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Chemical pretreatment effects on grain size results of clastic sediments and soils

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Determining the particle size is a current problem in many earth science sub-disciplines. Particle size distributions of sediments provide insight into the physicochemical environment, transport, accumulation and accumulation of particle formation, and post-deposition transformation processes. Therefore, granulometric proxies are widely used in paleoclimate research and many soil properties depend on their particle size distribution. Several studies are available comparing different laser diffraction devices, optical theories, and optical settings. Ignoring limitations of laser diffraction technique can result in poorly comparable granulometric data sets, however, inadequate chemical pretreatment procedures are also limiting factors, which are often overlooked. In this study, we examined different sediment types from various geomorphological environments from the Carpathian Basin: lake, eolian, fluvial sediments and paleosols. Our aim is to review and create a reliable methodology for laser diffraction particle size analysis and optical particle shape investigations. The widely used pretreatment methods (total of 13) were compared. The results showed that the samples with different textural parameters were differently affected by the preparation procedures. Compared to the silty textured loess and paleosol samples, applied techniques did not cause substantial changes of results of sandy materials, although the duration and the applied amount of the reagent had some impact on the grain size data. Using cluster analysis, the various pretreatment methods could be separated from each other proving that these procedures are able to create substantially different grain size datasets. Shape parameters of the particles were also modified by the pretreatment methods, significant changes could be observed in the circularity, convexity characteristics. The study is supported by the ÚNKP-19-3 New National Excellence Program of the Ministry for Innovation and Technology. The support of the National Research, Development, and Innovation Office (projects NKFIH KH130337 and K120620) is gratefully acknowledged.