



Erosion rates on different timescales in the Rhenish Massif and the Black Forest, Germany

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We constrained long-term erosion rates from the concentration of cosmogenic ^{10}Be in stream sediments in order to quantify the Late Quaternary denudation history of mountain ranges in central Europe. Four different catchments in Germany, ranging from 8 to 379 km² were investigated. Two of them, the Aabach and Möhne catchments drain predominantly low-grade Paleozoic metasediments. The other two, the Gutach and Acher catchments in the Black Forest are situated in Late Paleozoic granites. Erosion rates derived from the ^{10}Be concentrations are consistent in the Rhenish Massif (47 to 65 mm/ka) but more variable in the Black Forest (26 to 109 mm/ka). These spatially-averaged erosion rates integrate over the past 6 to 23 ka.

Short-term erosion rates were quantified by combining the amounts of suspended and dissolved loads in water samples with water discharge data and basin area. The dissolved loads were corrected for atmospheric and anthropogenic inputs by analyzing the stable isotope signature of $\delta^{13}\text{C}$ of dissolved inorganic carbon and by taking into account the precipitation, evaporation, and anthropogenic components. The suspended loads were measured especially during high-discharge events and were calculated by using calibration curves to get realistic results including rare flood events. These short-term erosion rates integrate over the last 5 to 80 a and vary between 11 and 25 mm/ka. They are only about one third of the erosion rates derived from ^{10}Be . The short-term erosion rates are complemented by erosion rates derived from the volume of sediment stored behind reservoirs of known age. These erosion rates range from 2 to 13 mm/ka and are lower than the erosion rates derived from river loads, as they do not take into account the dissolved load.