The cause of high Nb/Ta in K-rich lavas from the Sunda arc system

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The overall depletion of many terrestrial silicate reservoirs in Nb has been explained in some studies by the existence of superchondritic Nb/Ta reservoirs in either the core or mantle (e. g. [1–2]). As one example, K-rich lavas from the Sunda arc, Indonesia, have been invoked to tap such a high Nb/Ta reservoir, a hybridised mantle [3]. In order to elucidate the petrogenetic processes active beneath the Sunda arc and the causes for the apparently high Nb/Ta in some of these lavas, we determined major and trace element concentrations, Sr-Nd-Hf-Pb isotope compositions, and HFSE concentrations via isotope dilution by MC-ICP-MS on a representative set of 18 mafic samples, covering along and across arc sections from Krakatau to Lombok.

Similar Pb isotope compositions of all lavas, and mixing arrays of the Sunda arc lavas in εNd vs. $^{87}Sr/^{86}Sr$ space (εNd +1.3 to +5.6, $^{87}Sr/^{86}Sr$ 0.7040–0.7059) with local ocean floor sediments are in agreement with previous studies on the Sunda arc, suggesting a significant overprint of the mantle sources by fluids derived from subducted sediments. In contrast, the particularly K-rich back-arc lavas (e. g., Muriah volcano) do not lie on this mixing array (εNd -1.3 to +2.2, $Sr/^{86}Sr$ 0.7042–0.7046), and are the only ones exhibiting superchondritic Nb/Ta (18–25), attributed to slab melt overprint. However, other Sunda arc rocks yield sub-chondritic Nb/Ta (13–18).

In accord with previous studies [3–5], the incompatible trace element inventory of Indonesian high-K lavas can therefore be attributed to partial melts derived from rutile-bearing mafic oceanic crust with a thick cover of sediment. The more fluid-dominated trace element enrichment in the sources of the other Sunda arc lavas is also related to subducted sediments, resulting in distinct trace element and isotope compositions.

[1] Wade & Wood (2001), *Nature* **409**, 75–78. [2] Münker *et al*. (2003), *Science* **301**, 84–87. [3] Stolz *et al*. (1996), *Geology* **24**, 587–590. [4] Münker *et al*. (2004), *EPSL* **224**, 275–293. [5] König & Schuth (2011), *EPSL* **301**, 265–274.

Karst versus sandstone and anthropogenic influences on small rivers of the Franconian Alb

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The small rivers Wiesent, Schwabach, Pegnitz and Regnitz drain the area of the Franconian Alb in Southern Germany, a typical karst terrain. Therefore the chemistry of the rivers should trace limestone weathering as the principal influence on river water composition. However, also urban influences by the city agglomeration of Nuremberg and signals of siliciclastic rock weathering may become more important in their lowland regions. Such changes of influence may best be studied in small rivers (< 52 $m^3 s^{-1}$ for the Regnitz and < 12 $m^3 s^{-1}$ for its tributaries) with major element and stable isotope analyses of dissolved organic and inorganic carbon. For instance, CO_2 partial pressures in the Wiesent River headwaters were up to 50 times higher than those in the atmosphere (> 21000 ppmV) and exceeded values found in African tropical rivers. For the Wiesent, such high pCO_2 values originate from soils and groundwater as they primarily occur in the groundwater-dominated source region. These waters are also characterized by carbon isotope signals of the dissolved inorganic carbon ($\delta^{13}C_{DIC}$) that are more negative than –14 per mil versus the VPDB standard. This deviates from typical values found in limestone weathering areas and indicates influences of CO_2 from recycled C3 plant material. These first data from the Wiesent indicate that weathering is not limited by CO_2. However, high pCO_2 values reduced rapidly towards values around 2500 ppmV over the course of the river due to degassing. In addition, lower reachers of the Wiesent showed dilutions in ion contents that may be related to increasing influences of sandstone weathering. First results of the other rivers studied showed mainly $\delta^{13}C_{DIC}$ signals of limestone weathering with values ranging around –12 permille and confirmed that carbonate weathering is the major control in these rivers. Influences of within-river turnover of dissolved organic carbon (DOC) may be revealed by simultaneous concentration and carbon isotope analyses.