FILTERING PROCESS FOR RELIABLE VALUATION OF OXYGEN FUGACITY BASED ON IN-SITU ZIRCON CE AND EU ANOMALIES. THE RIO CAPIVARI COMPLEX, SOUTHEAST OF SÃO PAULO STATE, CASE OF STUDY.

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ABSTRACT: The calculation of oxygen fugacity (fO_2) applied to igneous systems is inferred from the anomalous concentration of multivalence species, sensitive to oxidation state. Recently, Ce and Eu zircon anomalies have been used to calculate silicic magma fO_2. The low zircon partition coefficient regarding trivalent Rare Earth Elements (REE) increases monotonously from La to Lu, and the chondrite-normalized REE patterns for zircon should increase over a logarithmic function curve, predicted by the Lattice Strain Model. However, Ce and Eu can assume, respectively, +4 and +2 charge, and both elements can show anomalous concentrations due to system oxidation and the Ce anomaly can be used to calculate the *f*O2 of the magma during zircon crystallization. The anomalies arise because Ce+4 easily substitutes the Zr+4, and Eu+3 is more compatible than Eu+2 on the zircon lattice. This work exposes the method for reliable Ce/Ce *f*O2 calculation and briefly discusses the results obtained, based on in-situ REE zircon trace elements, from samples of the Rio Capivari Complex (RCC), southeast of São Paulo State. CRC comprises basement lenses of calc-alkaline migmatitic orthogneiss and subordinate amphibolites in the Embu Terrane, ranging from 2,4 Ga (Siderian) to 2,0 Ga (Orosirian), with plutonism peak seemingly at 2,2 Ga (Rhyacian). The methodology consists of statistical filtering of fifty-four LA-ICP-MS analysis and geochronologic zircon U/Pb data. We compiled data of unpublished Maurer, V. C. (2016) Msc. thesis. In evolved magmas, other usual accessory minerals generally compete for REE's during crystallization, and can be included in zircon crystals, which disturb the results expected in the Lattice Strain Model. Because zircon is light REE depleted, and considered almost La free, the statistical approach is based on the difference between expected concentrations of the light REE, relative to medium and heavy REE and the La content. This method aims to select the results that best fit the expected lattice strain, cutting out samples that present improbable concentrations owing to the presence of inclusions that are not observed in the imaging techniques. The RCC granodiorites and amphibolites have titanite, apatite and garnet as accessory minerals and not detected inclusions of these minerals in zircon that could contaminate it with light REEs and strain the zircon lattice. After data processing, only six samples (five granodiorites, and one amphibolite) were considered inclusions free and able for fO_2 calculation. The filter process was made using excel, and *f*O2 calculations on Geo-*f*O2 software. Despite the short lack of accurate data, it is possible to perceive fO_2 increasing along the magmatic events of RCC orogeny. The Siderian granodiorites (FMQ = -2.6 to -0.98) are apparently less oxidized than the Rhyiacian granodiorites (FMQ = +0.95 to +4). In contrast, the Rhyacian amphibolite (FMQ = -6.8) suggests provenience from metamorphism of basaltic rocks, commonly more reduced. A feasible hypothesis for RRC crustal rocks fO_2 increment may be linked to the Great Oxidation Event (GOE), which provided free oxygen to the atmosphere from 2,4 to 2,0 Ga. Perhaps the RCC rocks marks the effects of GOE in the continental crust dynamics throughout the paleoproterozoic.

KEYWORDS: Zircon Ce and Eu anomalies; Oxygen fugacity; Rio Capivari Complex

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