



CORRELATION OF BASIN-SCALE DENUDATION RATES AND PRECIPITATION INCREASES OVER THE LAST 200 KA IN NW ARGENTINA

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Alluvial fill terraces are well developed in the Quebrada de Humahuaca of NW Argentina (23°S - 24°S) and record episodes of Late Quaternary sediment accumulation and river incision. Using a combination of cosmogenic radionuclide (CRN) and optically stimulated luminescence (OSL) dating, we have produced a chronology of terrace development for the past ~200 ka, including exposure ages and basin-scale denudation rates from five ¹⁰Be depth profiles. Denudation rates increase from ~20m/Ma to ~130m/Ma and the timing of these increased rates is compared to palaeo-precipitation proxy records from Bolivia. This long-term record is interpreted from gamma-ray spectrometry of clays and evaporites and generally shows increased frequency and magnitude of high precipitation phases over the last ~180 ka. Increased humidity and perennial lake phases begin at ~115 ka, ~90 ka, ~60 ka, ~50 ka and 30 – 25 ka (Fritz et al., 2004). Other records (e.g., Godfrey et al., 2004) record a major phase of lake expansion in Chile, as well as Bolivia, at ~38 ka. The exposure age and denudation rates of four inset terraces located ~200 km to the southeast of the Bolivian lake record were calculated from ¹⁰Be depth profiles using a sea level-high latitude production rate of 5.02 ± 0.27 at/g scaled to the site latitude and altitude after Stone (2000). Errors were computed with Monte Carlo simulations that included uncertainties in AMS measurements, bulk density, sample depth and OSL dating. ¹⁰Be

exposure ages are compared to OSL ages of post-incision loess deposits and, in one case, the shielding effects on ^{10}Be production have been modeled. Our exposure ages for each terrace, which show the expected progressive decrease in exposure age with altitude, are 203 ± 12 ka, 112 ± 9 ka, 65 ± 18 ka and 33 ± 4 ka and correspond to denudation rates of 19 ± 5 m/Ma, 33 ± 5 m/Ma, 55 ± 15 m/Ma and 130 ± 51 m/Ma. ^{10}Be concentrations in the oldest terrace profile could not be modelled with an exponential fit; the estimated exposure age is calculated from the top sample but is inconsistent with OSL ages of sediments underlying underlying the ^{10}Be depth profiles. Within error, the remaining ^{10}Be exposure ages are stratigraphically consistent with OSL ages of terrace sediments. Although tectonics is clearly influencing Late Quaternary landscape behaviour in this region, we suggest that terrace development, sediment storage rates and delivery mechanisms are predominately controlled by increases in precipitation and the last episode of widespread river incision in this part of the valley correlates to the period of major lake expansion in Bolivia and Chile.

References

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