



Chronology, pattern and rates of erosion and deposition processes of the Lima Conglomerate; Peru's most prominent fan delta

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Fluvial sediments from mountain belts like the Andes are important archives recording past Earth surface processes. The reconstruction of the timing and the rate of alluvial sediment deposition, paired with information about the provenance of the material bear important information when the scope lies in the detection of specific climate or tectonic events as driving forces. Three levels of the Lima fan-delta Conglomerate, situated on the western Peruvian Andean margin, have been sampled to study its erosional and depositional history.

First, quartz bearing clasts are used to infer the age of the terrace material deposition through isochron burial dating technique. Then, the sand fraction in the three levels are sampled to obtain the paleo-erosion rates at the time of the deposition of the Lima Conglomerate. Finally, the provenance of both the dated terrace deposits and the modern stream sediments, accomplished through matching detrital zircon U-Pb ages with crystallization ages of source rocks, are used to infer changes in the erosion and sediment dynamics between the past and the present period.

First, isochron burial dating results show same ages of 490 ± 70 ka for two of the three level of the Lima Conglomerate. This represents the first ages of the Lima Conglomerate and the first isochron burial dating results of alluvial sediments from the Andes.

Results of paleo-erosion rate estimates show an increase from a value of c. 105 ± 10 mm.ka⁻¹ for the sample of the lowermost level, 119 ± 11 mm.ka⁻¹ for the sample of collected from the intermediate level to c. 169 ± 14 mm.ka⁻¹ for the sample of the highest level. The modern erosion rates that have been calculated in the lowermost reaches of the entire western Peruvian Andes (Reber et al., 2017) are ranging from 9 mm.ka⁻¹ to 190 mm.ka⁻¹ with an average value of c. 38 mm.ka⁻¹. The inferred paleo-erosion rates are higher than the modern average value, suggesting that the formation of the Lima Conglomerate most likely occurred in response to a pulse of erosion. Finally, provenance tracing through detrital zircon ages show major changes in the sediment provenance through time. Nowadays, sediment source areas are mainly located along the steep middle reaches of the rivers whereas during the Pleistocene, sediment source areas were located in the steep reaches and also in the flat headwater areas.

These results suggest that an erosional pulse in the upstream basin on the sediment production, possibly resulted in the accumulation of the sediment of the Lima Conglomerate, and that this period has been strongly controlled by a combination of an orbitally-induced shift towards more humid climate and interglacial meltwater surges.