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# Upper Pleistocene dust dynamics reconstructed by isotope fingerprinting and the magnetic fabric of Loess-Palaeosol-Sequences

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Loess-Palaeosol-Sequences (LPS) are the most widespread aeolian sedimentary deposits providing climatic- and environmental records across continents. As dust sinks, they may archive information on dust source dynamics, if targeted source signals survived processes operating during production, transport, and syn- and post-depositional alteration of particles and sediments. Yet, our knowledge about such dynamics through palaeoenvironmental changes during the Upper Pleistocene remains vague. This limits our understanding of thresholds that may have (de-) activated dust sources causing major environmental changes in prevalent areas. We thus combine results of isotope- ($^{87/86}$Sr, $^{143/144}$Nd) and major element (Si/Al) provenance proxies that react differently to pre-, syn- and post depositional alteration processes, with granulometry (U-ratio) and the anisotropy of magnetic susceptibility (AMS). Granulometry is recognised as an indicator for wind strengths and the primary magnetic fabric of loess deposits has been successfully used to reconstruct surface near wind directions. We apply our approach on the RP1 profile of the Schwalbenberg LPS that covers the late OIS 3 and the OIS 2 in centennial-scale resolution. The site is embedded in the Middle Rhine Valley (Germany) dividing the Rhenish Massif in its western and eastern part. Consequently, the Schwalbenberg seems appropriate to trace provenance shifts as it is linked to a distal dust source via the Rhine and as it is surrounded by potential local dust sources of the Rhenish Massif. Our results indicate shifts in source areas NNE-SSW off the site, contemporary with increasing frost dynamics and aridification. Both factors seem to enhance dust inputs from the Rhine system up to a threshold where the Rhenish Massif gets activated as a dominant source. Geochemical fingerprinting and AMS at the Schwalbenberg RP1 LPS reveal

insights into dust source dynamics that allow for estimating their emission potential during Upper Pleistocene palaeoenvironmental changes.