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Volcanic arc turbidites of the Ediacaran Rocha Formation linked to the Brasiliano Orogeny and Kalahari Craton (Cuchilla Dionisio Terrane, Uruguay)

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Trace elements are particularly useful for provenance analysis, because they are insoluble and usually immobile under surface conditions and the ratios between incompatible and compatible elements (eg. Th/Sc, La/Sc) therefore reflect the source rock composition [1].

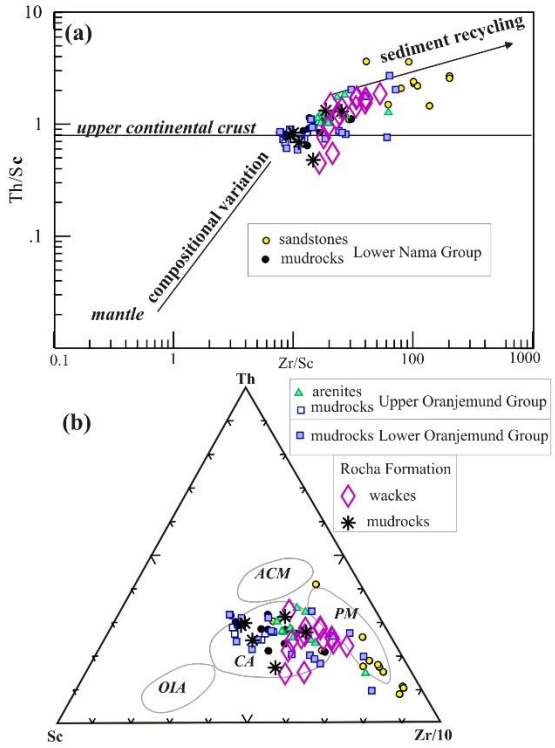

Figure 1: Th/Sc vs. Zr/Sc diagram [1] and ternary tectonic setting discrimination diagram [2]. ACM: Active Continental Margin, PM: Passive Margin, CA: Continental Arc, OIA: Ocean Island Arc.

The geochemistry of the Rocha Formation turbidites indicates an unrecycled upper continental crust (UCC) with insignificant weathering (CIA values between 60 and 72). Low Th/Sc and Zr/Sc ratios (Fig. 1a), high concentrations of Cr (up to 550 ppm), high Cr/V ratios (1 to 7) and a minor Eu/Eu* negative anomaly between 0.72 and 0.89, reflect a mafic source with the existence of Ca-plagioclase as a provenance component of the Rocha Formation which is confirmed by the petrography. In the Fig. 1a and 1b the Rocha Formation samples are compared with samples of the Oranjemund Group [3] deposited in the western margin of the Kalahari Craton and it is shown the evolution trend from an unrecycled UCC composition to a more evolved crustal composition represented by the Lower Nama Group deposited at ca. 550 Ma [4].

First results here presented are evidence of a first cycle sedimentation with a provenance derived from a volcanic arc, with an important mafic component. The felsic component is probably derived from the Brasiliano granites and the Mesoproterozoic basement in the Cuchilla Dionisio Terrane as deduced by detrital zircon dating [3].

Probably the upper Oranjemund Group and the Rocha Formation were deposited within a back arc tectonic setting between ca. 590 and 550 Ma and evolved to a foreland tectonic setting represented by deposition of the lower Nama Group, before the Marmora Terrane in the Gariep Belt overthrusted the western border of the Kalahari Craton [4], [5].

References:

[1] McLennan et al. (1990) Geo et Cosmo Act 54: 2015-2050
[2] Bhatia and Crook (1986) Cont to Min and Petro 92: 181-193
[3] Basei et al. (2005) Prec Res 139: 195-221
[4] Blanco et al. (2011) Prec Res 187: 15-32
[5] Blanco et al. (2009) J of Geol 17: 325-341