Phytolith indices as proxies of grass subfamilies on East African tropical mountains

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Abstract

The main objective of this paper is to provide researchers that investigate fossil phytolith assemblages and model/data comparisons a new tool for estimating C3/C4 grass composition over time. We tested the reliability of modern soil phytolith assemblages and phytolith indices for tracing the dominance of different grass subfamilies and tree cover density. We analyzed modern soil phytolith assemblages from sites over elevation gradients on Mount Kenya (Kenya), Mount Rungwe and around Lake Masoko (southern Tanzania). These data were compared with available botanical data. A phytolith index named Ic, proved to be an effective proxy of the proportions of Pooideae, Arundinoideae and Bambusoideae grasses (mainly C3 grasses) versus Panicoideae grasses (mainly C4 grasses), increasing with elevation in East-Africa. When tropical mountains are covered by open habitats (e.g. grasses and shrublands), Ic should be a reliable proxy of the C3/C4 grass composition. These results highlight the value of the phytolith index Ic, when interpreting paleo-environmental records from tropical mountains, to: 1) better understand past local and regional C3/C4 grass distributions and associated climatic changes and 2) increase the set of C3/C4 data available for model/data comparisons.

Key words: phytolith,paleovegetation,C3, C4,grass,woodland,East Africa