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Late Pleistocene aeolian dust provenances and wind direction changes reconstructed by heavy mineral analysis of the sediments of the Dehner dry maar (Eifel Mountains, Germany)

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The study presents the results of a heavy mineral analysis from a 38 m long record of aeolian sediments from a core section of the Dehner dry maar (Eifel Mountains, Germany). The record encompasses the period from 30 to about 12.5 ka. Heavy-mineral analysis of the silt fraction has been performed at a sampling interval of 1 m. Statistical analyses enabled the distinction of local and regional source areas of aeolian material and revealed pronounced changes in the amounts of different heavy mineral species and corresponding changes in the grain size index (GSI). The results indicate that during the early stages of MIS 2 (40 to 30m depth) aeolian sediments were supplied mostly from local sources. This period is characterized by a low GSI ratio resulting from a reduced mobility of material due to a vegetation cover. The climax of the LGM is characterized by a higher supply of heavy minerals from regional and more distant sources. Changes in the provenance areas are indicated in inverse relationships between zircon, rutile, tourmaline (ZRT) and carbonate particles. Shifts in the wind direction are documented in pronounced peaks of carbonate particles indicating easterly winds that have crossed the limestone basins in the Eifeler North South Zone. ZRT-group minerals on the other hand suggest a westerly source area and a supply from areas consisting of Paleozoic clastic sedimentary rocks. In the periods following the LGM the analyses indicate an increasing degree of mixing of heavy minerals from various provinces. This suggests the existence of a presumably incomplete, thin cover of deflatable loessic sediments that has been repeatedly reworked on the elevated surfaces of the Eifel.