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# Quantification of basin scale denudation rates in the active mountain belt of Taiwan: The in situ produced 10Be point of view.

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The terrestrial topography is controlled by combined actions of both internal (volcanic and tectonic activities) and external processes (erosion and weathering). Volcanic and tectonic are responsible for the relief building by accumulation, exhumation and uplift, whereas climatic processes are involved in the destruction and evacuation of the material. The balance between these processes induces a competition which can be quantified as uplift and denudation rates.

Due to its specific geodynamic and sub-tropical climatic contexts implying a rapid landscape evolution of the active mountain belt, Taiwan appears to be particularly well-suited to study the processes involved in landscape modeling and, more specifically, to quantify uplift and denudation rates. Since uplift rates have already been investigated, we will focus here on basin scale denudation rate quantification.

In Taiwan, denudation rates obtained from different methods covering various time scales have already been proposed: 1) measurements of the suspended and dissolved loads of a river yield short term (few tens of years) denudation rates ranging from 5 to 6mm/yr, and 2) low-temperature thermo-chronology studies and associated models give 2.3 to 10mm/yr on a much longer time scale (few hundreds of thousands to few millions of years). In order to determine if the observed discrepancy between these estimates results from the significantly different time spans investigated or from biases of the used methods, denudation rates on an intermediate time scale ranging theoretically from 100 to 100,000 years were determined using the in situ- produced cosmogenic nuclide method. This latter is less-sensitive to high-frequency erosional events and allows opening the short-term time window.

The studied watersheds were sampled according to different criteria such as a favorable lithology (quartz-bearing rocks), a minimum of anthropization and a minimum surface area on the order of 40km$^2$ to smooth the landsliding impacts. A preliminary sampling was undertaken at the main outlets of catchments on both sides of the Central Range (Tajia, Wu and Choshui Rivers to the West and Heping, Liwu and Mugua Rivers to the East), especially located in the North part of Taiwan. In situ-produced cosmogenic 10Be in river borne quartz minerals was used to deduce basin averaged denudation rates assuming that cosmogenic production has reached the steady state.

The results obtained as described above yield basin-wide denudation rates ranging from 0.07$\pm$0.01 to 0.98$\pm$0.85 cm/yr and from 0.13$\pm$0.04 to 1.44$\pm$1.16 cm/yr for the West and East Side Central Range's catchments, respectively. These denudation rates are integrated over a characteristic time scale of few hundreds of years. All together, the preliminary results show a convincing discrepancy between the western and eastern sides, in agreement with the dissymmetrical structure of the mountain topography. Indeed, the underplating phenomena due to collision occur especially beneath the Eastern Central Range and result in its rapid exhumation, whereas rock uplift is responsible for the mountain building in the Western part of Taiwan. The deeply eroded and steep catchments located in the Eastern part of the mountain belt and the more mature western landscape may reflect the differential uplift rates from each side of the Central Range.