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Tectonic-climate interactions as recorded in the Bagwalipokhar paleolake sediments from the Binta Basin, Lesser Himalaya over the last 35ka

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Himalayan paleolakes are excellent archives to understand the past interactions between tectonics, weathering and, climate. Here we present the $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ isotopic compositions for a 17m thick vertical sequence of paleolake sediments from Lesser Himalaya with the goal of delineating the provenance and its control on weathering in relation to tectono - climatic oscillation for the last 35ka. This paleolake is located near Bagwali pokhar of Binta basin and lies in the zone of active North Almora Trust and, there are evidences that the basin experienced large scale neotectonic activity. Based on the magneto-stratigraphic column, 20 discrete samples were analyzed focusing on the detrital fractions extracted following a very mild leaching technique to remove carbonate and Fe-Mn oxides in the sediments. To integrate the weathering history, we also measured major elements and calculated the weathering indices of Chemical Index of Alteration (CIA), chemical Index of Weathering (CIW) and the elemental ratio of mobile Na_2O, K_2O and CaO to immobile Al_2O_3 oxides. Age control for the samples is provided by OSL dates and, these sediments have depositional ages between 35ka and 2.5ka.

Measured compositions show large variations ranging from 0.73686 to 0.75066 (mean 0.742808 ±0.004) for $^{87}Sr/^{86}Sr$ and –17.01 to –14.13 (mean -15.22 ±0.71) for ε_{Nd}. Relatively low CIA values (69 to 77) and high oxide ratios suggest mild to moderate weathering in the source areas. When plotted on $^{87}Sr/^{86}Sr$ vs ε_{Nd} space together with known potential sources of Himalayan formations such as Higher Himalaya Crystallines (HHC), the Lesser Himalaya and the Ganga Basin, we infer a dominant HHC source for the paleolake sediments that remained so throughout the 35ka record of sedimentation. Our time series records of provenance indicators reveal subtle and significant changes with low $^{87}Sr/^{86}Sr$ and high εNd peaking at 34, 29, 15.8, 7 and 3ka, the timing of which coincides with increased precipitation in the region, thus revealing a possible climate-tectonic interaction.