Organic matter diagenesis and bacterial contributions to detrital carbon and nitrogen in the Amazon River system

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Limnol. Oceanogr., 54(3), 2009, 681-691 | DOI: 10.4319/lo.2009.54.3.0681

ABSTRACT: Amino sugars and amino acids, including the bacterial biomarkers muramic acid and D-amino acids, were measured to investigate the diagenetic alterations of and microbial contributions to detrital organic matter in the Amazon River system. Three size fractions of detrital material were analyzed: coarse and fine particulate organic matter (CPOM and FPOM), and ultrafiltered dissolved organic matter (UDOM). CPOM was depleted in amino sugars and had high percentages of total N as amino acids (32-37%), consistent with relatively fresh plant debris being a major source of CPOM. FPOM had the highest percentages of total C as amino acids (5-8%), and its composition appeared to be influenced by the preferential sorption of N-containing molecules. UDOM had the highest percentages of total N as amino sugars (up to 2.3%) indicating the relatively important contributions from microorganisms. A consistent trend of increasing proportions of D-amino acids among detrital size fractions, CPOM < FPOM < UDOM, suggests this parameter is a useful diagenetic indicator. About 4-17% of the C and 17-37% of the N in FPOM and CPOM were of bacterial origin based on D-alanine and D-glutamic acid yields. Similar bacterial contributions to UDOM were evident from the biomarker data, but they were not quantified due to insufficient information about representative yields of source biomarkers. Relationships between biomarker N and total N suggest that microbial activity influences the N content of detrital material. Bacterial contributions to detrital material were primarily as cellular remnants rather than living cells.

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