L.B.A.

Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia

2ª Conferência Científica Internacional do LBA

07 a 10 de Julho de 2002

Centro de Convenções Studio 5,

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The fate of phosphorus in a lowland Amazonian forest ecosystem.

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Phosphorus may limit net primary productivity in highly weathered tropical ecosystems. Under limiting conditions the size of the component fractions of the soil P pool can indicate the relative strength of biological and geological processes in soil P cycling. We conducted a field fertilization treatment to study the fate of P in two highly weathered soils, which varied both with respect to texture and total soil P pools. In each treatment (clay control, clay fertilized, sand control and sand fertilized) we examined P sinks including fine root, microbial and three soil pools (soil P that is considered readily available, of intermediate availability or unavailable for plant uptake) using ingrowth and exclusion cores over the course of one year. Of the soil P pools measured only the intermediate availability pool (NaOH + dilute acid extractable) showed a significant increase with fertilization, and this occurred only in clays (+ 18.3 kg ha^{-1} $\pm$ 3.2 after 1 year). In contrast, both root and microbial biomass P pools increased more in sands with fertilization suggesting a larger biotic P sink in these soils. Leaching of inorganic P from the surface soils was an unexpectedly significant fate of added P in both soil types (up to 18 % $\pm$ 3 of added P in the sands and 9 % $\pm$ 1 in the clays). Patterns in soil P pools and fluxes were strongly seasonal indicating high turnover rates and the dominance of biological mechanisms in short-term P cycling in this ecosystem.