Bulk deposition of base cations in a subalpine natural forest landscape estimated by canopy budget model: A focus on the forest edge canopy

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Abstract

Calculations of base cation inputs of loads in forest edge canopies are rare, although forest edge canopies play a paradoxical role in the effective capture of atmospheric deposition. Throughfall deposition and canopy exchange of base cations were studied with a continuous throughfall investigation under a natural forest edge and a closed canopy in a subalpine forest over a period of 2 years. Compared with precipitation, the concentration of base cations in the throughfall of both canopies was enriched as expected, but the enrichment level in the forest edge was less than that in the closed canopy. Moreover, the throughfall deposition of base cation fluxes in the closed canopy (35.19 kg ha⁻¹ y⁻¹) was slightly higher than that in the forest edge canopy (33.50 kg ha⁻¹ y⁻¹). Seasonally, the base cation input in the rainy season was 2.32–2.70 times higher than that in the snowy season in throughfall in forest edge canopy and the closed canopy. Furthermore, the canopy budget model suggested that the direction and magnitude of canopy exchange and dry deposition controlled the net throughfall fluxes (NTF) of base cations, and obvious differences could be observed between the canopy and seasonal scales. Compared with other elements, K and Mg leached from the main canopy exchange process, while Ca was absorbed by both canopy types in the annual NTF. These results highlight the spatial variability of base cation chemical characteristics, enhance cognitive the deposition of nutrients and regulatory factors in different forest landscapes, preferably guide the formulation forest ecological management strategies.

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