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European Standard Loess as baseline for paleoenvironmental interpretations of loess granulometric variations

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Loess-paleosol sequences are sensitive terrestrial archives of Quaternary aeolian dynamics and paleoclimatic changes. Loess is predominantly formed during glacial periods, whereas soils form during interglacials and interstadials, when dust sedimentation is reduced or absent. Common grain size (GS) based proxies used in loess research mainly reconstruct past sedimentation dynamics. However, the GS distribution of a loess sample is not solely a function of aeolian dynamics; rather complex polygenetic depositional and post-depositional processes must be taken into account.

Here we integrate GS data of primary loess samples from 14 profiles in Europe as baseline to identify and quantify the imprint of local paleoenvironments on GS distribution along vertical loess sections. Our GS data are measured by the same laser diffraction device (Beckmann Coulter LS13320) and available in the database of the Physical Geography laboratory at the RWTH Aachen University. Based on a catalogue of criteria, samples with least signs of weathering and reworking (e.g. low GS mean and good sorting, low magnetic susceptibility, low geochemical weathering proxies) are defined as primary loess of the studied loess sections. GS distributions of these loess samples show little variation, both within individual profiles (temporal) and in a supra-regional comparison (spatial). We calculate an averaged loess sample and interpret it as baseline loess or European Standard Loess. We discuss the significance of deviations from this standard loess related to different geomorphological conditions during deposition and later pedogenetic processes.