The phosphorus burial curve revisited

K.B. FÖLLMI, F. TAMBURINI, R. HOSEIN, B. VAN DE SCHOOTBRUGGE, AND K. ARN

Inst. Géologie, Univ. Neuchâtel, CH-2000 Neuchâtel (karl.foellmi@unine.ch, federica.tamburini@unine.ch, rachel.hosein@unine.ch, bas.vandeschootbrugge @unine.ch, kaspar.arn@unine.ch)

Phosphorus (P) serves as an element essential to life, and is closely linked to carbon (C) through photosyn-thesis and biogeochemical weathering. A proxy of change in the global P burial record for the last 160 million years is based on a compilation of P accumulation rates, which were calculated from systematically measured P contents in a great variety of Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP) cores (Föllmi 1995). Since its first publication three tests have been performed on this curve: The first test consisted in a re-examination of an important part of its early Cretaceous portion (137 to 132 myr; Valanginian-Hauterivian), which is based on relatively few data in comparison to younger parts. For this test, 575 P concentrations were measured in eight continental sections in central and southern Europe (Van de Schootbrugge, 2001). The resulting compilation correlates very well with the DSDP- and ODP-based data set, which suggests that the curve is robust for this time interval. The second test consisted in a close-up study of the last full glaciation phase. Here different P phases were analyzed in a selection of eight ODP cores using a sequential extraction method. An important result is that during this last phase of glaciation variations in P burial were coupled to climate change, albeit on a shorter time scale, in the range of the precession band frequency, and that glacial periods during this last glaciation show comparable to slighly higher P burial rates than interglacial stages (Tamburini 2001). The third test included a detailed analysis of the importance of biogeochemical weathering processes in glaciated areas. Here we selected the Rhône and Oberaar Glaciers catchments – both situated within the crystalline basement of the Aare massif (central Switzerland) –, and performed analyses on the geochemistry of the outlet waters, mineralogy of suspensed material, and geochemistry and mineralogy of moraine material of different ages. One outcome is that glaciers have an important potential for increasing biogeochemical weathering rates during and especially immediately after glaciation phases (Hosein and Arn, in prep.).

Melt and source diversity under the ultra slow spreading Southwest Indian Ridge

FONT, L.[1], MURTON, B.[1], ROBERTS, S.[1], TINDLE, A.[2]

Southampton Oceanography Centre, European Way, Southampton SO14 3HZ, UK. (lfm@soc.soton.ac.uk, bjm@soc.soton.ac.uk, sr1@soc.soton.ac.uk)
Earth Science Department, Open University, Milton Keynes, MK7 6AA, UK.(A.G.Tindle@open.ac.uk)

Glassy primary melt inclusions trapped within plagioclase and olivine phenocrysts and the matrix glass of basalts of the ultra-slow spreading Southwest Indian Ridge (SWIR), (49°E - 70°E) were studied to investigate the compositional evolution of parental melts, melt extraction and magma chamber processes during ultra-slow spreading. Specifically we test the hypothesis that the depth of melting, melt fraction, the extraction and mingling of melt increments and magma residence time change as spreading evolves form rift propagation in the East to steady-state in the West.

The matrix glass compositions of the SWIR show a unique MORB composition, with high Na_2O concentrations and enriched trace element and REE concentrations compared to a typical N-MORB (Meyzen et al, 2002). The melt inclusions show variable compositions along the ridge. Towards the East they show enriched compositions and more variability in major and trace element. Two groups of inclusions can be differentiated. One shows similar compositions to the matrix glasses, with flat HREE but enriched in LREE and LILE elements. The second group shows strong depletion in HREE and enrichment in LREE and LILE. They also show strong negative anomalies in Nb, Zr and Hf. The melt inclusion compositions towards the West of the ridge appear to be more homogeneous in composition and are depleted in LREE. They do also show negative anomalies in Nb, Zr and Hf. These variations in compositions can be related to enrichments of the melts by LILE carried out by metasomatic fluids coming from the mantle. Alternatively, Nb, Zr and Hf were held back by a mantle phase when these melts were segregated.

References

Meyzen, C., Humler, E., Ludden, J., Toplis, M., Mevel, C. (2002), *Abstract, InterRidge SWIR Workshop*, 26.