Employment of the generalized adsorption model for the prediction of solid-water distribution of cesium in the river-estaury-ocean system

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Since last century, a large amount of radiocesium released from atomic weapon tests and nuclear accidents was directly introduced into environment through atmospheric transportation and deposition on land surface soil, discharged into river system by erosion effect, and finally released into ocean. In this study, the generalized adsorption model for Cs^+ was employed to estimate the solid-water distribution of Cs^+ in the river-estuary-ocean system. The results confirmed that the capacity of each adsorption sites of sediment, i.e., frayed edge site, interlayer site, type II site, and planar site, can be precisely optimized through Cs^+ adsorption isotherm combined with the radiocesium interception potential and cation exchange capacity.

According to the model, the main contributor to Cs^+ adsorption is the frayed edge site due to the very low Cs^+ concentration in the river-estuary-ocean system. The different solid-water distribution of Cs+ in the river-estuary-ocean system was majorly controlled by the salinity in aqueous phase. Therefore, Cs^+ should be highly reactive with strong adsorptive character to particulate matters in river system, whereas a conservative distribution must be dominant in ocean with much weaker affinity to particulate matters because of the high salinity.