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Millennial scale variability in the biogeochemical silica cycle on East African mountains.

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On long geological and pedological time scales, biological weathering and accelerated cycling of silicon by grasslands are positively correlated with the supply of dissolved Si to rivers, lakes and oceans. However, a new study of the accumulation rates of biogenic silica particles in the Late Quaternary sediments of three lakes on Mount Kenya and Mount Elgon, East Africa, shows that production of amorphous silica by grass-rich terrestrial ecosystems (phytoliths) and aquatic ecosystems (diatoms) was out of phase. At all three sites grassland productivity peaked in the late-glacial, as marked by the influx of graminoid pollen, cuticles and phytoliths to the lake sediments. Conversely, diatom productivity declined, suggesting silica limitation when soluble silica was locked into vegetation and stored as phytoliths in plants and soils. Silica purging of catchment stores happens episodically, creating significant leads and lags within the continental Si cycle on millennial-to-orbital time scales. New developments in establishing silicon budgets for specific catchments, together with the application of silicon isotope analysis, will help in the understanding of these processes.