Andean influences on the biogeochemistry of organic matter in the Amazon River

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The prevailing conceptual model of organic matter (OM) dynamics in the Amazon River system is the regional chromatography model (RCM), which identifies leaves from as the ultimate source of riverine OM. According to the RCM, leaf litter decays rapidly and is either exported as relatively intact coarse particulate OM (CPOM) or further decomposed to dissolved OM (DOM). DOM is then partitioned between water and soil and transported into the river as either DOM or fine particulate OM (FPOM). Compositional patterns in different OM fractions were found to be remarkably consistent along ∼2000 km of the Amazon mainstem and were proposed to extend into the river's Andean headwaters. Our work in the Andes sheds considerable new light on the cycling of OM in the Amazon and the important role of erosional regimes (climate and topography) in determining riverine OM signatures. We found that above about 3000 masl in the Andes the erosion of mineral soils is low and erosion of surface (high OC) riparian soils dominates particulate loading to streams. DOM inputs are also relatively abundant. Between about 3000 and 750 masl, greater rainfall leads to rapid, constant OC leaching and erosion of mineral rich, OC-poor soils. Finally, in the foothills of the Andes, where rainfall is at a maximum and topography is gentler, FPOM and CPOM begin to reflect the input of less degraded surface soil and leaf litter inputs. Our results highlight the significant role that mountain headwaters play in determining the biogeochemistry of OM in large river basins.