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# *Interactive comment on* "Iron oxides control sorption and mobilisation of iodine in a tropical rainforest catchment" *by* Laura Balzer et al.

**Anonymous Referee #2**

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General comments

This study concerns the evaluation of the soil-related factors that dominate iodine retention and mobilization in tropical soils and solid phase sequential extraction was used to identify iodine binding forms in soils. It is interesting the evaluation of the mobilization along the nine soil profiles, however the main concern relates to the novelty of this study. Author should review the previous knowledge in detail about soil component controlling iodine mobility, and the novelty of this study should be stressed. The title "Iron oxides control sorption and mobilisation of iodine in a tropical rainforest catchment" presents a problem that is repeated throughout the article. I would expect a focus on the effect of Fe oxides on the mobilization of iodine, but Fe oxides have not been identified in this work.



In its current state, the manuscript is not suitable for publication in SOIL. I hope that the comments below are useful, and look forward to reading more about this work in the future.

Specific comments

Page 1 Lines 27-31: please cite more recent references (Humphrey et al. (2017) Environmental Science Processes and Impacts and references therein).

Page 5 Lines 1-2: the data related to "Physical soil properties for each horizon were recorded in the field including texture, aggregate type, degree of rooting, skeleton and pore volume (see Supporting Information)" are not provided in the Supporting Information.

Page 5 Lines 7-9: "The pH value of the air-dried soil was measured in water with a soil:solution ratio of 1:2.5. The water content ($\theta$) was determined gravimetrically for all horizons of profiles L2 and R2. Stream water temperature, pH, redox potential (Eh) and conductivity (EC) were measured in-situ using a handheld Hanna multi-parameter probe (HI 98195)" Some pH values are missing in tables S1 and S2. In addition, the role of pH on organo-iodine formation and the dissolution of Fe-oxides should be clearly explained. The authors mention redox potential (Eh) and conductivity (EC), however, no such results are presented in the manuscript.

Page 5 Line 18: the sequential extraction procedure according Schmitz and Aumann (1995) is a pretty well-established procedure. The OM-bound iodine can be severely underestimated using this method. Fractionation studies have a limited scope for iodine analysis in soils as operational procedures do not necessarily yield discrete fractions. A much greater emphasis has been placed on chemical speciation analysis and various methods have been successfully developed for analyzing chemical species. In addition, the authors should underline the potential artifacts created using this extraction procedure, and should also consider limitations/problems of the analytical approach. Overall, I recommend adding a paragraph with a list and more detailed discussion

about the uncertainties of the chemical fractionation.

Page 7 Line 25: My main concern related to this work is that it is not enough to identify the major Fe concentration using an energy-dispersive X-ray fluorescence spectrometer. In addition, the method of Cheburkin and Shotyk (1996) analyzed Pb and trace elements in peats. This result should be supported by the analysis of Fe components, e.g., selective extraction methods (for tropical soils see the methods described in Coward et al., 2017 Geoderma) or XRD.

Page 9 Fig. 3, Page 11 Fig. 4, and Page 13 Fig. 5: please report the correlation values.

Page 9 Line 5: more references are needed. Suggested readings: (Schlegel et al., 2006 Geochimica et Cosmochimica Acta; Shetaya et al., 2012 Geochimica et Cosmochimica Acta, Li et al., 2017 Journal of Contaminant Hydrology, Xue et al., 2019 Science of the Total Environment, Qian et al., 2020 Science of the Total Environment).

Page 10 Lines 1-3 and Lines 6-8: "The solid phase SE analyses showed that between 48 and 152 % (median: 78.7 %) of total iodine (Figure 4) but only between 12.3 % and 72.1 % (median: 30.8 %) of total Br in the soils was associated with reducible components (F4; iron sesquioxides (Fe2O3), hydroxides (Fe(OH)3) and oxide hydroxides (FeO(OH))" and "This was attributed to higher Fe contents in subsoil horizons, presumably in the form of Fe-oxides. . ." again, the solid phase extraction and speciation of Fe oxide would be needed.

Page 11 Fig. 4: the sum of F2, F3, and F4 fractions reaches up to 150%. Please explain why.

The section about conclusions could be improved; it is rather a summary of results than a real presentation of conclusions. What are the new insights into Fe oxides-mediated sorption and mobilization of iodine gained by applying the present fractionation method?



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