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The biogeochemical role of watersheds in a tropical cloud forest ecosystem of Ecuador

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In the framework of the DFG Research Unit FOR816 '*Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in South Ecuador'* we analyze the hydrological and biogeochemical characteristics of a cloud forest catchment. Focus is set on spatial and temporal patterns of nutrient and anion export (NO_3^-, SO_4^{2-}, PO_4^{3-}, and Cl^-). The cloud forest catchment is situated at an altitude of 1600 to 3100 m and around 4° south of the equator. It comprises 75.3 km^2 at the catchment outlet, and mean annual precipitation is ∼2200 mm. The additional input of cloud water which condenses on the vegetation is what distinguishes these ecosystems from lowland rainforests.

To carry out the research the catchment was divided into 8 subcatchments. Each subcatchment was equipped with an automatic water level sensor. Streamflows were measured and water samples were taken on a weekly basis. Some additional campaigns were made for high flow characterization. All anions were analyzed via ion chromatography. EC and pH were measured in situ by a handheld meter.

It was found that in sulfate, temporal biogeochemical patterns are less pronounced than spatial differences in the catchment's tributaries, the opposite being the case for nitrate. In general, ion concentration is low, as reflected in the mean electric conductivity of around 18 μS/cm and export is largely driven by storm events, where discharge can rise a hundred fold. Preliminary data suggest an export of nitrate of 21.7 kg $ha^{-1}yr^{-1}$ (i.e. 4.9 kg N $ha^{-1}yr^{-1}$) and of 22.5 and 24.0 kg $ha^{-1}yr^{-1}$ of sulfate

and chloride respectively. Phosphate concentration was below detection limit. Based on spatial differences in water chemistry, the tributaries were classified in homogenous areas by cluster analysis. In a later step, the mixing patterns of some elements will be used in end member mixing analyses to evaluate temporal changes of water provenances. This information will be translated into hydro-biogeochemical model predictions to spatially verify the model outputs.