



PALEOPROTEROZOIC EVOLUTION OF THE MINEIRO BELT, SÃO FRANCISCO CRATON, BRAZIL.

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The Mineiro belt occurs along the southern edge of the São Francisco Craton, as part of a large orogen resulted from convergence of Neoproterozoic fragments (São Francisco-West Congo-Gabon-Nigerian), lithosphere shortening and collision of the accreted Paleoproterozoic terrains. The belt geodynamics (2,4-1,9 Ga) included the formation of passive margin (e.g., Piracicaba Group of the Minas Supergroup) and back arc basins (e.g., Rio das Mortes and Nazareno greenstone belts), voluminous calc-alkaline and alkaline magmatism (including the extensive Mantiqueira gneissic complex, largely reworked in Neoproterozoic times), and sedimentary deposits (e.g., Serra do Ouro Grosso, Sabará, Itacolomi successions) indicating provenance from the foreland/active continental margin/intraoceanic arc settings (e.g., Noce *et al.* 2000; Teixeira *et al.* 2000; Machado *et al.* 1996, Alkmim and Noce, 2006; Ávila *et al.* 2006; Teixeira and Ávila, 2007). Contemporary and associated with Paleoproterozoic crustal growth, collision and extensional collapse of the Mineiro belt, diachronic deformation and metamorphism (2.131-2.121 Ma; 2.059-2.028 Ma) overprinted the country rocks and the Neoproterozoic foreland (e.g., Cherman, 2004; Alkmim and Noce, 2006; Ávila *et al.* 2007).

The pre, syn and late orogenic stages produced several plutonic pulses (2.250-2.200; 2.190-2.160; 2.130-2.040 Ma) either by intraoceanic dynamics with minor recycling of material formed in the previous accretionary phases, or by partial melting of Archean crust (Noce *et al.* 2000; Teixeira and Avila, 2007). The oldest plutons which occur southward of the Lenheiros Shear Zone (LSZ) includes the Serrinha igneous suite composed of plutonic, subvolcanic and volcanic rocks (sub-alkaline, calc-alkaline, metaluminous and peraluminous), intrusive into the Nazareno greenstone belt (Avila *et al.* 2007). The Serrinha suite rocks give U-Pb and ²⁰⁷Pb/²⁰⁶Pb zircon crystallization ages between 2.239 ± 25 Ma and 2.207 ± 4 Ma. The available T_{DM} ages (2,6-2,3 Ga), ε_{Nd(t)} values (-0,8 to +1,8) and ⁸⁷Sr/⁸⁶Sr initial ratios (≤0,703) suggest the protholiths derived essentially from Paleoproterozoic juvenile sources, whilst originated in an intraoceanic arc zone. It is noteworthy that Mantiqueira gneisses give a few U-Pb zircon crystallization ages in the range 2.203 to 2.210 Ma, revealing a protracted magmatic evolution which may be genetically linked with the oldest plutonic event (2.250-2.200 Ma) recognized southward of LSZ. Tectonically this juvenile magmatism may result from NW-SE subduction (present-day position) of oceanic lithosphere occurring outboard of the evolving passive margin. Positive to slightly negative ε_{Nd(t)} signatures of the Nazareno and Rio das Mortes greenstone belt amphibolites are also consistent with an existing Paleoproterozoic (>2,25 Ga) mafic lithosphere. We also speculate that the Serra do Ouro Grosso siliciclastic sequence for which a maximum age for sedimentation of 2.245 ± 85 Ma was reported (Valladares *et al.* 2004) is one tectonic deposit associated with such a protracted evolution of the Mineiro belt. In contrast, the plutons located northward of LSZ show variable U-Pb and ²⁰⁷Pb/²⁰⁶Pb zircon crystallization ages (from 2.191 ± 9 Ma to 2.101 ± 8 Ma) whereas their T_{DM} ages (2,5 to 2,7 Ga) and ε_{Nd(t)} values (-1,3 to -5,1) indicate that Archean components participated as magma source for the protholiths. These intrusions are contemporary with the Mantiqueira medium- to high grade orthogneisses for which U-Pb zircon crystallization ages in the time interval 2.180-2.160 Ma; 2.102-2.040 Ma are reported (Noce *et al.* 2007). The Mantiqueira rocks have T_{DM} ages between 3,4-2,9 Ga (ε_{Nd(t)} from -10 to -13) and 2,7-2,4 Ga (ε_{Nd(t)} from -7 to -3), suggesting a genetic relationship with a later, inverted (SE-NW) subduction of the lithosphere below the active continental margin, after the stacking of the 2,25-2,20 Ga accretionary prism (e.g., Serrinha suite). In consequence, these younger granitoid pulses may be considered as inboard plutonism. Finally, the strong magnetic anomaly recognized between the Paleoproterozoic terrain (Mineiro belt) and the São Francisco paleocontinent may represent a



crustal discontinuity for the ultimate paleotectonic scenario. If this interpretation given by integrated magnetic-gamaespectrometric images (Toledo *et al.*, 2007) is correct the NE-SW Bom Sucesso-Ibituruna-Jeceaba lineament (Campos, 2004) may be envisaged as the northern boundary (present-day position) of the Mineiro belt. Nevertheless toward the east this structure was obliterated by deep crustal reworking, high-angle shear zones and thrusts due to the Neoproterozoic Araçuaí-West Congo collisional orogen.

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REFERENCES

- Alkmim, F.F. and Noce, C.M. 2006. The Paleoproterozoic record of the São Francisco Craton. In: Field Workshop, Bahia and Minas Gerais, September, 2006. Ouro Preto, MG. Field Guide and Abstracts: 35-73.
- Ávila, C.A., Teixeira, W., Cordani, U.G., Barrueto, H.R., Pereira, R.M., Martins, V.T.S. and Dunyi, L. 2006. The Glória Quartz-Monzodiorite: Isotopic and Chemical Evidence of Arc-Related Magmatism in the central part of the Paleoproterozoic Mineiro Belt, Minas Gerais State, Brazil. *Anais da Academia Brasileira de Ciências*, 78: 543-556.
- Ávila, C.A., Cherman, A.F. e Valença, J.G., 2007. Dioritos Brumado e Rio Grande: geologia e relação com o metamorfismo paleoproterozóico do Cinturão Mineiro, borda meridional do Cráton São Francisco, Minas Gerais. *Arquivos do Museu Nacional* (submitted, 2007).
- Campos, J.C.S. 2004. O Lineamento Jeceaba-Bom Sucesso como limite de termos arqueanos e paleoproterozóicos do Cráton São Francisco meridional: evidências geológicas, geoquímicas (rocha total) e geocronológicas. Tese de Doutorado 16. Universidade Federal de Ouro Preto, MG, Brazil. 190 pp.
- Cherman, A.F. 2004. Geologia, petrografia e geocronologia de ortognaisses paleoproterozóicos da borda meridional do Cráton do São Francisco, na região entre Itumirim e Nazareno, Minas Gerais. Tese de Doutorado, Universidade Federal do Rio de Janeiro, Brasil. 259 pp.
- Machado, N., Schrank, A., Noce, C.M. and Gauthier, G. 1996. Ages of detrital zircon from Archean-Paleoproterozoic sequences: implications for Greenstone Belt setting and evolution of a Transamazonian foreland basin in Quadrilátero Ferrífero, southeast Brazil. *Earth and Planetary Science Letters*. 141: 259-276.
- Noce, C.M., Pedrosa-Soares, A.C., Silva, L.C.S., Armstrong, R. and Piuzana, D. 2007. Evolution of polycyclic basement complexes in the Araçuaí Orogen, based on U-Pb SHRIMP data: Implications for Brazil-Africa links in Paleoproterozoic time. *Precambrian Research*. 159(1-2): 60-78.
- Noce, C.M., Teixeira, W., Quéméneur, J.J.G., Martins, V.T.S. and Bolzachini, E. 2000. Isotopic signatures of Paleoproterozoic granitoids from the southern São Francisco Craton and implications for the evolution of the Transamazonian Orogeny. *Journal of South American Earth Sciences*. 13: 225-239.
- Teixeira W. e Ávila, C.A. 2007. Evolução geodinâmica do Cinturão Mineiro: revisão do conhecimento após duas décadas de estudo. 10º Simpósio de Geologia do Sudeste, MG, Brasil. Livro de Resumos: 84.
- Teixeira, W., Sabaté, P., Barbosa, J., Noce, C.M. and Carneiro, M.A. 2000. Archean and Paleoproterozoic Evolution of the São Francisco Craton, Brazil. In Cordani *et al* (eds.): *Tectonic Evolution of South America*. Rio de Janeiro: Sociedade Brasileira de Geologia, 2000. Special Publication: 101-137.
- Toledo, C.L.B., Hackspacher, P., Silva, A., e Ochoa, J.C. 2007. O lineamento Bom Sucesso e suas implicações na evolução tectônica da borda meridional do Cráton do São Francisco: uma discussão com base em dados geológicos e aeromagnéticos. 10º Simpósio de Geologia do Sudeste, Livro de Resumos: 94. Diamantina, MG.
- Valladares, C.S., Machado, N., Heilbron, M. and Gauthier, G. 2004. Ages of detrital zircon from siliciclastic successions south of the São Francisco Craton, Brazil: implications for the evolution of Proterozoic basins. *Gondwana Research*. 7(4): 913-921.