

## Erosion rates on different timescales in river catchments of low mountain ranges

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In order to unravel the Late Quaternary landscape evolution in a mountain range typical for central Europe, we determined erosion rates on timescales of  $10^1$  to  $10^4$  years. Four different catchments in Germany, ranging from 8 to 379 km<sup>2</sup> were investigated. Two of them, the Aabach and Möhne catchments are located in the Rhenish Massif and drain Paleozoic sediments. The other two, the Gutach and Acher catchments in the Black Forest are situated in Late Paleozoic granites. Long-term erosion rates derived from the concentration of cosmogenic <sup>10</sup>Be in stream sediments are consistent in the Rhenish Massif (47 to 65 mm/ka) but more variable in the Black Forest (26 to 109 mm/ka). These erosion rates integrate over the past 6 to 23 ka and are similar to local rates of river incision and rock uplift during the Quaternary as well as to local average denudation rates since the Mesozoic derived from thermal modelling of fission track data.

The determination of short-term erosion rates, quantified from the suspended and dissolved river loads, requires corrections to obtain realistic geogenic values. The dissolved loads were corrected for atmospheric and anthropogenic inputs using major dissolved ions, precipitation data, and carbon isotopic compositions of dissolved inorganic carbon. The suspended loads were measured especially during high-discharge events and were calculated by using calibration curves relating discharge to the amount of suspended load. These erosion rates integrate over the last 5 to 80 years and vary between 9 and 25 mm/ka. They are only about one third of the erosion rates derived from <sup>10</sup>Be. These erosion rates are complemented by erosion rates derived from the volume of sediment trapped in three reservoirs over periods of 13 to 28 years (2 to 10 mm/ka).

## Fate of chlorinated compounds in a sedimentary fracture rock aquifer in South Central Wisconsin

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The study site, located in south central Wisconsin, is a deep fracture rock aquifer contaminated by various chlorinated compounds. Spills of PCE, TCE, 111TCA, BTEX and ketones occurred in the 1950s and 1960s and DNAPL can still be found in the source zone. Based on hydrogeological and geophysical data, the deep (more than 600 feet) fracture rock system is divided into 7 hydrogeological layers. Collected Contamination has mainly been found in Layer 5 at a depth of 160-170ft and the length of the plume, defined by an extensive monitoring network (more than 200 monitoring wells including monitoring ports in multilevel wells) is now more than 8000 feet long. Historical and current data show that extensive dechlorination has been occurring at the site and the composition of chlorinated compounds in the groundwater has been evolved to mainly cis-12DCE and 11DCA which are degradation products of TCE and 111TCA respectively. Geochemistry data (Fe, Mn, and SO<sub>4</sub>) together with field parameter data (DO) and dissolved gases data (methane) show very different redox conditions in different areas of the aquifer, ranging from aerobic to methanogenic which is consistent with the degradation patterns observed in these areas. Complex transport and degradation patterns were revealed at this site and degradation pathways were proposed based on VOCs concentration data. Carbon and chlorine isotope data of these chlorinated compounds (mainly chlorinated ethenes) provide additional information for evaluation of the degradation patterns in different part of the aquifer. These data show different isotopic patterns for biodegradation of cis-12DCE which could be linked to two different spills. These data also showed that 11DCA, a by-product of biodegradation of 111TCA, is also attenuated by biodegradation. The biodegradation patterns inferred from the isotope data agreed with the variable redox conditions observed in the aquifer.