

Decrease in net methylmercury production following an iron amendment to tidal wetland sediments

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Tidal wetlands are often important sources of methylmercury (MeHg) in aquatic ecosystems. As a result, the restoration of wetland habitat may cause an increase of MeHg concentrations. In the Sacramento and San Joaquin Delta of California, concerns over potential increases in MeHg from wetland restoration are currently impeding wetland restoration efforts. There has been significant research into mercury biogeochemistry in wetland sediments, however, there have been few successful efforts to minimize the production and export of MeHg from restored wetlands. To provide a tool for controlling MeHg, we have evaluated the use of an iron sediment amendment to reduce net MeHg production in tidal wetland sediments. The addition of Fe [II] decreases MeHg production by lowering the concentration of bioavailable inorganic Hg [II] species that are methylated by bacteria. Under the reducing conditions typical of wetland sediments, dissolved Hg [II] speciation and concentration is controlled by sulfide species (i. e., S [-II]) with the concentration of dissolved bioavailable Hg [II] complexes increasing as porewater S [-II] increases. Addition of iron decreases the concentration of S [-II] through the formation of FeS_(s). To test the potential use of iron addition to control MeHg production, microcosms collected from an estuarine tidal marsh in San Francisco Bay were amended with 180g-Fe/m², 360g-Fe/m² and 720g-Fe/m² and operated under simulated tidal conditions. Shortly after iron addition, porewater S [-II] concentrations decreased at all iron doses relative to the control, and net MeHg production and export to the overlying surface water decreased by over 90% at the highest iron dose. Despite some conversion of FeS_(s) to pyrite, the effects persisted for at least 12 weeks. Experiments were also conducted to assess the effects of marsh vegetation on MeHg production and examine the role of oxygen released from plant roots and decomposition of plant-derived organic matter. Our research suggests that it may be possible to control net MeHg production in certain tidal wetlands with an iron amendment. Field-scale application of iron addition is being used to assess the efficacy of this approach under different conditions (e.g. plant communities, marsh elevation) encountered in tidal wetlands.

Research of saturation of mineral waters with quartz and amorphous silica in cold carbonic and nitric thermal waters in Southwest Transbaikalia

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Silicon is a constant component of natural waters structure. Despite a wide occurrence of silicon circulation in natural waters and its essential role in behavior of many physical and chemical processes, until today insufficient attention is given to the quantitative definition of this component. In mineral waters, especially in thermal, the concentration of dissolved silicon can reach half of general mineralization that should affect their physical and chemical properties. In connection with it the consideration of factors with which the receipt and accumulation of silicon is connected is, undoubtedly, important.

Detailed data about the content of silica in natural waters are necessary not only for the estimation of scales of migration of this component, but also for the decision of the question, concerning intensity of the rock aeoliation, problems of their origin.

Unique feature of the nitric thermal spring is the presense of high concentration of fluorine-ion (to 15 mg/dm³) and silicon (to 110 mgH₄SiO₄/dm³) in their structure of. Accumulation of these components in thermal waters is promoted by the alkaline environment and the elevated temperature.

For the purpose of determining saturation of mineral waters with quartz and amorphous silica the solubility of these connections at various temperatures has been calculated. The received results have shown that all thermal waters are supersaturated in relation to quartz. However deposits of this compound in places of thermal spring discharging is not observed. Many researchers explain this by the extremely small speed of reaction of quartz crystallization from solution.

Polymerization and deposition of silica never occurs until its concentration in a solution is below the solubility of amorphous silica. Results of calculations point out the lack of saturation of thermal and cold waters, at temperatures of their discharging, amorphous silica, that is, all silicon in these waters is in truly dissolved condition.