Geochemical characteristics across the river-sea interface: a case study in the Geum and Sumjin River systems, South Korea

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The artificial estuary dam at the river-sea interface could affect the role of river, which transports particulate and dissolved pahses to deltas and the ocean. Here, we collected water samples across the river-sea interface in August and October, 2016 in order to examine the effect of estuary dam on water chemistry: the Geum River-Yellow Sea system with estuary dam versus the open Sumjin River-South Sea system. On an average molar basis, Na and HCO_3 are dominant ions in both river systems: major cation abundances follow the order of Na > Ca > Mg > K, and major anion abundances follow the order of HCO_3 > Cl > SO_4 > NO_3. Results show that both elemental and stable isotope geochemistry are clearly affected by the estuary dam, which makes them abruptly be changed. In the Geum River-Yellow Sea system, stable isotopic compositions ($\delta^{18}O$, δD and $\delta^{13}C$) are sharply increased at the estuary dam and reach to the seawater values without seasonal variation, while in the Sumjin River-South Sea system, they are gradually increased showing clear seasonal variation. In both systems, the PAAS-normalized REE patterns are quite different in river and seawater samples: the river water does not show any enrichment of either LREE or HREE, with a little Gd anomaly, while seawater displays the HREE enrichment with negative Ce anomaly. This study highlights that both elemental and isotope geochemistry are significantly changed by the artificial estuary dam, which will have the potential to alter them in the ocean and marine life.