



Why is iodine not released from tropical soils? A case study from Costa Rica

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Iodine (I) is an essential trace element for all mammals. A lack of I leads to several health problems. The mobility of I in terrestrial environments is closely related to that of dissolved organic carbon (DOC). Retention and mobilization of I in soils and related I loads in adjacent rivers in tropical ecosystems are poorly understood. The objective of the present study is to decipher soil-related factors that govern I retention in a tropical river catchment. We focused on the relationship between I and DOC solubility in soils and related transport to the stream. Soil and water samples were taken in a pristine pre-montane rainforest in Costa Rica encompassing nine soil profiles, distributed equally in the catchments around two tributaries and the main river. River water was sampled over a period of five weeks. In addition to I concentrations in stream water, the water leachable fraction of I in soils was assessed by leaching experiments. Solid phase sequential extraction was used to identify I binding in soils. Results show, that I concentrations in soils are extremely high (median: 69 mg kg^{-1}), but water-soluble fraction was less than 0.1 %, only. Low I mobility in soils leads to I concentrations between $0.77\text{-}1.26 \text{ } \mu\text{g L}^{-1}$ in stream waters during base and even storm flow conditions. This indicates a strong sorption of I to the soil matrix. Solid phase sequential extraction identified I sorption to metal oxides as the main retention factor (median: 79 % of total I). I is likely sorbed as I-DOC-complexes to metal oxides. The significant correlation of I and DOC in leachates indicates the transport of small amounts of organically bound I from upper- to subsoil horizons. We conclude, that tropical soils, rich in organic matter and sesquioxides, inhibit I release and support strong I accumulation through strong sorption.