Boron isotopes fractionation demonstrate dominant biological control on dissolved fluxes at tropical watershed (Mule Hole, India).

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Vegetation cycling is thought to either enhance chemical weathering for example through the release of organic acids or decrease chemical weathering through the recycling of elements. Boron isotopes (expressed as $\delta^{11}B$) are fractionated at the surface of the earth during chemical weathering, which make $\delta^{11}B$ a potential tracer of chemical weathering intensity. Boron is also an essential micronutrient necessary for vegetation growth, but little is known on the boron cycle at the catchment scale and its isotope fractionation in plants.

This study was undertaken at the Mule Hole Critical Zone Observatory, South India. We investigated $\delta^{11}B$ of rainfall, throughfall, streamlet, soil porewater, groundwater, litter and soils to decipher the relative influences of weathering, biological cycling and atmospheric input using a boron solute budget at soil-plant scale and then the catchment scale. Results show that all dissolved compartments are enriched in ^{11}B by more than 30‰ compared to the gneissic bedrock, which is compatible with both boron incorporation in secondary minerals (or adsportion) and biological uptake. Throughfalls display the highest $\delta^{11}B$ of the catchment (reaching 66‰) indicating addition of heavy isotopes by canopy leaching and/or dry deposition. Boron annual budget at the catchment scale however show that boron input to the stream from mineral weathering is minor (<10%) compared to the cycled fraction through vegetation (>80%). Unexpected boron enrichment in the solid phase of the two investigated soil profiles derive from boron long term accumulation in the clay fraction. The absence of upper horizons depleted in boron is consistent with the truncation of soils profiles during ancien erosion events. It thus appears that from the boron isotopes point of view, present-day biological cycling is decoupled from soil processes.