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

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1 **Employment of the generalized adsorption model for the prediction**
2 **of the solid-water distribution of radiocesium in the river-estuary-**
3 **ocean system**

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18 **Abstract:** Since last century, a large amount of radiocesium (RCs) released from
19 atomic weapon tests and nuclear accidents, such as in Chernobyl and Fukushima, was
20 directly introduced into the environment through atmospheric transportation and
21 deposition on land surface soil, discharged into river systems by erosion effects
22 during rainfall, and finally released into the ocean. In this study, a generalized
23 adsorption model (GAM) for Cs⁺ was employed to estimate the solid-water
24 distribution of Cs⁺ in the river-estuary-ocean system. The results confirmed that the
25 capacity of each adsorption site of river sediments, i.e., interlayer site, type II site, and
26 planar site, can be precisely optimized through the adsorption isotherm of Cs⁺ on the
27 river sediments combined with the radiocesium interception potential (*RIP*) and
28 cation exchange capacity (*CEC*).

29 According to the GAM, the main contributor for Cs⁺ adsorption is the frayed
30 edge site rather than others due to the very low concentration of Cs⁺ in the river-
31 estuary-ocean system. The different solid-water distribution of Cs⁺ in the river-
32 estuary-ocean system was dominantly controlled by the salinity in the aqueous phase.
33 Therefore, Cs⁺ should be highly reactive with strong adsorptive character to
34 particulate matter in the river system, whereas a conservative distribution must be
35 dominant in ocean with much weaker affinity to particulate matter because of the high
36 salinity.

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