Interpretation of mercury geochemical anomalies in catchment sediments/alluvial soils of China

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The China Geochemical Baselines (CGB) project provides geochemical baselines of catchment sediments and alluvial soils for 81 chemical parameters, including 76 elements, FeO, CO_2, H_2O^+, organic carbon and pH. Sampling sites (n=3382) cover approximately 94% China's territory, corresponding to a sampling density of 1 sample per 3000 km^2. The median mercury (Hg) determined by cold mercury vapor generation AFS in 3376 top samples (0-25 cm) is 26 ng/g and in 3026 deep samples (25 cm thick section at a depth of 100 cm or C horizon) is 18 ng/g. The median top/deep Hg concentration ratio is 1.26, with an average value of 1.87. Clearly, Hg exhibits modest but systematic enrichment in top samples. The national-scale Hg distribution pattern both in the top and deep samples illustrates an increasing trend from the northwest to southeast across China. This is interpreted to be primarily related to: 1) the extensive distribution of Lower Cambrian black shale in the southeast of China; 2) large-scale epithermal metallogenic domains developed in southwestern China characterized by mineralization of Au, Hg, Sb, As, P, Pb, Zn, Ni, Mo, PGE and barite, where Hg occurs as an metallogenic element or accompanying element; and 3) the varied climate and landscapes in China, which ultimately determine Hg geochemical behaviour in soils. Generally, the Hg top/deep concentration ratios increase from western/southwestern to eastern China, and this is interpreted to be a consequence of anthropogenic emissions from the densely populated areas in east China, and its humid and semi-humid climatic conditions. Geology, metallogeny, mining, climate, landscapes and human activities are demonstrated factors controlling elevated Hg concentrations in catchment sediments and alluvial soils in China.