Occurrence of iodine and methane in active margins: a potential link to past climatic changes

UDO FEHN[1], ZUNLI LU[2] AND HITOSHI TOMARU[3]

[1]Earth & Environmental Sciences, U. Rochester, Rochester, NY, 14627, USA (fehn@earth.rochester.edu)
[2]Earth Sciences, Univ. of Oxford, Oxford OX1 3PR, UK (zunli.lu@earth.ox.ac.uk)
[3]New Energy Resources Research Center, Kitami Inst. of Technology, Hokkaido 090-8507, Japan (tomaru@mail.kitami-it.ac.jp)

We report here results of ^{129}I determinations in more than 200 pore water samples from gas hydrate fields and mud volcanoes collected from active margins with slab ages ranging from 6 My to 130 My. The close relation between iodine and methane allows the application of the ^{129}I dating system for the determination of sources responsible for these two compounds. Generally, iodine ages were considerably older than the host sediments for the gas hydrates, but did not show correlation with the ages of subducting marine sediments, pointing to sources of iodine in the upper plates of subduction zones. A statistical analysis of all the data shows that the distribution for the iodine ages starts around 55 Ma, with a broad peak around 30 Ma. The distribution follows the changes in atmospheric oxygen concentration, which in turn is related to the evolution of the global climate and the deposition of carbon. The data demonstrate that, along active margins, large amounts of iodine were deposited in the Early Eocene, which is mobilized and transported in fluids through fractures in the upper plates leading to the accumulation and release in gas hydrate fields and mud volcanoes. Using iodine as a proxy for organic material, a substantial fraction of methane fluxes at active continental margins is the surface expression of carbon deposition in the early Eocene and subsequent release following changes in global climate patterns.

Primitive lithium isotope signatures in CR carbonaceous chondrites?

MANUELA A. FEHR[1], RACHAEL H. JAMES[1,2], MARK A. SEPHTON[3], ZITA MARTINS[3], AND PHIL A. BLAND[3]

[1]Department of Earth and Environmental Sciences, The Open University, Walton Hall, Milton Keynes MK7 7SA, UK (*correspondence: M.A.Fehr@open.ac.uk)
[2]NSRD Geology & Geophysics, National Oceanography Centre, Southampton, European Way, Southampton SO14 3ZH, UK
[3]Department of Earth Science and Engineering, South Kensington Campus, Imperial College London, SW7 2AZ London, UK

The CR carbonaceous chondrites are thought to be some of the most primitive meteorites. They show variable degrees of aqueous alteration and may give insights into the earliest stages and onset of aqueous alteration [1]. Lithium isotopes are fractionated during low temperature aqueous processes and therefore can provide further information about the alteration history of CR chondrites.

Lithium isotope data were obtained by MC-ICPMS and are reported as δ^7Li (differences in $^7Li/^6Li$ relative to NIST L-SVEC). A suite of Antarctic ordinary chondrites that display variable degrees of terrestrial weathering show Li isotope fractionation only for the most severely weathered sample. All CR chondrites investigated in this study display smaller degrees of terrestrial weathering. Therefore, their δ^7Li is likely not affected by Antarctic weathering. The five analyzed CR chondrites have, on average, a significantly lighter δ^7Li of $+1.1 \pm 0.9$ ‰ compared to other carbonaceous chondrites ($\delta^7Li = +3.1 \pm 1.8$ ‰, [2]). The generally light δ^7Li values of the CR chondrites might reflect their proposed complex alteration history [3]. However, samples MET 00426 and QUE 99177 display a slightly lighter δ^7Li of 0.6 ± 0.1 ‰ compared to the other three samples (GRO 95577, GRA 95229, EET 92042) that have a mean δ^7Li of 1.4 ± 0.1 ‰. These former two CR chondrites show very limited aqueous alteration [1] and high amino acid contents indicating that their soluble organic material is more primitive than any other chondrite [4]. Their Li isotope composition may therefore represent the δ^7Li of the pristine early solar system, whereas more positive δ^7Li values of other carbonaceous chondrites might reflect the effects of aqueous alteration processes.

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