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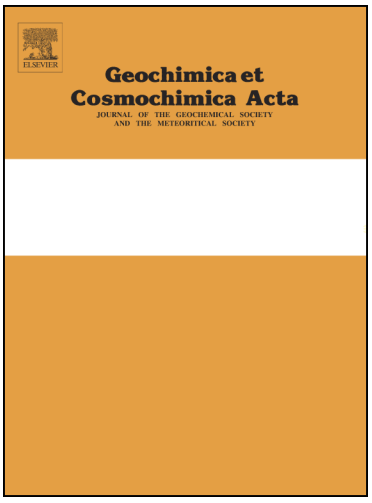

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Processes controlling silicon isotopic fractionation in a forested tropical watershed: Mule Hole Critical Zone Observatory (Southern India)

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Abstract

Assessing the dynamics of the silica cycle in the critical zone remains challenging, particularly within the soil, where multiple processes are involved. To improve our understanding of this cycle in the Tropics, and more specifically the role played by vegetation, we combined elemental Si mass balance with the δ^{30}Si signatures of the compartments involved in the water-plant-rock interactions of a tropical forested watershed, Mule Hole (Southern India). To accomplish this, we analysed (1) the δ^{30}Si values of present-day litter phytoliths from tree leaves and grass, as well as soil amorphous silica (ASi); (2) the Si isotope fractionation induced by phytolith dissolution; (3) the silicon mass balance inferred from isotopes at the soil-plant scale; and (4) the consistency between water sources and the δ^{30}Si signatures in the ephemeral stream.

The δ^{30}Si values of present-day litter phytoliths and soil ASi vary within a narrow range of 1.10 to 1.40 ‰ for all samples, but two deep vertisol samples which likely trapped phytoliths from different vegetation growing under more humid conditions, as indicated by pollen analysis. A homogeneous signature of litter is a minimum condition for using δ^{30}Si as a

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