Assessment of heavy metal pollutions from lead-zinc mining activities in the North River Basin, China

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Chemical analysis of 120 samples of surface sediments and 82 samples of surface water around the lead-zinc ore mining area in the North River Basin (upper part of the Pearl River Delta), South China was performed in order to (i) determine the contamination levels of heavy metals (Tl, As, Cd, Cr, Cu, Hg Ni, Pb and Zn) by means of Inductively Coupled Plasma Mass Spectrometry (ICP - MS); (ii) identify potential sources of the heavy metals; and (iii) to identify those processes that determine the spatial variability of the heavy metals between the source areas and some distant locations in downstream direction. Among the examined elements, high contents of Tl, As, Cd, Cu, Pb and Zn were found in the sediments from the mainstream and feeders of the North River close to the mining area. We interpret the most likely sources of the heavy metal contamination in the sediments are wastewater discharges, mineral tailing materials and dust depositions resulting from the excessive mining activities, since the heavy metal distribution in the basin generally shows a decreasing trend from the location closest to the mining sites towards the downstream directions, and most importantly because the heavy metal contents are mostly related to the Tl contents. Thallium, as a rare element is seldom found in the normal environmental settings but is highly concentrated in the lead-zinc ore minerals in this area. Thus, the good relationships between the Tl contents and the contents of other heavy metals signify that Tl could be used as a special environmental tracer to track, and eventually to quantify the heavy metal contaminations from mining activities of ore specifically bearing Tl. This work enhances our understanding of heavy metal contaminations around a mining site. The local environmental protection and future mineral resources exploitation activities might also benefit.

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The characteristics of generation and distribution of CO_2 gas pools in Songliao Basin, China

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There are so many gas pools with high CO_2 component are distributed in volcanic reservoir. It also indicates that the CO_2 in CO_2 gas pools are mainly of magma origin by the analysis of the characteristics of gas components, carbon isotope composition of CO_2 and helium isotope composition of He in 10 of CO_2 gas pools in Songliao Basin. The main characters of CO_2 gas pools are $\delta^{13}C_{CO2} > -8‰$ and R/Ra=1.9~7.2. Geological background and analysis of fluid inclusion indicate that the CO_2 in Changling, De hui and Gu long etc fault depression are mainly forming lately. The reasons are following. The first is that the fluid inclusions of CO_2 are late period fluid inclusions which are banded occurrence in cracks of transecting quartz grain or transecting widen quartz. Their homogenization temperatures are 120~140°C. So, the forming stage of CO_2 may be mainly between 72Ma and 48 Ma. The formation and distribution of CO_2 are relatives with many kinds of faults including lithosphere faults, crust fractures, basement rifts and overburden faults especially relatives with NE-NNE deep faults which have strike slip motion in late stage. These kinds of faults mainly controlled depression formation in early stage and had NE-NNE left-lateral strike slip motion in late stage. Also, volcanic erupted with amazing amount of CO_2 in this stage and the faults became the channel of the CO_2 migration and then prompted the formation of CO_2.