fe is solubilized after 4 days.