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高窒素負荷条件下のスギ林とアカマツ林における酸の収支
Proton budgets for a Japanese cedar stand and a Japanese red pine stand receiving high nitrogen deposition

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To evaluate of the effects of atmospheric nitrogen (N) inputs on soil acidification, the proton budgets for a Japanese cedar (*Cryptomeria japonica*) stand (Cs site) and Japanese red pine (*Pinus densiflora*) stand (Ps site) in Gunma prefecture, central Japan, were studied by measuring biogeochemical fluxes (atmospheric deposition, canopy leaching, vegetation uptake and leaching from soil). Proton budgets were estimated for two individual compartments of the forest ecosystems: vegetation canopy and soil horizon with root zone.

Nitrogen inputs below the canopies at Cs site and Ps site were 2.0 kmol ha^{-1} yr^{-1} and 3.4 kmol ha^{-1} yr^{-1}, respectively, which have almost been equal to those in nitrogen-saturated forests in northwestern Europe. Its outputs from the soil horizon at Cs site and Ps site were 3.9 kmol ha^{-1} yr^{-1} and 2.5 kmol ha^{-1} yr^{-1}, respectively. These results indicate that the ecosystems were nitrogen-saturated, and that a net loss of N occurred at Cs site.

The dominant proton sources in vegetation canopies were atmospheric H^+ deposition at Cs site, and leaching of anions at Ps site. In soil layers, the dominant proton sources were base-cation uptake by vegetation and nitrification of NH_4^+ derived from organic N at Cs site, and nitrification of atmospheric NH_4^+ at Ps site, respectively. The sum of internal proton sources within the soil-vegetation system at Cs site and Ps site was 15.5 $kmol_c$ ha^{-1} yr^{-1} and 6.9 $kmol_c$ ha^{-1} yr^{-1}, respectively. These internal proton sources were 4.9 times at Cs site and 1.6 times at Ps site as large as the sum of external sources (atmospheric H^+ deposition, uptake of atmospheric NH_4^+ by the canopy and nitrification of atmospheric NH_4^+).

These proton sources were neutralized almost completely within the system mainly by base-cations release from the canopy or the soil, and uptake of NO_3^- by vegetation at the both sites. These results suggest that the forest ecosystems studied have the higher capacity to neutralize acid than nitrogen-saturated forests in northwestern Europe. It is concluded that soil acidification due to N deposition is unlikely to occur at present at the sites.

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