Surficial littoral sediments of hypersaline lake, the Salton Sea, a sink for selenium mobilized from the Colorado River delta

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The hypersaline Salton Sea is California's largest lake and one of the most important wetlands in the Western US [1]. This eutrophic lake is located in SE California and supports endangered fish and avian populations threatened by several pollutants, including selenium (Se). Se is mobilized through agricultural irrigation and enters the Salton Sea mainly as selenate. In Salton Sea littoral sediments selenate reduction potential far outweights dissolved Se inputs [2]; as a result, virtually all the Se discharged to the Salton Sea remains sequestered in sediments [3].

To assess littoral sediments as a potential Se sink we investigated microbial selenate reduction and Se spatial depth distribution. In samples collected from different depths (0-8 cm, 2 cm intervals) at two locations (north and south), we measured selenate reduction rates (SeRR) using flow-through reactors (FTR) and isotherm constants for selenate sorption in slurry experiments. We also determined bulk density, porosity, particle size distribution, C_{org}:N, bulk Se concentration, and most probable numbers for selenate-reducers (SeR-MPN).

Littoral sediments from north and south sites showed similar trends. The highest SeRR (1.4-2.5 μg $h^{-1}cm^{-3}$) were detected at 0-2 cm, and decreased significantly with depth. C_{org}:N increased with depth: the lowest values (5.2-5.9) were found at 0-4 cm, and the highest (6.5-7.7) at 4-8 cm. At the end of FTR experiments, SeR-MPN ($2\text{-}7\times10^4$ MPN cm^{-3}) and bulk Se concentration (~25 mg kg^{-1}) were the highest in surface sediment.

Our data confirm that selenate reduction in littoral sediments of the Salton Sea is microbially mediated. Our results also suggest that microbes inhabiting surface sediment are well adapted to reduce selenate entering the Salton Sea to predominantly elemental Se. We can therefore conclude that better adapted microbial communties and close proximity to the water-sediment interface make surficial Salton Sea littoral sediments an important Se sink.

[1] Miles (2009) USGS OFR 2009-1276 [2] VillaRomero (2013) *Hydrobiologia* **709**, 129-142 [3] Schroeder (2002) *Hydrobiologia* **473**, 23-45