

Pathways of nutrient flow in an eastern Amazonian watershed.

Daniel Markewitz, The University of Georgia, dmarke@warnell.uga.edu (Presenting)

Ricardo de O Figueiredo, EMBRAPA, ricardo@cpatu.embrapa.br

Marysol E Schuler, UFPA, marysol@ipam.org.br

Eric A Davidson, The Woods Hole Research Center, edavidson@whrc.org

To investigate pathways of nutrient flow to streams we combine data from numerous flow paths in the 130 km² watershed of Stream Cinqueta e quatro in Fazenda Vitoria Paragominas, Brazil. Flow paths include rainwater, pasture and forest surface runoff, soil lateral flow waters, upland groundwater wells, near-stream groundwater wells, and a single riparian zone well. We are combining traditional geochemical mixing models and end-member mixing analysis (EMMA) to assess discharge fractions from specific flow paths. Using a graphical approach we found K and Ca to be well behaved conservative tracers. The volume-weighted mean concentrations of three end-members (pasture surface runoff, upland groundwater, and riparian groundwater) geometrically encompass >85% of the streamwater concentrations. Initial analysis with EMMA using seven solutes indicates, however, that as many as five end-members may be appropriate. Solution for the discharge fractions over two annual cycles of high and low flows demonstrate that during the low flow periods of the year riparian groundwater is predominate, contributing ~70% fractional discharge. As stream flow increases pasture runoff has increasing importance with fractional discharge increasing from 0 to ~20%. More interesting, perhaps, is the increasing importance of upland groundwater during these same periods with fractional discharge increasing from 20 to ~80%, on average. Kinematic pressure waves (i.e., a rapid forcing of groundwater to the stream from increased pressure of rainfall inputs) may be an important process in this watershed.

Science Theme: ND (Nutrient Dynamics)

Presentation Type: Poster

Abstract ID: 100

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