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Spatial distribution of the sediments in the Gangkou River catchment: Evidence from chemical composition, rare earth elements, and lead isotopes

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Sediment geochemistry has been widely used to identify the source of the sediments delivered from catchment to the deposition basin. In this study, bed load sediments, high terrace soils, beach sediments, and cores drilled at estuary were collected at the catchment of Gangkou River and its tributary, Linlu River, southern Taiwan. All sediments were sieved by 0.062 μm sifter and exchangeable, carbonate, and iron oxide phases were leached and only residue silicate phase were digested. Chemical composition, rare earth elements (REEs), and lead isotopes were measured. The results show that two major catchments, Linlu River and Gangkou River, as well as high terrace soil and beach sediments can be successfully classified by chemical composition and lead isotopes. However, REEs show signature of upper continental crust and no differences among all the samples, possibly due to the same source of high REEs minerals. The characteristic of chemical composition and lead isotopes are different between two catchments and the estuary sediments as well as beach sediments near the estuary imply mixing behavior between two catchments. The upper most of the estuary core samples, presented as modern sediment, have similar chemical composition and lead isotopes compared with the mainstream. However, the beach sediment on the top of the dune and the lower part of the core samples, which are older than 7 ka, have distinct chemical and isotopic characteristics, indicating different sediment sources. In summary, chemical composition and the lead isotopes are robust tracers for the leached fine sediments in Gangkou River catchment but REEs are not. The results of estuary core indicate that the sediment source of the estuary before 7 ka is different from the present.