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Variations in sedimentological properties in Lake Challa, East Africa: Understanding the source to sink processes

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The clastic mineral fraction of lacustrine sediments has been proven to provide valuable information about sedimentation dynamics within a lake, and it can be used to define distinct terrestrial source areas and transport mechanisms from source to sink. Down-core variation in the properties of the clastic mineral fraction yields indications for changes in terrestrial sediment sources over time. However, in order to use terrestrial proxies in palaeo-environmental reconstruction, we have to understand and quantify the modern conditions of sediment provenance and deposition at the study site.

In this study we present data on grain-size distribution, mineralogy and particle shape of the clastic mineral component of lacustrine sediments from Lake Challa, a small freshwater lake of volcanic origin, located on the eastern slope of Mt. Kilimanjaro. Situated close to the equator, it contains a uniquely long and continuous sediment sequence allowing the study of inter-hemispheric climate dynamics. The finely laminated profundal sediments of Lake Challa are characterized by a fine-grained texture and are mainly composed of organic matter, biogenic silica and authigenic carbonate, with a relatively minor component of detrital mineral that can either originate from erosion of the steep volcanic crater walls or was mobilized by wind from unvegetated areas of the surrounding scrub savannah landscape. In order to distinguish between these two sources of terrestrial sediment input (i.e. local run-off versus distant aeolian) into Lake Challa, and to map out differences in sediment properties, samples were investigated from profundal surface sediments and short cores, as well as on-shore soils from several locations around the lake and from beyond the crater catchment.

Variation in grain-size distribution and mineralogy can be linked to distinct terrestrial sources, whereas the shape of single particles gives additional information about transport dynamics. In future, the results from this study will be applied to the down-core record of Lake Challa to reconstruct climate-driven changes in terrigenous sediment input over time.