A VERTICAL DISTRIBUTION OF ION FLUXES IN WET AND DRY TROPICAL FOREST OF SOUTHEAST ASIA

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Nutrient imbalances and deficiencies by fluctuation of atmospheric depositions are inadequately understood in tropical forest of Southeast Asia. To evaluate a sensitivity of the nutrient dynamics of tropical forest to atmospheric deposition, comparisons of the vertical distribution of ion fluxes from rainfall to stream between wet and dry tropical forests at a small-catchment scale were applied.

Study catchments are at the Danum Valley reserved forest in Sabah, Malaysia, as wet tropical forest site, and the Sakaerat Silvicultural Research station in northeastern Thailand as dry tropical forest (tropical seasonal forest) site. According to Koppen's classification, the climates of the region in the wet and dry tropical forests are classified as tropical rainforest (Af) and tropical savannah (Aw), respectively. Ion fluxes via rainfall, throughfall, soil solution, and stream water have been observed for 2 years by 2 week-interval sampling or ion exchange resin method. Annual vertical fluxes of Na^+, K^+, Ca^{2+}, Mg^{2+}, NH_4^+, NO_3^-, and SO_4^- were calculated in each catchment. In addition, pH and SiO_2 concentration in stream water were measured at 2 week interval.

Vertical distribution of ion fluxes from canopy to stream water was different between the wet and dry tropical forests. An increasing rate of annual Ca^{2+}, Mg^{2+} and NO_3^- fluxes from canopy to soil was much larger in wet tropical forest than in dry tropical forest. The flux rapidly decreased from soil layer to stream in both the wet and dry tropical forests. This suggests that a size of internal nutrient cycle in wet tropical forest was larger than in dry tropical forest. Large biomass and high turnover rate may lead to the large internal cycle in wet tropical forest. Meanwhile, annual discharge of Ca^{2+} and Mg^{2+} via stream was higher in the wet tropical forest than in the dry tropical forest. Annual discharge of SiO_2 was also higher in the wet tropical forest than in the dry tropical forest. The results indicate a higher weathering capacity in wet tropical forest than in dry tropical forest.

In the stream water, periodically low pH with high NO_3^- or SO_4^{2-} was observed in dry tropical forest, whereas pH was relatively high and stable through a year in wet tropical forest. In the wet tropical forest, acid substances appear to be easily neutralized by high cation fluxes derived from large internal nutrient cycling and relatively high weathering capacity. Therefore, it is assumed that stable stream pH in the wet tropical forest was due to high neutralizing capacity of the catchment. In contrast, the dry tropical forest might be more sensitive for the atmospheric depositions than wet tropical forest.