

Deposition and retention of meteoric ^{10}Be in river terraces of Taiwan Island during the Holocene

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Meteoric ^{10}Be is produced in the atmosphere and then scavenged by rainfall and dust to the Earth's surface. It is commonly used to quantify soil and surface ages, trace soil movement, and quantify erosion and weathering rates by coupling with ^9Be if the ^{10}Be depositional flux is known. Although previous efforts, including general atmospheric circulation modelling (GCM) and observations from records of precipitation and dated soil, have advanced our understanding on ^{10}Be deposition over different timescales, uncertainties in its deposition and retention remain. Specifically, the debate about the precipitation additive versus dilution effect on ^{10}Be flux is still ongoing, and also the common assumption of full retention of ^{10}Be in soil may be invalid.

In order to consider these uncertainties, this study focuses on Taiwan Island, where the precipitation rate is quite high (~2.5 m) and has great variability due to typhoon attacks. We measured ^{10}Be inventories from depth profiles of three terraces across Taiwan Island, with ^{14}C ages ranging between 3.6 and 9.3 cal. kyr BP. The total ^{10}Be inventories in these profiles range from $2.2\text{--}7.8 \times 10^9$ at/cm². Correcting these inventories for ^{10}Be inheritance and for partial dissolved loss of particulate-bounded Be, resulting ^{10}Be depositional fluxes are about 30%–50% of the modeled value derived from GCM¹, but no geographic or climatic effect can be detected.

The deficit between our measured ^{10}Be depositional flux and the GCM-derived flux may be reconciled for each terrace, assuming an overestimated depositional age, surface erosion (~1 m), or a sampling depth not deep enough to reach the ^{10}Be inheritance level. We thus suggest that the terrace-derived ^{10}Be depositional flux provides a lower limit for the long-term flux in Taiwan Island. In summary, understanding all the associated uncertainties of ^{10}Be deposition will improve the accuracy of this proxy in mountain belts.

Ref: 1. Heikkilä et al., 2013, *Clim. Past*: 2641–2649.