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## Formation of Karrentische in a coastal tropical environment and their use for denudation rate estimates

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Limestone boulders on top of pedestals reminiscent of karrentische occurring in glaciated karst were found and studied on the karstic part of Guam, Mariana Islands. Field, petrographic and XRD examination showed that these features form as a boulder falls from a cliff on limestone ground and protects it from surface lowering that affects the surroundings. Consequently, a pedestal forms and its height is a direct measurement of the denudation amount since the boulder fell. Since their formation and occurrence on karstic terrain closely resembles karrentische but the placement of boulders differs from the "classic" karrentische, we refer to them as tropical karrentische.

The investigated karrentische on Guam are essentially also a consequence of reef formation during MIS 5e interglacial period and denudation during glacial period. Hence, we investigated the denudation rate using tropical karrentische in combination with sea-level notches and fossil reef terraces which provided palaeosurface elevation and time constraint for denudation onset, respectively.

The accuracy of the field evidence was tested by theoretical calculations. We calculated the denudation from the a) runoff of the measured CaCO<sub>3</sub> solute amount in the vadose water and b) the maximum possible denudation as if the system in the given conditions was at equilibrium.

Field evidence indicates an average denudation rate of ~40-70 mm/ka since the Last Interglacial (MIS 5e) sea-level maximum drawdown, ~125-116 ka ago. Theoretical denudation considering the modern solute runoff would be ~110 mm/ka, while the maximum possible rates can be up to 150 mm/ka, which is in line with the karrentisch-deduced estimate, since only a portion of the theoretical estimates translate into actual denudation.

The results of this research show that tropical karrentisch can be a very valuable denudation indicator in coastal tropical settings and can probably be extended to non-tropical areas where time and palaeosurface can be constrained. Additionally, the deduced relatively high denudation rates also have implications on palaeo sea-level reconstructions based on elevated reef terraces that are prone to denudation.