Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.34524

Impact of Paddy Field Irrigation to the Silicon Stable Isotope Ratios in major Japanese Rivers

TAKAAKI ITAI[1] AND KOHKI FURUSHO[2]

[1]Department of Earth and Planetary Science, The University of Tokyo
[2]The University of Tokyo

Although dissolved silica (DSi) in rivers is primarily derived from silicate weathering, widespread paddy fields may alter DSi concentrations and isotopic signatures through biological uptake and recycling. Such effects may be particularly pronounced in East Asia, for example in the Japanese Archipelago, where paddy fields cover >10% of the land area. Here we show $\delta^{30}Si$ variability in major Japanese rivers and evaluate the impact of paddy-dominated catchments using the Kinu–Kokai River system as a case study. Field surveys of 14 major rivers in eastern Japan (November 2022; June–July 2024) including the Abukuma, Kitakami, Agano, Shinano, Hime, Kurobe, Joganji, Jinzu, Sho, Tenryu, Fuji, Tone, Mogami, and Kiso Rivers show $\delta^{30}Si$ values ranging from 0.67 to 2.46‰, with a significant correlation with paddy field coverage in the catchments ($r = 0.72$, $p < 0.05$). In the Kinu–Kokai system, $\delta^{30}Si$ increases downstream from 1.03‰ to 1.87‰, indicating progressive removal of isotopically light Si. Seasonal variations in river water $\delta^{30}Si$ reflect paddy field water management practices. A Rayleigh fractionation model suggests substantial Si removal within the paddy field system, thereby altering riverine fluxes to the ocean. In the presentation, we will show a first-order estimate of Si removal by paddy fields at the national scale.