14.5-P: Leaching of essential nutrient cations and anions from undisturbed lowland forests across the Brazilian Amazon Basin.

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Nutrient leaching plays a key role in the regulation of productivity, sustainability and carbon balance of terrestrial ecosystems, particularly when weathering and atmospheric deposition are limited sources of essential nutrients. While leaching of inorganic (plant available) forms of essential nutrients has traditionally been thought to be regulated by plant demand, leaching of organic forms is less well understood. Controls over nutrient leaching are fundamental to the question of ecosystem sustainability of native forests and how these processes might respond to land use and climate change. Recent work has focused on the controls of organic and inorganic nitrogen (N) leaching in temperate ecosystems which are putatively N limited. We examined losses of both N and phosphorus (P) in tropical lowland forests occurring on N-rich and P-poor soils. Our study sites span 10 degrees of longitude across the Brazilian Amazon. While total rainfall and mean annual temperature do not vary significantly (26- 26.7 ºC and 2000-2200 mm respectively), seasonal distribution of rainfall and soil class do vary. As expected, total N concentrations in stream water were relatively high (50- 650 ppb N). Both total N concentration and proportion of N in organic form increased as we moved westward across the sites, correlated to an increase in the length of the dry season. Most streams showed a significant pattern of decreased NO3-N concentration in the dry season with no seasonal pattern for NH_4-N or organic N. In contrast measured P concentrations were very low (0.5 to 2 ppb P) and consistent across shifts in seasonality and soil development. Phosphorus leaching was strongly dominated by organic forms with inorganic P rarely reaching detection limit. The highest concentrations of mineral nutrient cations (Ca^{2+}, Mg^{2+}, and K^{+}) occurred in streams on the least developed soils (Alfisols) with much lower levels found in streams located in more developed soils (Ultisols and Oxisols). Our results suggest we need to consider climate and soil development as important regulators of nutrient losses from undisturbed terrestrial ecosystems.