Landscape evolution studies depend critically on the quantification of long-term denudation rates. These are difficult to obtain in active mountain belts, because sediments are normally rapidly eroded in these environments. Terrestrial in situ cosmogenic nuclides (^{10}Be and ^{36}Cl) have been used in this study in different ways to estimate denudation rates in the southern Central Andes of Chile. An inventory of large bedrock involved landslides, with a chronology supported by ^{10}Be and ^{36}Cl exposure dating provides reconstructed sediment volumes to estimate denudation rates from landslides during the Pleistocene. Simultaneously, ^{36}Cl basin-wide average erosion rates were obtained for small catchments inside the same area. Both long-term (10^3–10^6 a) estimates were compared to short-term estimates based on suspended sediment records for the last 30 years.

Rates of denudation of ~0.1 mm/a were obtained using the landslide inventory data, similar to the ^{36}Cl basin-wide average erosion rates (0.15–0.23 mm/a). The estimations from suspended sediment records for the last 30 years show variable values, depending on their position along the orogen, between 0.03 to 0.15 mm/a. As accumulation inside the range is minor, there are two possibilities that can explain these observations, setting aside scale differences for the studied areas. Although for one area all estimates are similar within uncertainty, for others present day sediment transport by large rivers is out of equilibrium with long-term transport. The system might be currently transport-limited but during the Pleistocene it must have had periods of increased sediment discharge. A second alternative is that the bedload component of sediment transport needs to be incorporated more precisely into the estimations from suspended sediment records. Application of three bedload transport theoretical formulations to major rivers of the region supports this asseveration, suggesting that in this environment bedload can represent up to 80% of the sediment transport.

Pleistocene landscape evolution of the southern Central Andes quantified with cosmogenic nuclide techniques

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