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Historical and millennial geomorphic evolution of Pacific Central Andes: coupling hydrological and cosmogenic records

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To understand the mechanisms and the rates of the geomorphic evolution of a mountain range, it is important to quantify landscape processes over different time scales. If historical records of hydrological events are used to constrain erosion and transport rates over the last decades, improvement and use of cosmogenic terrestrial nuclides method in geomorphology is fundamental to extend the study of these processes over millennial timescales. Combining these two quantitative approaches can allow determining the history of the erosive signal and the contribution of factors like climate and tectonics to catchment dynamics.

The Pacific side of the Central Andes, characterized by a similar tectonic pattern and by a strong North-South climatic gradient, offers the opportunity to estimate the impact of climate variability on catchments denudation rates. In this study, we couple records of river suspended load fluxes over the last 40 years with measurements of cosmogenic nuclide (10Be, 26Al, 21Ne) concentrations in alluviums and colluviums in 20 main catchments of Peru and Chili. Short-term erosion rates are very low from South Peru up to the Central Chili, then increase with a strong gradient around the region of Santiago, well correlating with the precipitation distribution over the range. To determine long-term erosion rates, we sampled river sands for cosmogenic analysis in similar morphostructural areas for each catchment. Moreover, for some of them we

extended the sampling to several points of the river profile and to hillslopes, and collected different size of cobbles. This approach will allow us to detect local variations of the erosion rates within the single catchments and to better constrain the dynamics and transport of sediments in rivers.