III Conferência Científica do LBA

Anais de Trabalhos Completos
27 a 29 de julho de 2004
Academia de Tênis Resort
Brasília, Brasil

III LBA Scientific Conference
Abstract Book
July 27-29, 2004
Academia de Tênis
Brasília, Brazil

Several LBA studies have shown that forest clearing in the Amazon can alter the transport of sediments, organic matter and associated nutrients to the rivers. In this study, we present the results of an integrated analysis of physical and anthropogenic controls of river biogeochemistry at the Ji-Paraná basin (RO). Previous results obtained by our group demostrated that both soil properties and pasture cover are the main drivers of river characteristics and metabolism. To quantify the effects of these two drivers, we performed a multiple linear regression analysis, relating basin characteristics (derived from a GIS analysis) and river biogeochemistry at 38 sites along the Ji-Paraná river basin, during wet and dry seasons. Each site represents a different mixture of cover type and soil properties. Effective cation exchange capacity (ECEC) and percentage of pastures were treated as independent variables. River water electrical conductivity (EC) and Na+, Ca2+, Mg2+, K+, Cl- , DOC, TSS, DIC and PO43- concentrations were the dependent variables. Spatially, higher values of all ions were associated with areas dominated by pasture, with the highest concentrations found in the central part of the basin, where pasture areas and soil fertility are at a maximum. As the river enters the lower reaches, forests dominate the landscape, and the concentrations drop. The percentage of the basin area covered by pasture was consistently the best predictor for all parameters during the wet season. Higher DOC concentrations were related to higher values of TSS which, in turn, were originated in pasture areas. During the dry season this pattern was not observed. Our preliminary analysis, relating river biogeochemistry with potential soil erotion in the basin shows that areas covered by pasture are associated with higher concentrations of both DOC and TSS, a pattern also found for other parameters.

20.4: Stream water chemistry in three meso-scale hydrologic basins in Eastern Amazonia

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We are evaluating the effects of land use change on stream water chemistry of three meso-scale (100's of km^2) hydrologic basins near Paragominas, in Eastern Amazonia, which have the following areas and percentages of forested cover: Cinquenta e quatro (Cq) watershed (130 km^2) with 18% forest; Sete (St) watershed (150 km^2) with 34% forest; and Pajeú (Pj) watershed (45 km^2) with 45% forest. Eleven field campaigns of stream chemistry measurements were conducted from April 2003 to February 2004 along three first-order streams, from their headwaters in remnant mature forests, through pastures, secondary forests, and agricultural fields. The average values across the sampling stations in each stream are (*nutrient concentrations in μM*): pH (Cq=5.85; St=4.93; Pj=4.60), conductivity (Cq=39.2; St= 30.2; Pj=40.1 $\mu S\ cm^{-1}$), turbidity (Cq=96.4; St=13.84; Pj=14.21 *FTU*), alkalinity (Cq=158; St=10; Pj=6 $\mu Eq\ L^{-1}$), O_2 (Cq=4.79; St=6.22; Pj=4.91 $mg\ L^{-1}$), Ca^{2+} (Cq=21; St=8; Pj=12), Mg^{2+} (Cq=34; St=13; Pj=19), K^+ (Cq=48; St=63; Pj=95), Na^+ (Cq=82; St=106; Pj=161), NH_4^+ (Cq=3; St=0.8 ; Pj=0.6), NO_3^- (Cq=1.5; St=1.0; Pj=1.8), PO_4^{3-} (Cq=3.6; St=4.7; Pj=3.4), and Cl^- (Cq=119; St=166; Pj=299). In all streams turbidity and pH tend to be lower close to the stream headwaters draining the mature forests and increase downstream. All streams also show a peak in turbidity and pH during the rainy season. Among the three streams, turbidity and pH are highest in the most deforested watershed. Concentrations of O_2 decrease in the reservoirs, that ranchers commonly construct. Because soils are relatively similar within the study area, we suspect land use conversion is an important factor affecting the observed trends in stream chemistry.

20.5: The chemistry of two streams draining kaolinitic soils

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The Amazon and Cerrado regions of Brazil share a predominance of highly weathered, clay-rich soils and an extended dry season. Geology in our two study areas within these regions differ, however, with the eastern Amazon location being tertiary sediments of the Amazon trough and the Cerrado location being Precambrian bedrock of the Brazilian shield. The Amazonian study site has been 80% deforested and converted to cattle pastures, whereas the Cerrado site is located in a preserve that maintains native vegetation. The Amazon watershed is ~13000 ha with baseflow discharge of 800 m^3/sec, while that in the Cerrado is ~2000 ha with baseflow discharge of 100 m^3//sec. Si and Al concentrations in the Amazon and Cerrado streams (Si: 135 and 87 *u*M; Al: 1.3 and 0.7 *u*M, respectively) indicate that kaolinite is most likely in an equilibrium mineral phase in both study areas. However, dissolved element concentrations in the Amazonian stream exceeds that in the Cerrado stream for all macro anions (HCO3: 56 vs 44; NO3: 7.9 vs 1.0; Cl: 202 vs 38; SO4: 1.2 vs 30 *u*M) and cations (NH4: 2.4 vs 0.8; Ca:78 vs 60; Mg: 84 vs. 19; K:22 vs 1.8; Na: 151 vs 9 *u*M). Despite concentration differences, HCO3 and Cl are the predominant charge balancing anions in both streams, and Ca is an important charge balancing cation. However, the contribution of Na to charge balance in the Amazonian stream (31%) exceeds that in the Cerrado stream (10%). The concentration discharge relationships also differ between the two streams: cation concentrations increase with increasing flow in the Amazonian stream and decrease with flow in the Cerrado stream. Mechanisms contributing cations to this Amazon stream during high flow may relate to greater land use conversion in its watershed compared to the Cerrado study site.