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Arsenic and uranium distribution in salt and surface soils around lakes in the arid area of Mongolia

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Many inland saline lakes have been shrinking throughout the world. When lakes shrink or desiccate it affects their water chemistry and ecosystems. Previous studies have shown that the enrichment of trace metals especially As and U increases in lake water due to intense evaporation (Gankhurel et al., 2022). If, the desiccation of the lake occurs high concentration of As and U in water can precipitate as a soluble salt in the dried lakebed. Therefore, the dried bed of saline lake will be the source of trace metals pollution. It also produces dust which is transported locally and regionally. The study aimed to understand the distribution and solubility of trace metals in salt and soils around saline lakes in the arid area of Mongolia. We are focusing on the Valley of the Gobi Lakes, Mongolia which is one of the primary sources of Asian dust storms.

We collected salt and soil samples from ten lakes (some of them already dried) in June 2022. Samples were analyzed using a sequential extraction procedure and X-ray diffraction to understand the mineralogy and speciation.

The concentration of As and U in salt samples ranges from 6-95 mg/L and 2-46 mg/L, respectively. The concentration of As and U in surface soil samples was 8-53 mg/L and 1-30 mg/L, respectively. The chemical speciation results show that As and U in salt and surface soil samples are associated mainly with an easily soluble fraction such as exchangeable fraction and carbonates. The XRD patterns of the salt samples indicate the common presence of thenardite (Na2SO4), halite (NaCl), gypsum (CaSO4 2H2O), and scarce carbonate minerals such as calcite and monohydrocalcite. The presence of thenardite and halite is consistent with the chemical composition of the lake water (Fukushi et al., 2020, Gankhurel et al., 2022). It provides evidence that supports the previous study result which is that precipitated salts around the lake area have easily soluble As and U. Therefore, these salts can easily transport to the surrounding environment as a surface runoff with precipitation or transported by wind to become a source of contamination.