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# A preliminary source-to-sink sediment budget for aeolian sands

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Source-to-sink sediment budgets are being intensively studied in fluvial systems. In contrast, sediment budget calculations are very rare for wind-transported material. This may be attributed to the fact that the exact delineation of both source and sink areas in aeolian systems can pose difficulties.

In the Pannonian Basin, aeolian action by northwesterly to northerly winds exerted a thorough impact on landscape evolution during the Quaternary, testified among others by yardangs, wind corridors and numerous ventifacts as well as extensive blown sand fields. Wind erosion has been dated to be important since at least 1.5 Ma ago. Considering the sand fraction, the Pleistocene Pannonian Basin seems to be a nearly complete aeolian sedimentary system from source to sink, thus it provides a good opportunity to carry out sediment budget calculations.

The largest blown sand accumulation occupies $\sim$10 000 km2 in the central part of the Pannonian Basin, in the area called Kiskunság, and contains considerable volumes of aeolian sands extending down to the Lower Pleistocene. Its material is traditionally considered to originate from fluvial sediments of the Danube floodplain. However, recent studies on wind erosion and wind direction reconstructions have indicated that a considerable portion of the sand can have had a provenance in the extensive unconsolidated sediments of the Late Miocene Lake Pannon, which cover the uplifting Transdanubian Range and its surroundings. To gain data on this question, we carried out sediment budget calculations to assess if material volumes of the supposed source and sink areas are comparable.

In the source area we reconstructed a paleotopography, practically a bounding envelope surface for the Pliocene/Pleistocene boundary using existing knowledge e.g. on the typical succession of Lake Pannon sediments and the evolution history of the area. The missing volume down to the present-day surface was then calculated, where the removed material was constituted dominantly by the Upper Miocene sediments, subordinately by older clastics. The final amount of sand possibly eroded by the wind from the area was calculated by reducing this volume through estimating the portion of sand in the lacustrine succession and the ratio of aeolian and fluvial erosion. Aeolian sand volumes of the sink were calculated using borehole data from publications and original borehole documentations. This approach contains several error sources, including uncertainties in the position of the envelope surface, varying quality of borehole documentations or the distribution of sampling points. As a result, the estimated error margin of the missing volume computation is up to 50% and the provided value is rather a minimum estimation. A similar value can be valid for the sink area.

The calculations showed that sand volumes of the source and sink areas are comparable, with the eroded material being about one third to a half of that of the deposited amount (somewhere below 150 km3 and between 300-400 km3, respectively). This result supports the idea that Transdanubia is an important source area of the Kiskunság blown sand field. The portion of sand in the sink not accounted for by the present estimation can be derived from two sources. Probably more blown sand had been delivered to the sink from areas even more upwind from the Transdanubian Range (Danube Basin), now not included in the calculations. The floodplain of the Danube may have also provided sediments, but mostly only in the Late Pleistocene, when the river had already occupied its modern course upwind of the Kiskunság area.

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