Stream water chemistry and internal nutrient fluxes in a Malaysian tropical rainforest

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The Acid Deposition Monitoring Network in East Asia (EANET) has promoted case studies on catchment-scale analysis in several forest types of the East Asian region. Especially, nutrient imbalances by fluctuation of atmospheric depositions are inadequately understood in tropical rainforest. Dissolved matters in rainfall, throughfall, soil solution, and stream water had been observed for 3 years by biweekly sampling or ion exchange resin method in forested catchment at Danum valley, Sabah in Malaysia. In the stream, seasonal pattern of water chemistry was generally unclear. Particularly, pH was relatively high (ca. 7.0) and stable in the stream through a year. Meanwhile, NO_3^- and DOC modestly increased with high water flow rate in heavy rain event. Significant correlation between SiO_2 and cations suggested that cation-leaching from the catchment was derived from weathering process. In soil layer, pH of soil solution was lower in 20 cm depth (ca. 4.8) than in 70 cm depth (ca. 6.0). High concentration of NO_3^- and DOC (including organic acid) in surface soil may lead to a decrease in pH. Principal component analysis for soil solution and stream water revealed that pH was mainly controlled by NO_3^- and DOC in the soil layer and by cations in the stream. In vertical distribution, annual fluxes of almost all ions rapidly increased from canopy to soil layer and decreased in the stream. The rate of the decrease from soil to stream were more pronounced in NO_3^-, NH_4^+ and K^+ than in Na^+, Ca^{2+} and Mg^{2+}. In addition, leaching of Na^+, Ca^{2+} and Mg^{2+} via stream greatly exceeded input via atmospheric deposition. Therefore, in the tropical rainforest, high weathering capacity in deeper soil (or pervious rock layer) may contribute to low sensitivity of stream water chemistry to atmospheric deposition or heavy rain event accompanied with the leaching of NO_3^-.