

Interactive comment on “Landscape control of uranium and thorium in boreal streams – spatiotemporal variability and the role of wetlands” by F. Lidman et al.

C. Noubactep (Referee)

cnoubac@gwdg.de

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Landscape control of uranium and thorium in boreal streams – spatiotemporal variability and the role of wetlands

By Lidman et al.

Major Comments

Very well written and structured paper. Good and updated literature review. The authors may consider and discuss Kalin et al. (2005) specified below. Considering the chemistry of individual systems (streams, sub-catchments) would ease comparison.

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For example just plot pH vs. [element] whether there is a trend or no is useful for the discussion. In case there is a trend, use the pH dependant speciation.

Summarized this reviewer thinks that at least one more Fig. is essential.

Minor comments:

Wedepohl (1995) is missing in References. Unless this is a review, there must be other estimations! ThIV, UIV, UVI are more common, U6+ for example is UO₂²⁺... Page 2827: “Details on the sampling and analyses of the stream water samples can be found elsewhere (Lidman et al., 2011; Bjorkvald et al., 2008 - chronology or alphabet? In both cases: Bjorkvald et al., 2008; Lidman et al., 2011 please check through the manuscript).” Page 2832: “Based only on stream water analyses it is not possible determine the reason for the lower export of thorium, but there are several possibilities, e.g. lower weathering rates of thorium bearing minerals, precipitation of secondary thorium minerals or preferential sorption of thorium to some phase in the soils.” [comparing the solubility limits of Th and U gives the best response to this issue. The fact that UVI exists beside UIV is already an argument, the slight differences in pH values and the corresponding Th/U speciation should be considered. The possible complexation with organic matters is the another available argument, please use them!]

3.2 Atmospheric deposition of uranium and thorium 3.3 Fluxes of dissolved uranium and thorium 3.4 Concentrations in surface soils [I would use “uranium and thorium” also here] 3.5 What controls the fluxes of uranium and thorium?

Remark on Discussion in page 2838: The flow velocity is a key issue. Rapid flow means less residence time and low leaching. Accordingly, an increased U/Th concentration can only be a peak. Continuous leaching of “significant” amounts of Th/U can only been coupled with slower flow velocities [depending on the mineralogy of the ore].

Remark on Discussion in page 2839: The concentration range must be properly considered (see an excellent paper by Kalin et al. 2005 and relative old Russian papers,

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e.g. Kochenov et al. 1977). Kalin M., Wheeler W.N., Meinrath G. (2005): The removal of uranium from mining waste water using algal/microbial biomass. J. Environ. Radioact. 78, 151-177. Kochenov S.V., Korolev K.G., Dubinchuk V.T., & Medvedev Y.L. (1977): Experimental data on the conditions of precipitation of uranium from aqueous solutions. Geokhimiya, 11, 1711 - 1716.

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