Hg isotopes reveal important contribution of glacier melting to Lake Hg budget on Tibetan Plateau

YULONG LIU[1], JIUBIN CHEN*[12], SHENGLIU YUAN[2]

[1]State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, CAS
（liuyulong@mail.gyig.ac.cn）

[2]Tianjin University, Institute of Surface-Earth System Science
（*correspondence:jbchen@tju.edu.cn，yuanshl05@163.com）

Mercury gains great attention because of its toxity and mobility. Inorganic Hg may be transformed to the most toxic MeHg by microorganisms in anoxic lake system. Up to now little is known on Hg isotope systematics in lake systems of the Tibetan Plateau, the highest plateau in the world. We report for the first time mercury isotopic composition for water samples of a typical plateau saline lake, the Nam Co Lake and its 9 tributaries in this pristine area with a goal of tracing its sources and processes undergone. Large variation of both MDF and MIF of Hg isotopes were determined for the three lake profiles, with δ^{202}Hg of mainstream ranged from -2.52‰ to -0.01‰, Δ^{199}Hg from 0.14‰ to 0.64‰, while range of -1.72‰~-0.56‰, 0.49‰~1.43‰ for tributaries, respectively. Lake Δ^{199}Hg here is much lower than those in Canada (0.58‰~1.91‰)[1] and of tributaries. The Δ^{199}Hg / Δ^{201} Hg ratio of river water is 1.17, probably demonstrating a main source of glacier melting，while other Δ^{199}Hg and SO_4^{2-} concentration data may indicate additional sources from catchment rock weathering and precipitation. Further investigation showed that in addition to the source contribution, lake mercury isotope indicate also impact of inlake processes. Three lake water columns showed different Hg isotope variations, with a negative peaks at subsurface (around 15 m depth), which could likely be explained by the photoreaction of Hg complexed with sulfur-containing organic compounds[2, 3], which may be further impacted by the changes with depth of the sunshine waveband. Taking Hg isotope data into account, annual mass balance calculation shows that a large proportion of input mercury is reducted and released back to atmosphere, resulting in negative Δ^{199}Hg values for residue Hg. Our result highlight the importance of Hg isotope study and stimulate further investigation of the impact of inlake processes on Hg isotope systematics in plateau lakes.

[1] Chen, J.B., et al. (2016), Chem. Geol. **426**, 33-44. [2] Zheng, W. and H. Hintelmann, (2010) J. Phys Chem. A **114(12)**, 4246-4253. [3] Kritee, K., et al. (2018), ACS Earth Space Chem. **2(5)**, 432-440.