

## Low H<sub>2</sub>O in the LOMU source of oceanic magmas: inferences from a South Atlantic Glass

P. J. MICHAEL<sup>1</sup> AND V. S. KAMENETSKY<sup>2</sup>

<sup>1</sup> Dept. Geosciences, The University of Tulsa, 600 S. College Avenue, Tulsa, OK, 74104, USA (pjm@utulsa.edu)

<sup>2</sup> Centre for Ore Deposit Research and School of Earth Sci., Univ. of Tasmania, GPO Box 252-79, Hobart, Tasmania 7001, Australia (Dima.Kamenetsky@utas.edu.au)

The hypothetical mantle component LOMU was proposed (Douglass et al., 1999) as a mantle mixing component to explain MORB and OIB isotopes from the South Atlantic. LOMU has very low <sup>206</sup>Pb/<sup>204</sup>Pb and <sup>143</sup>Nd/<sup>144</sup>Nd and very high <sup>207</sup>Pb/<sup>204</sup>Pb, <sup>208</sup>Pb/<sup>204</sup>Pb, and <sup>87</sup>Sr/<sup>86</sup>Sr and requires time integrated low U/Pb and is consistent with ancient subcontinental lithospheric mantle (SCLM). The distribution of LOMU-bearing MORB and OIB around S. America and Africa suggests that SCLM was delaminated from Gondwana during its breakup (ibid.). LOMU's existence was dramatically confirmed by recovery from the MAR near Bouvet triple junction of a primitive high-Mg andesite glass (S18/60-1) whose isotopes match hypothetical LOMU and whose origin is attributed to melting of Precambrian lower crustal garnet-bearing mafic rocks (Kamenetsky et al., 2001).

We report volatile contents of glass S18/60-1. H<sub>2</sub>O=515 ppm and H<sub>2</sub>O/Ce=114; the lowest values measured in an undegassed submarine glass. (H<sub>2</sub>O/Ce, is constant at 250±50 for depleted and enriched MORB and OIB globally). CO<sub>2</sub>=97±13 ppm: only slightly below the solubility limit of CO<sub>2</sub> at eruption depth (2100 m). We suggest that the Precambrian mafic source of LOMU has had low H<sub>2</sub>O at least since Gondwanaland's breakup. This has caused its viscosity and melting temperature to remain high, thus helping preserve its large-scale integrity and allow for the extreme isotopic ratios in ridge melts.

Previously, this isotopic signal in the southern MAR was identified as EM1 derived from recycled sediments. Low H<sub>2</sub>O in some of the glasses was held as evidence that sediments are effectively dehydrated during subduction (Leist et al., 2001). We propose instead that the distinctive isotopic signal here is from LOMU which is due to delaminated subcontinental mafic material. Low H<sub>2</sub>O in S18/60-1 is consistent with such material and is not related to H<sub>2</sub>O-cycling during sediment subduction.

### References

- Leist L., Dixon J. and Schilling J., (2001), *Eos Trans. AGU* **82** (47), Abstract V12C-0989.  
 Douglass J., Schilling J.-G. and Fontignie, (1999), *J. Geophys. Res.* **104**, 2941-2962.  
 Kamenetsky V.S., Maas R., Sushchevskaya N.M., Norman M.D., Cartwright I. and Peyve A.A., (2001) *Geology* **29**, 243-246.

## Molecular evidence for microorganisms in recent and ancient methane-related settings

W. MICHAELIS<sup>1,6</sup>, R. SEIFERT<sup>1</sup>, K. NAUHAUS<sup>2</sup>, T. TREUDE<sup>2</sup>, M. BLUMENBERG<sup>1</sup>, K. KNITTEL<sup>2</sup>, A. GIESEKE<sup>2</sup>, K. PETERKNECHT<sup>1</sup>, T. PAPE<sup>1</sup>, A. BOETIUS<sup>3</sup>, R. AMANN<sup>2</sup>, B. BARKER JØRGENSEN<sup>2</sup>, F. WIDDEL<sup>2</sup>, J. PECKMANN<sup>4</sup>, N. V. PIMENOV<sup>5</sup>, M.B. GULIN<sup>6</sup>, AND V. THIEL<sup>1</sup>

<sup>1</sup> Institute of Biogeochemistry and Marine Chemistry, University of Hamburg, Bundesstrasse 55, 20146 Hamburg, Germany

<sup>2</sup> Max Planck Institute for Marine Microbiology, Celsiusstrasse, 28359 Bremen, Germany

<sup>3</sup> Alfred Wegener Institute for Polar and Marine Research, 27515 Bremerhaven, and International University Bremen, 28725 Bremen, Germany

<sup>4</sup> Geowissenschaftliches Zentrum, University of Göttingen, Goldschmidtstrasse 3, 37077 Göttingen, Germany

<sup>5</sup> Institute of Microbiology, Russian Academy of Sciences, pr. 60-letiya Oktyabrya 7, k. 2, Moscow, 117811, Russia

<sup>6</sup> Institute of Biology of Southern Seas, National Academy of Sciences of Ukraine, pr. Nakhimova 2, Sevastopol, Ukraine, (michaelis@geowiss.uni-hamburg.de)

A large portion of methane produced in marine sediments is metabolized anaerobically before reaching the water column or the atmosphere. Combined results from field and laboratory studies now strongly suggest that syntrophic consortia of Archaea performing reversed methanogenesis and sulfate-reducing bacteria (SRB) account for anaerobic oxidation of methane (AOM) in marine sediments. (Thiel et al., 1999; Boetius et al., 2000). We here provide structural and isotopic information on biomarkers extracted from a set of methane-related deposits from the anoxic zone of the Black Sea. The unique sample set of almost sediment free massive microbial mats performing combined anaerobic oxidation of methane (AOM) and sulphate reduction allowed detailed biogeochemical studies. Lipid analyses of the macroscopically distinct types of microbial mats revealed substantial differences regarding both their lipid compositions and the carbon isotope signatures of individual compounds. The anoxic Black Sea setting can be used as a perfect reference for tracking anaerobic methane carbon cycling in Earth history. Comparison with fossil seep deposits reveal that the recycling of methane carbon by certain Archaea and their eubacterial associates has been an important subsystem for the turnover of buried organic carbon throughout the geological past.

### References

- Boetius A., Ravensschlag K., Schubert C. J., Rickert D., Widdel F., Gieseke A., Amann R., Jørgensen B. B., Witte U. and Pfannkuche O., (2000), *Nature* **407**, 623-626.  
 Thiel V., Peckmann J., Reitner J., Seifert R., Wehrung P. and Michaelis W., (1999), *Geochim. Cosmochim. Acta* **63**, 3959-3966.