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COS 97-6 - Discharge–calcium concentration relationships in streams of the Amazon and Cerrado of Brazil: Soil or land use controlled

Thursday, August 11, 2011: 9:50 AM
12B, Austin Convention Center

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Background/Question/Methods

Stream discharge-concentration relationships are indicators of terrestrial ecosystem function. Throughout the Amazon and Cerrado regions of Brazil rapid changes in land use and land cover may be altering these hydrochemical relationships. The current analysis focuses on factors controlling the discharge-calcium (Ca) concentration relationship since previous research in these regions has demonstrated both positive and negative slopes in linear $\log_{10}$discharge-$\log_{10}$Ca concentration regressions. The objective of the current study was to evaluate potential factors controlling stream discharge-Ca concentration relationships including year, season, stream order, vegetation cover, land use, and soil classification. It was hypothesized that land use and soil class are the most critical attributes controlling discharge-Ca concentration relationships. A multilevel, linear regression approach was utilized with data from 51 stations on 28 streams throughout Brazil. These streams come from three distinct regions and varied broadly in watershed size (<1 to >10^6 ha) and discharge ($10^{-5.7}$ to $10^{3.2}$ m^3 sec^{-1}).

Results/Conclusions

Linear regressions of $\log_{10}$Ca versus $\log_{10}$ discharge in 13 gauged streams have a preponderance of negative slopes with only two streams having significant positive slopes. A multilevel model based ANOVA decomposition suggests the effect of discharge on Ca concentration is large but variable. Vegetation cover, which incorporates aspects of land use, explains the largest proportion of the variance in the effect of discharge on Ca (slope) followed by season and year. In contrast, stream order, land use, and soil class explain most of the variation in stream Ca concentration (intercept). In the current data set, soil class, which is related to lithology, has an important effect on Ca concentration but land use, likely through its effect on runoff concentration and hydrology, has a greater effect on discharge-concentration relationships. The multilevel model for the discharge concentration relationship, in concert with a multilevel model for discharge in locations without gauges allowed assessment of slope sign (+/-) at all 51 stations.

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