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Freie Themen

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Titel
Quantitative and qualitative biogenic silicon analyses combining modern microscopical and spectroscopical methods

Abstract
Numerous organisms comprising pro- and eukaryotes are evolutionarily adapted to synthesize siliceous structures (biosilicification). In terrestrial biogeosystems biogenic silicon (BSi) accumulation of phytogenic (BSi synthesized by plants), protistic (diatoms and testate amoeba), microbial (bacteria and fungi) and zoogenic (sponges) origin results in formation of corresponding BSi pools. Accumulation and recycling of BSi in terrestrial ecosystems influence fluxes of dissolved Si from the continents to the oceans, thus act as a filter in the global Si cycle. Although the biogenic control mechanism especially of phytogenic Si pools (phytoliths) has been generally recognized since decades quantitative information on other terrestrial BSi pools is rare. Additionally, information on physicochemical properties of the various siliceous structures are needed to better understand their dissolution kinetics. We used modern microscopical (laser scanning microscopy, LSM; Scanning electron microscopy with coupled energy-dispersive X-ray spectroscopy, SEM-EDX) and spectroscopical (micro-Fourier transform infrared spectroscopy, micro-FTIR) methods for quantitative and qualitative analyses of BSi structures. LSM was used to measure volumes and surface areas of BSi structures and corresponding surface-area-to-volume ratios (A:V ratios) were calculated as an indicator for the resistibility of these siliceous structures against dissolution. Volume measurements were also used for the quantification of BSi pools by multiplication of corresponding volumes with BSi density. SEM-EDX analyses provided information on the elemental composition of different BSi structures and with the help of micro-FTIR we were able to gain specific information about chemical bonding and molecular structures of BSi. These information will help us to understand in detail dissolution kinetics of various siliceous structures, thus their role in Si cycling.