Geophysical Research Abstracts,
Vol. 11, EGU2009-6242, 2009
EGU General Assembly 2009

Environmental impacts of Tl related to mined Dajiangping pyrite deposit in west Guangdong Province, China

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This study focuses on the accumulation of Tl in Dajiangping pyrite deposit area in west Guangdong province, China, as a case study for environmental impacts of Tl due to natural processes and human activities. The pyrite deposit is one of the largest in Asia and has been mined on large scale since 1970s. Results show that Tl and other trace elements in local ecosystems, such as rocks/ores, soils, surface and ground waters, water sediments, plants and crops in Dajiangping near the pyrite ore deposit are enriched, characterized by high concentrations. The range of Tl concentrations is from 13.7 to 43.0 mg/kg in chunk concentrated ore, from 31.0 to 56.4 mg/kg in powdery concentrated ore and 49.7 to 51.6 mg/kg in pyrite tailing. Tl concentrations range from 15.0 to 21.0 mg/kg in soils of mineralized area, from 7.4 to 30.5 mg/kg in alluvial deposits and from 1.2 to 2.0 mg/kg in undisturbed background soil. Elevated concentrations of Tl have been observed in surface water from upstream(2.2 μg/L) to downstream(102.6 μg/L) sections. Tl concentrations are comparatively high in the groundwater in mineralized area (7.8 μg/L). Tl concentrations in the edible parts of plants and crops range from 0.02 to 22.03 mg/kg (dry weight). Tl uptake shows characteristics of species-dependent, more in vegetables (around 90 mg/kg) than crops (0.3-8.1 mg/kg). For each individual plant, Tl concentrated more in roots than leaves and stems. The enrichment of Tl in the local ecosystem might come from the weathering, leaching and dissolving of Tl pyrite minerals. All this work adds new knowledge to understand Tl behaviour in mined Tl-pyrite deposits, and also benefits to the study on local environmental protection and mineral resources exploitation in the future.