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Regional patterns in inorganic nutrient losses across the central Amazon Basin: preliminary results

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Nutrient losses have important implications for sustainability, productivity and carbon balance of forest ecosystems. Losses are particularly important in ecosystems where mineral nutrient inputs from weathering processes and atmospheric deposition are limited. The traditional notion that ecosystem losses of biotically available nutrients (e.g., inorganic forms such as NO3- and PO4 3-) are a consequence of nutrient limitation are being expanded by the new idea that losses of biotically unavailable forms (organically bound forms) can control nutrient-carbon interactions in forests over time. We examined patterns in nutrient loss across geographically broad variations in state factors (e.g., parent material, climate, and soil development as an index of time). Controls over nutrient losses are fundamental to the question of ecosystem sustainability of native forests and how these processes might respond to land use and land cover change. Moving from Altamira in the southeast to study sites north of Manaus in the northwestern end of our transect we characterized hydrologic losses of major anion and cation nutrients from primary forests in both dry and wet seasons (October- November 2002 and April 2003). Chloride (Cl-), potassium (K+) and calcium (Ca2+) all decreased significantly across the transect as we moved inland (Cl: 6.2 to 1.0 ppm, K: 0.7 to 0.1 ppm, and Ca: 4.4 to 1.0 ppm) . In contrast, the highest concentrations of nitrogen as nitrate (NO3--N) and total phosphorus (Ptot) were found in Manaus the westernmost site (0.2 ppm and 1.4 ppb respectively). Santarém showed the most significant effects of seasonality especially for nitrogen as ammonium (NH4+-N) and sulfate (SO42-). At all three sites significantly higher NO3 concentrations were measured in the wet season. The higher concentrations of rock nutrients in Altamira may reflect the younger soils found there (Alfasols as compared to Ultisols and Oxisols at the other two sites). More intensive sampling in the coming year will allow us to better disentangle the importance of state factors that co-vary across the transect.

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