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Visualization of post-sedimentary grain size reduction in loess sequences by calculation of laser diffraction patterns with two different optical models

Philipp Schulte and Frank Lehmkuhl
Department of Geography, RWTH Aachen, Aachen, Germany (philipp.schulte@geo.rwth-aachen.de)

Loess is predominantly accumulated during glacial periods. During interglacial and interstadial periods soils are developed. Soil formation usually results in a reduction of the particle grain size. In Loess sediments the post-depositional grain size variation is due to a reduction of the dominating coarse silt fraction in favor of an increasing of the clay fraction. The fine and medium silt fractions also increase in most cases. Generally there are two post depositional fractionation processes which are responsible for this grain size shift: (1) the chemical weathering of silt sized minerals like mica and feldspar as a result of Hydration and Hydrolysis, (2) the physical weathering of all containing minerals by cryogenic processes. There are many widely used proxies to estimate the vertical variation and the different intensities of the post-depositional weathering. However, there are uncertainties related to aeolian sorting effects, the distance to the source regions and carbonate dynamics, which reduces the sensitivity of common proxies to the chemical weathering. In this study we present a simple and quick method using laser diffraction calculations obtained by two different optical models to highlight the enrichment of fine grained material by the transformation and neoformation of pedogenic minerals.