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Paleomagnetic results of high grade metamorphic rocks from the Juiz de Fora Complex, SE Brazil, and the Cambrian Gondwana APW path.

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The Juz de Fora Complex is mainly composed of granulites and granodioritic-migmatitic gneisses. It is a cratonic basement of the Ribeira Belt (> 1,500 km long) which was formed as a result of interactions between the Congo-São Francisco, Kalahari, and other cratonic blocks, during the Brasiliano (Pan-African) orogeny (700-450 Ma). Major shear zones in the Ribeira belt separate tectonic domains, which have different rock associations, structural and metamorphic features. One of the main shear zone is the Além Paraiba dextral shear zone, a large-scale NE-SW strike-slip fault (10 km wide). The Juiz de Fora Complex is mainly exposed along this shear zone. Paleomagnetic analysis on oriented samples from 64 sites widely distributed along the Rio de Janeiro State (SE Brazil) yielded a northeastern, steep downward inclination direction (Dm=40.0°, Im=75.4°, α_{95}=6.0°, K=20.1) disclosed for 30 sites. The corresponding paleomagnetic pole is situated at 335.2°E; 0.6°S (α_{95}=10.0°, K=7.9). Rock magnetism indicates that both (titano)magnetite and titanohematite are the main magnetic minerals responsible for this direction. As the Além Paraiba shear zone reworked plastically intensively the Juiz de Fora Complex under granulite facies conditions at high temperatures (> 800°C), certainly no previous magnetization has survived and therefore the ChRM direction found for the Juiz de Fora Complex is probably related to the cooling phase of the last stages of the Brasiliano orogeny in the area.

Since the rocks are strongly magnetically anisotropic (average value of ~ 52%) we have corrected ChRM directions and its corresponding paleomagnetic pole for the magnetic anisotropies effect. This correction yielded a new mean ChRM (Dm=2.9°, Im=75.4°, α_{95}=6.4°, K=17.9) whose paleomagnetic pole (RB_C) is located at 320.1°E; 4.2°N (α_{95}=10.3°, K=7.5). Both mean ChRM and paleomagnetic pole obtained from uncorrected and corrected data are statistically different at the 95% confidence level.

Even though the geological evolution for the Juiz de Fora Complex based on geochronological data suggests an age in the range of 565-500 Ma for the magnetization found in the studied rocks, the paleomagnetic results permit farther constraint on the age of this magnetization to ~510 Ma by correlations with high quality paleomagnetic poles in the 560-475 Ma Gondwana APW path.

Our study has shown that high-grade metamorphic rocks are also suitable for paleomagnetic works, and that the AMS can be a good tool for ChRM corrections.

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