

Interactive comment on “X-ray fluorescence mapping of mercury on suspended mineral particles and diatoms in a contaminated freshwater system” by B. Gu et al.

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Response: We thank Reviewer's comments for improving our manuscript. Yes, the technique can, in principle, be applied to any other sites or materials contaminated with Hg, as long as the average Hg concentration is $> 50 \text{ } \mu\text{g/g}$ (described in the conclusion, p. 12). However, it is possible to detect or map at lower Hg concentrations if Hg exists as localized hot spots (for example, if Hg is precipitated as cinnabar or metacinnabar particles under reducing environments). The technique is especially well suited to map the localized Hg hot spots, as our work demonstrated. Hg is a global problem, and there are too many Hg contaminated streams and lakes around the globe

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such as the San Francisco Bay Delta waters (Pickhardt and Fisher, 2007) (discussed in the manuscript, p. 12). High levels of Hg contamination are also found at many Hg-mining sites. Both abiotic and biological processes are important for Hg sorption due to strong binding affinities of Hg to soft bases such as sulfide and thiolates in natural organic matter and biological materials. Per reviewer's comment, we modified the introduction (p. 2), and added some perspectives regarding Hg as a global pollutant.

Additional details and explanation were also provided in the Figure 3 legend. The individual diatom shown in image (a) apparently seems different from that in image (b) with respect to size and morphology; they are likely two different species so that it is not unexpected they may differ in the amount of Hg adsorption due to different surface characteristics (e.g., the type and relative abundance of surface functional groups). Yes, we annotated the images by circling the particle(s) used in the determination of Hg in Table 1. Fig. 4a,b,c were unrelated but used to support the hypothesis that organic matter (carbon) is associated with iron oxide minerals and acts as a bridge for Hg sorption. We used complementary tools including (a) X-ray microprobe fluorescence imaging and elemental analysis (e.g., Hg, Fe, etc.), (b) scanning electron microscope (SEM) backscattering elemental analysis showing the association between C and Fe, and (c) FTIR infrared spectroscopic analysis of natural organic matter adsorbed on mineral particles. We made these clarifications in the Fig. 4 legend.

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