Los Morros olivine basalts from the Domeyko Cordillera in the Antofagasta region, northern Chile

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In the eastern flank of the Domeyko Cordillera at 23°45' S two types of olivine basalts crop out as lava flows covering the Permian crystalline basement and as sills in Jurassic limestones. The basalts lay on an uplifted crustal block within the transpressional Domeyko fault system (DFS).

One type is an olivine-phyric alkali basalt, with Mg# 62-67, Ni 120-190 ppm and Cr 205-338 ppm. The Ta/Hf (>0.4); La/Nb (<2) and Ba/Nb (12-31) ratios suggest an intraplatelike affinity (OIB-type mantle source).

The other, is an olivine-clinopyroxene-phyric transitional basalt (in TAS diagram), with high Ba/Nb (90-100) and Th/Nb (>0.2) ratios indicating an arc affinity. A primitive character is suggested by: Mg# 70-74; Cr 870-1100 ppm, Ni 220-300 ppm and olivine phenocryt with core compositions (2300-3200 ppm Ni and Fo_{88-92}) in the range of mantle olivi-nes. Its source is more refractory than that of the alkali basalt.

New $^{40}Ar/^{39}Ar$ step-heating ages ranging from 55.6±1.4 to 56.7±1.0 Ma (this work) place the alkaline magmatism in the Palocene-Eocene transition. These ages are close to, but slightly older than the 52.5±1.8 Ma (K/Ar, [1]) for the spatia-lly associated transitional basalts with arc-affinity.

The nature and close relationship in space and time of these basalt types is consistent with short crustal residence time and deep major-faults in extensional zones. The Los Morros basaltic magmatism may imply that the inverse structures of the DFS associated to these mafic rocks may represent step-inverted normal faults inherited from Paleocene and/or previous extensional episodes, later reactivated by the transpressional Incaic tectonic event, which uplifted the Domeyko Cordillera during the Eocene-Oligocene time.

[1] Mpodozis et al (1993) Ser.Nac.Geología & Minería, 282.

Metal isotope fractionation during microbial processes in the Critical Zone

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Oxidation of sulfide minerals (e.g. pyrite) in sulfidic mine waste leads to the formation of acid mine drainage [1]. Herbert and Schippers (2008) found large Fe isotope fractionations ($\Delta^{56}Fe$: -1.4‰ to -2.4‰) between pore water and Fe(oxy-)hydroxides in mine tailings and concluded that this was the product of microbially catalyzed iron cycling [2].

In this study the potential of Fe and Cu isotope fractionation analysis is investigated to fingerprint microbial oxidation of metal sulfides in mine tailings. We focus on the investigation of the metal isotope fractionation between the sulfides and the metal(oxy-)hydroxides. We tested the selectivity of a sequential extraction method consisting of six extraction steps, to distinguish between sulfates, carbonates, Fe(oxy-)hydroxides, oxides, sulfides and silicates [3, 4]. For this test we used a synthetic test sample with known Fe isotope ratios of the components. The first results show that for Fe isotopes no significant isotope fractination occurs during the extraction.

In the next steps we will adopt this sequential extraction method to natural samples from a porphyry copper mine tailings in Chile [5, 6] and determine the Fe and Cu isotope compositions of the particular fractions. In addition, we will perform laboratory experiments of microbial mineral oxidation and compare the isotope fractionation with that in the mine tailings.

[1] Dold & Fontboté (2001) *J. Geochem. Expl.* **74**, 3-55. [2] Herbert & Schippers (2008) *Environ. Sci. Technol.* **42**, 1117-1122. [3] Dold (2003) J. Geochem. Expl. **80**, 55-68. [4] Mehra & Jackson (1960) Clays Clay Min. **7**, 317-327. [5] Dold (2006) *Environ. Sci. Technol.* **40**, 752-758H. [6] Korehi *et al.* (2013) *Environ. Sci. Technol.* **47**, 2189-2196.