Geochemical evidence indicates a paleo-lake burst event in the Huange (Yellow River)

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A series of enclosed paleo-lakes occurred in the upper and middle reaches of the Huanghe (Yellow River) during the late Cenozoic, and the San-Men paleo-lake was one of the largest and latest ones. The development and outburst of San-Men paleo-lake as one of the most important events for the Huanghe river evolution, might have played an important role in shaping the geomorphology and constraining sediment source-to-sink process in the North China plain and surrounding Bohai and Yellow Seas.

Here we present U and Nd isotopes of core sediments from CSDP-1 in the central south Yellow Sea in order to examine the infleucne of this lake burst event on sedimentation in the marginal seas. The U-series isotope ($^{234}U/^{238}U$) provides a way to determine the time scale of sediment source-to-sink process, defined as sediment “transport time”, while the Nd isotope (εNd) of detrial sediments can trace the sediment provenance. Calculated sediment “transport times” in core CSDP-1 vary from 200 to 600 ky, displaying an abrupt increase at the depth of 30 m (at about 0.26 Ma, coinciding with the beginning of rapid loess deposition at Mangshan section). This layer with extreamly long sediment “transport time” is also characterized by strikingly high εNd (up to -10.7), indicating a significant εNd feature of loess sediment (-11 to -10.5). It is hypothesized that the long transport times up to 600 kyrs at this layer may imply a long storage or traping history of the Huanghe sediment in the San-Men lake before the outburst event resulting in the sediment delivery to the Yellow Sea. The other evidences from geomorphological, sedimentary stratigraphic and Quaternary geological observations all suggest that the lake burst and significant out-flowing of the Huanghe sediment occurred at ~0.26 Ma. The coupling process of tectonics and monsoon climate might trigger this lake burst event.

Acknowledgement: This work was supported by National Natural Science Foundation of China (Grant Nos. 41225020 and 41376049).