

$\delta^{18}\text{O}$ and Mg/Ca temperature in Brazil margin foraminifera species

A.R. PERRETTI^{1*}, K.B. COSTA¹ AND R.E.M. RICKABY²

¹Oceanographic Institute, Univ. São Paulo, São Paulo, SP, 05508 120, Brazil (*correspondence: adrianarp@usp.br)

²Department of Earth Science, Parks Road, Oxford, OX1 3PR, United Kingdom

Oxygen isotopes ($\delta^{18}\text{O}$) and Mg/Ca ratio observed in foraminiferal tests can be used to establish the ocean temperature from organism habitats.

Temperature values obtained from $\delta^{18}\text{O}$ ($T_{\delta^{18}\text{O}}$) and Mg/Ca ($T_{\text{Mg/Ca}}$) in seven different planktonic and benthic foraminiferal species were compared in order to evaluate differences among these results in each species. Holocene samples were collected in two cores from slope of the Brazil margin in the Western Atlantic Ocean between 21° and 24°S (KF-D, 1503 m and KF-12, 1568 m).

Salinity (WOA 05, Locarnini *et al.* [1]) and $\delta^{18}\text{O}$ seawater (South Atlantic equation, LeGrande & Schmidt [2]) were used to estimate the mean calcification depth. $\delta^{18}\text{O}$ values were corrected from disequilibrium as described by Niebler *et al.* [3]. Local temperature was obtained from WOA05 (Antonov *et al.* [4]). We selected the paleotemperature equation that provided the best fit to each species.

In general $T_{\delta^{18}\text{O}}$ showed lower deviation from local temperature (-0.40 - 0.02) than $T_{\text{Mg/Ca}}$ (-9.20 - 9.48).

In planktonic species (*G. ruber* and *G. sacculifer*) both proxies present a good relationship with the local temperature; meanwhile in benthic species *Uvigerina sp.* presented the best fit.

C. corpulentus showed deviation of -9.20 °C and 0.03 °C for $T_{\text{Mg/Ca}}$ and $T_{\delta^{18}\text{O}}$, respectively. These results suggest that $T_{\delta^{18}\text{O}}$ from this species could probably be used to reconstruct temperature, but the mechanism that control Mg/Ca relationship could not be the same one observed in other *Cibicides* species of this work (*C. wuellerstorfi* and *C. kullenbergi*).

$T_{\text{Mg/Ca}}$ in *H. elegans* was expected to present the best fit as it is an aragonitic species. Although, the deviation was 9.48 °C, much more than the temperature deviation observed in $T_{\delta^{18}\text{O}}$ (0.11 °C). *H. elegans* are not commonly used in $\delta^{18}\text{O}$ analyses, but the result show a good relationship between $\delta^{18}\text{O}$ and temperature.

[1] Locarnini *et al.* (2006), *WOA 2005*, 182p. [2] LeGrande & Schmidt (2006), *Geophys. Res. Lett.* **33**, 2006GL026011. [3] Niebler *et al.* (1991), *Use of proxies in paleoceanography*, 165-189. [4] Antonov *et al.* (2006), *WOA 2005*, 182p.

Controls of H incorporation in pyroxenes and garnets from FTIR data on Kaapvaal craton xenoliths

A.H. PESLIER^{1,2}, A.B. WOODLAND³ AND M. LAZAROV³

¹Jacobs Technology, ESCG, Houston, TX 77058, USA (anne.h.peslier@nasa.gov)

²ARES, NASA-JSC, Houston, TX 77058, USA

³Geosciences, U. of Frankfurt, D-60438 Frankfurt, Germany

Pyroxene (Px) and garnet (Grt) accommodate hydrogen (H) as defects bonded to structural oxygen. The present study aims at characterizing the control on incorporation of water (H contents calculated as H₂O ppm) in orthopyroxene (Opx), clinopyroxene (Cpx), and Grt using Fourier transform infrared spectrometry (FTIR). We want to test on natural peridotites from the Kaapvaal craton [1, 2] experimental results which suggest that H partitioning is controlled mainly by Al in px, and Si, Ti, and pressure (P) in Grt [3-7].

Garnets

Grt water contents range from 0 to 19 ppm H₂O, with 6 out of 19 samples having no detectable H. In Lihobong xenoliths, Cpx H₂O may increase with increasing Ti and decreasing oxygen fugacity. No correlations with Si content, P, or any other parameters are evident.

Pyroxenes

Opx water contents correlate negatively with Opx Al^{IV} indicating that H incorporation is charge coupled with Al^{IV}. Cpx water contents correlate negatively with Cpx Ca contents and positively with Cpx Al^{VI} and Fe³⁺/ΣFe (Mössbauer data [8]), suggesting that substitutions on the M1 and M2 sites can control H. These correlations are most evident when examining xenolith locations individually. The intake of water by Px consequently appears to depend on the Px composition and the local mantle water conditions. In particular, Px from P > 3 GPa have a narrow range of H₂O contents (Opx: 119-251; Cpx: 149-398 ppm) compared to those from lower pressures (mainly off-craton; Opx: 5-460 ppm; Cpx: 5-957 ppm), and this corresponds to a narrow range of low px Al contents at P > 3 GPa [9]. For a similar Px major element composition, water contents increase in Px from Lihobong, through Finsch Mine, Jagersfontein, to Kimberley xenoliths.

[1] Woodland & Koch (2003), *E.P.S.L.* **214**, 295-310. [2] Lazarov *et al.* (2009), *Lithos* **in press**. [3] Withers *et al.* (1998), *C.G.* **147**, 161-171. [4] Hauri *et al.* (2006), *E.P.S.L.* **248**, 715-734. [5] Kohn & Grant (2006), Keppeler & Smyth, Eds. (MSA), **62**, pp. 231-241. [6] Aubaud *et al.* (2008), *C.M.P.* **156**, 607-625. [7] Tenner *et al.* (2009), *C.G.* **262**, 42-56. [8] Woodland (2009), *Lithos* **in press**. [9] Peslier (2009), *J.V.G.R.* **in press**.