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Interactive comment on “Understanding the role of water and tillage erosion from $^{239+240}\text{Pu}$ tracer measurements using inverse modelling” by Florian Wilken et al.

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General comments This study quantifies soil redistribution due to both water and tillage erosion processes in a 4.2-ha catchment (corresponding to one single field) located in an intensively cultivated region of Northeastern Germany. To reach this goal, Pu-239+240 inventory measurements have been conducted (and interpolated) and an inverse modelling approach (based on the SPEROS-Pu conceptual model) has been undertaken. Overall, the study was well designed (through a nice nested sampling approach with five densified sub-grids). In total, soil cores were collected at 219 locations (including 10 detailed depth profiles sampled at different topographic locations

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across the study site) and analysed for Pu-239 and Pu-240 by ICP-MS, which represents considerable field and lab work efforts! The authors should be congratulated for that!

At some places, the text is unclear and could be improved, the use of several terms and technical formulations is sometimes misleading, but this will likely be fixed easily by the authors when revising the text (see the annotated pdf file).

In the discussion and in the conclusions, I have the feeling that, at some places, the authors go maybe a bit too far when extrapolating their results, and they should be more nuanced in the text. Importantly, the advantages of using Pu-239+240 inventories (compared to Cs-137 inventories) for reconstructing soil redistribution between 1964-2016 should be better justified in the text, in my opinion. Of note, analysing Pu-239 and Pu-240 requires time-consuming chemical sample preparation steps that are not required for analysing Cs-137 ('simple' physical measurement). A reason for using Pu isotopes could be that the study area received significant Chernobyl fallout in 1986 (in addition to the global fallout with a peak in 1963-64), which would complicate the temporal reconstruction. However, this is not specifically addressed by the authors (nor supported by their measurement of both Pu-239 and Pu-240, the ratio of which should directly provide the answer?) Of course, there could also be other (good) reasons to use Pu isotopes instead of Cs-137, but their clarification in the text would be appreciated.

For detailed comments, questions and suggestions all throughout the text, please refer to the enclosed annotated pdf file.

Please also note the supplement to this comment:

<https://www.soil-discuss.net/soil-2020-22/soil-2020-22-RC2-supplement.pdf>

Interactive comment on SOIL Discuss., <https://doi.org/10.5194/soil-2020-22>, 2020.

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