Geogenic contaminants in groundwater resources of Amazonian riverine communities: results of a vast exploratory field-study

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World-wide, river basins and deltas with arsenic (As) and manganese (Mn) contaminated groundwater are characterized by a locally high spatial variability of contaminant concentrations. Since As and Mn are of concern for human health, it is important to understand where and under which environmental conditions these elements are mobilized from aquifer sediments and accumulated in groundwater. Unraveling the regional geochemical mechanisms triggering the enrichment of toxic elements in groundwater forms therefore a particularly important step to raise awareness and implement mitigation where needed.
Here, we discuss the results of a large-scale field study, exploring geogenic contaminants in shallow groundwater resources throughout the vast Amazon Basin. We sampled groundwater from household tube-wells from riverine communities along the main Amazon River and some of its major tributaries, covering large parts of the Peruvian and Brazilian Amazon region.
We compare the main and trace element hydrochemistry of groundwater pumped by wells located on the older terraces, with those located in the actual river plain, characterized by young, reactive deposits. The latter are most prone to reach aquifers in which strongly reducing conditions prevail, leading to mobilization of redox sensitive trace elements, such as arsenic, manganese and iron. We further link patterns of measured groundwater arsenic concentrations with available remote sensing data for different geological settings along the Amazon River and its tributaries, with the aim to gain insights on the factors inducing spatial variability in contaminant groundwater chemistry.
Our study highlights the importance of the geological history of this dynamic river basin on the presence and distribution of trace elements in groundwater resources of Amazonian riverine communities.