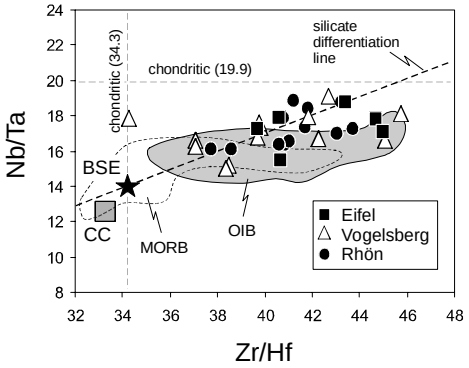
# High-field strength elements (Nb, Ta, Zr, Hf) in continental basalts from the CEVP – Implications for the HFSE budget of the lithospheric mantle and the global Nb budget

J.A. PFÄNDER[1,2], S. JUNG[1], C. MÜNKER[1] AND K. MEZGER[1]

[1]Institut für Mineralogie, Universität Münster, Germany
[2]Institut für Geologie, TU Freiberg, Germany (pfaender@tu-freiberg.de)

Nb/Ta ratios in continental basalts from the Central European Volcanic Province (CEVP) are among the highest values measured so far in terrestrial rocks by high-precision methods. In volcanic rocks from the Rhön, Vogelsberg and Eifel regions, Nb/Ta ratios are subchondritic (<19.9) with values between 15.0 and 19.1 and on average higher than in ocean island basalts at comparable Zr/Hf ratios (see figure). This observation is investigated within the context of a potentially Nb enriched lithospheric mantle that may play a role in balancing the global Nb budget.




Crustal contamination of most samples is displayed by elevated $^{187}Os/^{188}Os$ ratios (>~0.150), but samples having low (i.e. mantle like) $^{187}Os/^{188}Os$ (~0.129-0.150) have the highest Nb/Ta ratios, indicating that the elevated Nb/Ta ratios are not imprinted by crustal assimilation.

Nb/Ta ratios are positively correlated with Lu/Hf ratios in all but the Vogelsberg tholeiites, a feature that cannot be explained by partial melting of either spinel or garnet peridotite sources, but by the mixing of asthenospheric melts from a garnet bearing source with melts produced from amphibolitic veins. High HFSE concentrations and elevated Nb/Ta ratios (~17) with respect to the asthenospheric mantle (~14) require only low amounts of such melts in the order of a few percent. Therefore, elevated Nb/Ta ratios within some of the volcanic rocks of the CEVP do not mirror elevated Nb/Ta ratios within the subcontinental lithosphere itself, but reflect the presence of HFSE enriched, amphibole rich domains from which high Nb/Ta melts are produced during magma ascent and remelting.

# The reconstruction of changes in the seep activity of a pockmark site using Mg/Ca and Sr/Ca ratios in the sediments of the lower Congo Fan

K. PFEIFER[1] AND S. KASTEN[2]

[1]Alfred Wegener Institute for Polar and Marine Research, Am Handelshafen 12, 27570 Bremerhaven, Germany (Kerstin.Pfeifer@awi.de)
[2]Alfred Wegener Institute for Polar and Marine Research, Am Handelshafen 12, 27570 Bremerhaven, Germany (Sabine.Kasten@awi.de)

Pockmark structures of the Northern Congo Fan at a water depth of 3100 m were investigated during RV Meteor cruise M56 in November and December 2002. The data presented here were obtained by geochemical sediment and pore water sampling in a pockmark called Black Hole. No direct evidence for active fluid/gas discharge into the water column was detectable in this pockmark; however, gas hydrates were found close to the sediment surface. The depression was covered by fauna characteristic for areas of fluid/gas seepage such as vesicomyid clams and vestimentiferan tubeworms. Additionally, the sediments contain huge amounts of authigenic carbonates. In the sediments, authigenic carbonate formation occurred in the form of finely disseminated precipitates and also as massive carbonate concretions. Major and minor element contents were analysed for both, the bulk sediment and the concretions, and also in the pore water. Sr/Ca and Mg/Ca ratios determined in the concretions and in the surrounding sediment showed characteristic values which were used to distinguish between authigenic high Mg-calcite and aragonite precipitations (Bayon *et al.*, 2007). High Mg-calcite was found at different depths in the sediment, whereas aragonite was only present close to the sediment surface. Changes in the Sr/Ca and Mg/Ca ratios determined in the pore water are characteristic for the carbonate mineral which currently precipitates from the solution. Pore water-ratios indicative for high Mg-calcite precipitation were found in the recent zone of anaerobic oxidation of methane, whereas ratios indicative for aragonite formation were only found in the surface sediment where sulphate concentrations are at seawater level. The combination of pore water and solid phase Sr/Ca and Mg/Ca ratios enables a distinction between recent carbonate mineral formation and carbonate precipitation in the past. Based on the elemental composition of the bulk sediment, we created a model for the history of past methane fluxes and seep activity for the investigated region of the pockmark.

## Reference

Bayon G., Pierre C., Etoubleau J., Voisset M., Cauquil E., Marsset T., Sultan N., Le Drezen E., Fouquet Y., (2007), *Marine Geology*, doi: 10.1016/j.margeo.2007.03.007