Boron and lithium isotope compositions of acid-sulfate fluids from the Eastern Manus Basin, Papua New Guinea

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We report lithium (Li) and boron (B) concentrations and isotopic data of black smoker and acid-sulfate submarine hydrothermal fluids collected in 2006 and 2011 from DESMOS and SuSu Knolls vent fields located in the Eastern Manus Basin [1].

End-member black smoker fluids from SuSu Knolls have B and Li concentrations ranging from 1.2 to 1.8mM and 622 to 860μM, respectively. Isotopic compositions vary from 15 to 18‰ for δ^{11}B and 5.5 to 5.9‰ for δ^{7}Li. These variations match with other back-arc basin hydrothermal systems in the western Pacific [2] [3].

In contrast, acid-sulfate fluids from North Su site (located within the SuSu Knolls series) and DESMOS show varying compositions reflecting differences in the contribution of magmatic fluids. DESMOS fluids are depleted in Li relative to seawater indicating a low extent of water interactions and and a highly altered basement. Acid-sulfate fluids from North Su have similar or higher Li concentrations than seawater. Almost all samples are, however, enriched in B, potentially added during magmatic degassing and water-rock interaction. To calculate end-member compositions we assume that the acid-sulfate fluids display a mixture between seawater and magmatic fluid. Assuming the magmatic fluid contains no Mg, the end-member calculation can be done by an extrapolation to zero-Mg. At North Su site, δ^{11}B varies from 6.5 to 14.1‰ and δ^{7}Li from -4 to +5‰ for acid-sulfate fluids. End-member calculations for DESMOS fluids indicate no magmatic derived Li, hence δ^{7}Li could not be extrapolated.

These data will be discussed in the context of magmatic inputs, phase separation, and subseafloor water-rock interaction. They give new insights into the behaviour of Li and B isotope systematics and fluxes from submarine vent fluids affected by different amounts of magmatic input.

[1] Reeves et al. (2011) *GCA* **75**, 1088-1123 [2] Yamaoka et al. (2015) *CG* **392**, 9-18 [3] Mottl et al. (2011) *GCA* **75**, 1013-1038