Cu isotope systematics in the largely anthropogenically impacted Pearl River, China

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High precision Cu isotope measurements were performed on MC-ICP-MS for both suspended particulate matter (SPM) and dissolved phase ($\delta^{65}Cu_{SPM}$ and $\delta^{65}Cu_{DISS}$) of the anthropogenically impacted Pearl River (China). Both Cu concentration and its isotopic composition display large geographical and temporal variations in SPM and water samples. The downstream increase of the $\delta^{65}Cu_{SPM}$ in SPM from -0.03‰ to +0.44‰ is coupled with the increase of the Cu concentration from 40ppm to 360ppm. For the dissolved load, all samples display a significant variation of $\delta^{65}Cu_{DISS}$ between +0.20‰ and +1.83‰, with more positive $\delta^{65}Cu_{DISS}$ during the high water period (mean value +1.03‰) than the low water period (mean value +0.65‰). However, no obvious hydrological impact was found on $\delta^{65}Cu$ in SPM. Our data indicate that the Cu of the Pearl River is mainly controlled by mixing processes between natural bedrocks, which are transported by weathering and erosion processes, and an anthropogenic contribution (domestic sewage, industrial and mining residue), effect of in situ biogeochemical processes is limited. Accordingly, the present study provides new insights for using the Cu isotope compositions as both sources and processes tracers in large anthropogenically impacted river systems.