Migration and impact of Antimony and Arsenic in water environment of the Dachang multi-metalliferous mine area, Guangxi, China

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Mining activities lead to the release of metalloids, such as Sb and As to the adjacent environments and cause a significant Sb and As contamination. The distribution and mobility of Sb and As in surface water of mine area were investigated, so as to assess the potential risk of Sb and As released from mine exploitation.

In Dachang multi-metalliferous mine, China, mine tailing, adit water, flotation drainage, river water, sediment and suspended particulate matter (SPM) were sampled in January (dry season) and July (wet season) of 2007 and then analyzed for Sb and As by ICP-MS. Mine tailings showed Sb concentrations of 175 to 7119 mg/kg and As concentrations of 309 to 24333 mg/kg. Distribution of Sb and As in the streams indicates that Sb and As are mainly from the mine tailing, adit water and flotation drainage. On average, soluble Sb and As in river waters were 563 µg/L and 82 µg/L, respectively, 188 and 21 times higher than the background values. The river waters draining the mining area show a severe contamination of Sb and As, and form a threat to the eco-environment of Diaojiang River which is a tributary of the Pearl River. Regarding the partitioning between water and SPM, Sb and As tend to migrate in dissolved phase in water environment. Whereas, the partitioning coefficient ($K_d = C_{SPM} / C_{aq}$) of Sb was lower than As, suggesting a lower affinity to SPM of Sb than As. This viewpoint could also be supported by the higher As/Sb value in precipitate than in solution. Moreover, the variation of As/Sb ratio in dissolved phase could imply a stronger attenuation of As than Sb in river water.

Chlorine isotope composition of spring waters from Martinique (Lesser Antilles)

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The cycling of chlorine (Cl) across subduction zones can shed lights on the cycling of other related volatiles (e.g., H_2O; from the enrichment into the subducting slab before the trench to the episodic release at various depths in the subduction zone), but poorly constrained. One recent study has shown that the Cl isotope compositions of volcanic gases/wells from the Izu-Bonin-Mariana arc show large variation [1]. But the potential Cl isotope fractionations [2] associated with degassing of Cl could complicate the data interpretation. In an attempt to better understand the Cl characteristics in arc systems, we investigated the Cl isotope compositions of chloride (Cl^-) in the cold and thermal spring waters from Martinique, a Lesser Antilles arc island. These springs have relatively low temperatures (<55°C) to avoid any degassing loss of Cl from the water and thus can provide a better constraint on the Cl sources.

The cold springs contain low Cl^- with a small variation of $\delta^{37}Cl$ from –0.2 to +0.2‰. This Cl^- is probably sourced from the marine aerosol by precipitation and/or from soil/rocks leached by the runoffs. The thermal springs contain a little higher Cl^- than cold springs. At low elevations, some springs show partial mixing of Cl^- with seawater. The thermal springs show a slightly larger variation of $\delta^{37}Cl$ from –0.4 to +0.2‰, except that one spring has extremely high value of +1.1‰. All data of seawater, cold springs and thermal springs from Martinique can be enclosed by a triangle on the $\delta^{37}Cl$ vs. $1/[Cl^-]$ diagram, indicating mixing of Cl^- among three components: (1) seawater with high Cl^- content and a $\delta^{37}Cl$ value of 0‰; (2) precipitation or diluted seawater with low Cl^- content and a $\delta^{37}Cl$ value of 0‰; (3) a component with high Cl^- content but a low $\delta^{37}Cl$ value of <–0.6‰. This ^{37}Cl-depleted component is either from the magmatic source or as a result of interaction between groundwater and clay minerals.

[1] Barnes *et al.* (2008) *Geology* **36**, 883-886. [2] Sharp & Barnes (2006) EOS Trans. AGU, 87(52) abstract V14C-03.