

$\delta^{44/42}\text{Ca}$ in gas hydrates, porewaters and authigenic carbonates from Niger Delta sediments

G.M. HENDERSON¹, N.-C. CHU¹, G. BAYON², AND M. BENOIT³

¹Department of Earth Sciences, University of Oxford, Oxford OX1 3PR, UK; nanchin@earth.ox.ac.uk;
gideonh@earth.ox.ac.uk

²Département Géosciences Marines, IFREMER, 29280 Plouzané, France; gbayon@ifremer.fr

³IUEM, Place Nicolas Copernic, 29280 Plouzané, France; mboit@univ-brest.fr

We report Ca isotope ratios for gas hydrates, pore waters and authigenic carbonate concretions recovered by coring at cold seep locations from the Niger Delta deep province. Our aim in this study has been to understand the mechanisms controlling Ca-isotope fractionation during biogeochemical processes at cold seeps.

Carbonate precipitation in cold seep environments is closely related to the anaerobic oxidation of methane (AOM), which is mediated by a consortium of micro-organisms and releases bicarbonate (HCO_3^-) and sulfide (HS^-) into surrounding pore waters [1]. We found that carbonate precipitation causes ^{44}Ca enrichment in the surrounding pore-waters, as expected from previous work demonstrating that calcite prefers isotopically light Ca [2]. Our measured $\delta^{44/42}\text{Ca}$ values for pore-waters are consistent with values estimated previously by Teichert et al. [3]. In our studied sediment cores, the highest $\delta^{44/42}\text{Ca}$ ratios in pore-waters were measured at the AOM sediment depth (dashed line in Fig.1), indicating on-going carbonate formation at these horizons. Porewater and carbonate $\delta^{44/42}\text{Ca}$ measurements may therefore offer potential to identify the location and intensity of AOM processes now and in the past. We will also discuss the mineralogical control of Ca isotope fractionation at cold seeps.

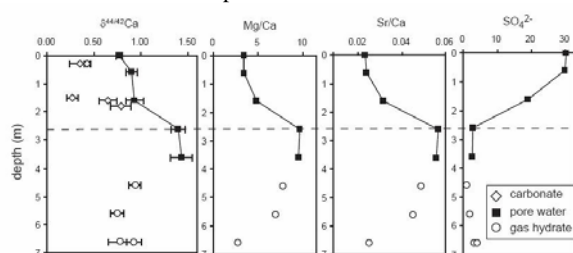


Figure 1. $\delta^{44/42}\text{Ca}$, Mg/Ca and Sr/Ca of carbonates pore waters and gas hydrates from core N2-KS44.

References

- [1] Bayon G. et al. (in review) *GCA*.
- [2] Gussone et al. (2005) *GCA* **69**(18), 4485-4494.
- [3] Teichert B.M.A., Gussone, A. and Bohrmann G. (2005) *Geology* **33**(3), 213-216.