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Mg isotopic variation in the paleo-Yamuna River system indicates continental weathering in the late Quaternary

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Magnesium isotopic compositions in sediments and river waters can serve as a proxy to identify the sources of riverine magnesium and acts as a promising indicator of continental weathering. However, there is still uncertainty about the response of $\delta^{26}Mg$ to hydrological changes and primary factors controlling the fractionation of riverine $\delta^{26}Mg$ due to the scarcity of high-resolution time-series studies on various catchments. Rivers are influential geological forces that significantly shape landscapes and regional hydrology, contributing to the sustenance of human civilizations. The ancient Ghaggar-Hakra River (mythologically known as Vedic Saraswati) shifted eastward toward the modern Yamuna River (one of the major tributary of Ganga) have been linked to the deurbanization of the Harappan (Indus) Civilization, which majorly took place around 4.0–3.9 thousand years ago (ka). Here, present $\delta^{26}Mg$ isotopic variation of in two cores drilled on the postulated paleochannel of Yamuna (Y2) and modern-day Yamuna bank, (~48 m and ~20 m deep respectively), in the NW Indo-Gangetic Plain. The Yamuna River drains through diverse lithologies of Himalaya and affected severly by Indian Summer Monsoon (ISM). Thus, the Yamuna paleo-channel may serve as a natural laboratory for investigating continental weathering and source-to-sink transport of Mg particularly during Holocene period. By systematically investigating the age wise Mg isotopes of these paleochannels, we aim to determine the major processes that control the behavior of riverine Mg isotopes, to constrain weathering-induced Mg-C cycling, and further to explore the indication of river Mg isotopes in different phases as a weathering proxy.