The relative contribution of different mercury sources to methylmercury production in the Sacramento-San Joaquin Delta

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Mercury (Hg) contamination is considered one of the greatest threats to the Sacramento-San Joaquin Delta (Delta). This threat is primarily driven by the transformation of Hg by native bacteria into the more toxic and biologically available form, methylmercury (MeHg), in the wetlands and sediment of the Delta. To effectively manage this threat, a quantitative understanding of the relative contribution of the different Hg sources to MeHg formation is needed. While current models indicate that 1-2% of the Hg entering the Delta arrives through atmospheric deposition (wet and dry), it is has been long held that this mercury source is likely very reactive once deposited. On the other hand, mass balance estimates indicate 90% of the Hg entering the Delta arrives adsorbed to suspended particles from tributary discharge, but this source is thought to be less reactive. We conducted an in situ mesocosm dosing experiment where different Hg sources to the Delta (atmospheric, dissolved riverine and suspended sediment) were "labeled" with different stable Hg isotopes and added to mesocosms deployed in wetland cells. We measured six time points from each mesocosm, one prior to the spike and five after the spike: 30 minutes, 1 day, 3 days, 7 days and 27 days. Preliminary results from this experiment suggest that aqueous Hg sources (Hg introduced with precipitation and filtered river water) are more (10-1,000x) available to methylating microbes than particle bound Hg. Consequently, although direct atmospheric Hg deposition may contribute a small portion of the total Hg loading to the Delta, it may contribute to a substantial portion of the MeHg production within the Delta. These findings suggest that efforts to control MeHg in the Delta should consider the relative contribution of the different Hg sources to MeHg production in addition to the current loads analysis approach.