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Source and re-distribution of zinc isotopes in river catchments, Southern Taiwan

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To examine systematically of potential Zn isotope fractionation associated with various surface processes, including chemical weathering, anthropogenic pollution and adsorption, we have studied the spatial distribution of zinc (Zn) and Zn isotopes in the Erren River (ERR) and Gaoping River (GPR) catchments in Southern Taiwan. Specimens of river waters, suspended and stream sediments were sampled along geographical transects from the headwaters to the estuary during monsoon season, as well as samples of major tributaries (Laonong, Chishan and Chukou Rivers). Major and trace elements were analyzed by ICP-OES and HR-ICP-MS, where the 66Zn/64Zn ratios (expressed as δ66Zn) were measured by MC-ICP-MS (Neptune, Thermo-Fisher Scientific) after column purification. A high-precision Zn isotopic determination was established by combining the standard-sample bracketing (SSB) procedures and the external normalization method, Cu was used as the internal dopant for mass discrimination correction. The long-term external reproducibility achieved is better than 0.04 ‰ (2σ).
In the GPR, the dissolved Zn contents ranged between 0.17 and 0.89 nmol/L, the only exception is the estuary sample 0.01 nmol/L. No correlation between the dissolved Zn and the geographic location was observed. The dissolved Zn concentrations in the ERR are much higher than the GPR, ranged from 0.1 to 174.4 nmol/L. The high Zn content in the ERR is probably due to serious industrial pollution from surrounding factories. This is supported by correlation between Zn and Cu in the ERR waters. The dissolved δ66Zn values vary from 0.35 to 0.03‰ and show a systematically decreasing trend with the flow path from the upstream to the estuary. These preliminary results imply that Zn isotopes were potentially affected by contributions of anthropogenic sources and/or adsorption/desorption processes. To isolate these artifacts, laboratory experiments were performed to evaluate the Zn isotope fractionation associated with nano-particles adsorption/desorption processes.