Hydrogeochemical response of land-use in the Aquatic Eco-region Xingu-Tapajós (Brazilian Amazon): Emphasis on trace elements

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The aquatic eco-region Xingu-Tapajós (Brazilian Amazon) is one of the most important areas on Earth in terms of biodiversity. However, it has been suffering several impacts associated with different land-uses, such as urban growth, wood exploration, agriculture, livestock and mining activities. This work proposes the determination of trace elements in fluvial water samples colleted along this eco-region. A sampling campaign (30 samples) was performed in September/October-2008. The total contents of trace elements (Al, As, Ba, Be, Cd, Cu, Pb, Co, Cr, Fe, Mg, Mn, Ni, V, Zn, U, Hg) were determined by ICP-MS. The criteria of sampling points (56) selection was based on the spatial scale of Otto-basins (19), as proposed by Brazilian National Water Agency (ANA). Contamination intensity was evaluated by comparing the values obtained in the field with the ones proposed by Brazilian legislation (CONAMA 2005) [1]. The concentrations of Hg, U, V, As and Be were lower than detection limits. About 41% of the samples presented some irregularity in comparison with the Brazilian legislation, and such non-conformities were related to the presence of the following metals [element (number of sampling points in disagreement)]: Zn (6)> Cd (4) > Pb/Mn (3) > Ni (2). More than 90% of the sampling points in disagreement with CONAMA revealed geochemical anomalies of Zn. Most of critical points of contamination were located in the Tapajós river basin, especially closer to Itaituba Municipality, where the land-use is strongly marked by mining activities and agriculture. In the Xingu river basin, the only points in disagreement with CONAMA were located closer to São Felix do Xingu Municipality, where the livestock and agriculture are predominant. In the near future, it is expected that these results can be integrated with biotic data, supporting decision-making in programs of environmental managment and preservation of Amazonian biodiversity.

[1] CONAMA (2005) Directive 375. Superficial water quality.

Residence time of river sediments in the Ganges alluvial plain from U-series disequilibria

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U-series disequilibria are used to quantify the residence time of sediments in a catchment because it is an important parameter to be constrained to understand how erosion responds to external forcing factors. This is a consequence of the dual property of these nuclides 1) to be fractionated during physical denudation and chemical weathering processes and 2) to have radioactive decay periods of the same order of magnitude as the time-scales of these processes (e.g. [1, 2]). This potential has been applied in the Ganges river system by measuring ^{238}U-^{234}U-^{230}Th radioactive disequilibria in coarse-grained and suspended fine-grained sediments, collected at different depths, from the Ganges and one of its main Himalayan tributary: the Narayani-Gandak river [3].

Results suggest that U-series disequilibria in Ganges river sediments vary with grain size and sampling location. The range of observed U-series disequilibria is explained by a mixing model between a coarse-grained sediment end-member, represented by bedload and bank sediments, and a fine-grained end-member. Both end-members originate from Himalaya but they undergo a different weathering and transfer history from Himalaya to the plain, during different histories of transfer. The coarse-grained sediment end-member transits slowly (i.e. > several 100's ky) in the plain whereas the fine-grained sediment end-member is transferred much faster (<20-25 ky), as indicated by the absence of significant variations in Th isotope composition of the fine-grained sediment end-members.

[1] Chabaux *et al*. (2003) *Reviews in Mineralogy & Geochemistry* **52**, 533–576. [2] Chabaux *et al*. (2008) 'U-series Geochemistry in weathering profiles, river waters & lakes' in *U/Th Series Radionuclides in Aquatic Systems, Radioactivity in the Environment* **13**, 49–104. [3] Granet *et al*. (2010) 'U-series disequilibria in suspended river sediments & implication for sediment transfer time in alluvial plains: the case of the Himalayan rivers'. *Geochemica et Cosmochimica Acta* (in press).