On the reliability of paired carbon isotope as a pCO_2 proxy in the Ediacarian Araras platform, Brazil

PIERRE SANSJOFRE[1,2,3]*, , MAGALI ADER[1], RICARDO I.F. TRINDADE[2], AFONSO C.R. NOGUEIRA[4]

[1]Institut de Physique du Globe de Paris, France (ader@ipgp.fr)
[2]Universidade de São Paulo, Brazil (rtrindad@iag.usp.br)
[3]McGill University, Montréal, Canada (*correspondence : pierre.sansjofre@mcgill.ca)
[4]Universidade Federal do Pará, Belém, Brazil (anogueira@ufpa.br)

The snowball Earth model accounts for many of the typical geological and geochemical features of the Marinoan glaciation deposits (~635Ma) and of their overlying cap carbonate [1]. Melting this snowball Earth would have required a massive increase of the atmospheric carbon dioxide content (pCO_2). Recently however, we proposed instead a low atmospheric pCO_2 in the glaciation aftermath [2]. Our interpretation is based on paired carbon isotope data obtained on cap carbonates from Mirassol d'Oeste section (Ediacarian Araras platform, Brazil), together with previous results from cap carbonates of the Doushantuo Fm. and Zhamoketi Fm [3,4]. All three data sets showed low $\Delta^{13}C_{carb\text{-}org}$ ($=\delta^{13}C_{carb}$-$\delta^{13}C_{org}$). We made the case that these anomalously low values result from a decrease in the photosynthetic fractionation factor (εp), which can be related to pCO_2 lower than 3000 ppmv at the time of cap carbonate deposition.

We performed here a regional study based on 4 other sections sampled along the Araras carbonate platform. This new data set is broadly consistent with a low atmospheric pCO_2 scenario and allow to explore and identify both the local and global carbon isotopic variations of the Araras carbonate platform. In details, some features indicate that the occurrences of the low $\Delta^{13}C_{carb\text{-}org}$ are restricted to shallow depositional environments. In this present contribution, we discuss two alternate hypotheses that can be invoked to explain the low $\Delta^{13}C_{carb\text{-}org}$: (i) a shallow water early diagenetic process inducing a $\delta^{13}C_{org}$ increase and a $\delta^{13}C_{carb}$ decrease or (ii) primary producers presenting lower εp due to other parameter than pCO_2. In both case, the diagenetic event and the primary producers would remain to be constrained.

[1] Hoffman and Schrag (2002) *Terra Nova* **14**, 129-155. [2] Sansjofre *et al*. (2011) *Nature* **478**, 93-96. [3] Jiang *et al*. (2010) *Earth Planet. Sci. Lett.* **299**, 159-168. [4] Shen *et al*. (2008) *Earth Planet. Sci. Lett.* **265**, 209-228.

Magnetic susceptibility and $\delta^{18}O$ characterization of granites related with W, Sn, Mo and Bi (Au) hydrothermal vein deposits

HELENA SANT'OVAIA[1], HELENA C.B. MARTINS[1] AND FERNANDO NORONHA[1]

[1]DGAOT, Centro de Geologia, F.C. Univ. Porto, Portugal, hsantov@fc.up.pt (* presenting author)

The Northern Portugal mainland comprises an important W-Sn metallogenic province characterized by W-(Mo-Bi),W, W-Sn, and Sn hydrothermal vein deposits related with sinorogenic Variscan granites. These granites are usually classified into two main groups: peraluminous and metaluminous. As the granite rocks reflect redox states of their corresponding melts, the presence of magnetite and/or ilmenite as acessory minerals represent oxidized- and reduced-type respectively. The mineralogical features and magnetic susceptibility (K) of the granites were examined in order to deduce the redox conditions of magma systems, using the magnetic susceptibility data from around 644 sampling stations on different massifs of Variscan Portuguese granites. Whole-rock oxygen-isotope ($\delta^{18}O$) values were compiled from bibliography [1,2,3,4]. Despite of different petrographic and geochemical characteristics, K values in the majority of the studied granites vary from 20 to 300 × 10^{-6} SI units corresponding to peraluminous and meta-peraluminous, reduced, ilmenite-type granites. The oxidized or magnetite-type granites are scarce and represented by metaluminous late orogenic with K values ranging from 15 to 20 × 10^{-3} SI units and low $\delta^{18}O$ values ranging from 8.9 to $10.3^0/_{00}$. Major W-Sn ore deposits are related to reduced ilmenite-bearing granites with $\delta^{18}O$ enriched (9.3 to $13.5^0/_{00}$); W- (Mo-Bi- Au) deposits are related with oxidized granite series (i.e. magnetite or titanomagnetite-bearing granites). Magnetic susceptibility measurements, represent a powerful tool on mineral exploration of deposits related with intrusive magmatism.

[1] Antunes *et al*. (2008) *Lithos* **103**, 445-465. [2] Martins *et al*. (2009) *Lithos* **111**, 142-155. [3] Neiva *et al*. (2009) *Lithos* **111**, 186-202. [4] Sant'Ovaia *et al*. (2011) *Min. Mag*. **76**, 6, 2325.

This work has been financially supported by PTDC/CTE-GIX/099447/2008 (FCT-Portugal, COMPETE/FEDER).

DOI:10.1180/minmag.2013.077.5.19