Referee #2

We thank the referee for acknowledging the interest in the ms.

- We acknowledge the fact that there is great uncertainty in the input data, as well as on the mechanisms governing TEs accumulation in the soil; decoupling and/or quantifying these uncertainties is out of the scope of the ms. Yet, the approach followed to quantify the inputs was able to reproduce the observed trends with lateral mixing and under the "Idealized Trend" assumption (also called ZOFE assumption in Figure 5, which we recognize could be misleading and should be corrected for homogeneity). We pointed out that the metal inputs with sewage sludge was perhaps not fully cached, and we did some investigation to understand the reason if it. Regarding the implementation of the lateral mixing, please see answer #4 to Referee 1. Said this, we recognize that simulation adequacy would require additional considerations, therefore we won't use this term in the ms.
- The IDMM is mainly designed to simulate labile metal concentrations, but we agree that it would be informative to show the total metal concentration simulations as well. Therefore, we will include them, but we propose not to disregard the Cu data. Indeed, we do recognize that the hypothesis of fungicide application and bioturbation/soil removal is not conclusive, but we should also consider that: i) the Cu labile concentration trends are plausible and a valuable source of information; ii) we should give evidence in the literature of those data which could not be explained satisfactorily, for future research; iii) there is no obvious reason why Cu total concentrations should be biased, while the total concentrations of the other metals should not be so. Therefore, we propose to show the total concentration simulations for Zn, Cu, Cd, Pb, leaving open the question of the large decrease of Cu, which the model will not simulate.
- We will use a slightly different but more standardized approach to estimate trace element critical limits. This time we will apply: *Lofts et al. (2004). Deriving Soil Critical Limits for Cu, Zn, Cd, and Pb: A Method Based on Free Ion Concentrations. Environ. Sci. Technol. 2004, 38, 3623-3631.* Furthermore, in the future projections we will show the variation of the critical limits over time together with pH and SOM changes. We agree with the Referee that the background concentrations should be subtracted for the calculation of the critical limits; therefore, we propose to subtract the trace element concentrations estimated by the model before 1949 (the start of the experiment).
- The organic amendments are applied at different frequencies and quantities in order to introduce the same (estimated) amount of organic matter, so that the comparison is done on the same basis. Since the TEs concentrations had not been assessed before this work, they did not contribute to the decision of applying different rates of organic amendment. Said this, the Referee is right that the FYM is from cow and the comment is valid that FYM from different sources could have much higher TEs concentrations. We will rephrase the sentence.
- By geogenic deposition we mean the natural concentration of TEs in the atmosphere, i.e. due to eruptions from volcanoes, which give rise to TEs deposition well before anthropogenic activities became prevalent. In fact, this deposition would be detectable even at "pristine conditions". This is why we used data from deep peat bog layers to estimate this natural deposition of TEs (please note that we did not use peat bog data to estimate mineral weathering!).
- Regarding DOC, please see the answer #3 to Referee 1.
- The Referee is right that even after >65 yr of soil management, none of the plots here considered have reached a new equilibrium condition: pH and SOC are still decreasing, sometimes at lower rates than initially. Therefore, keeping fixed pH and SOC can be a crude assumption. We propose to apply a SOC model to predict the future SOC (and DOC) changes over time (see answer #3 to

Referee 1). For pH, since its value will depend upon a number of factors, not least the speciation and cycling of added N, we propose to use simple extrapolation of the observed trends.

- Menichetti et al. (2016.). Parametrization consequences of constraining soil organic matter
- models by total carbon and radiocarbon using long-term field data. Biogeosciences, 13, 3003-3019.
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- We will delete the description of the measured data and give space to the additional work that these comments have raised. Though it would be interesting to apply a multi-linear regression to explain the measured data, we feel it would be out of the scope of this ms, which is focused on model application and future predictions of TEs bioavailable concentrations.
- The spectroscopic analysis is useful for two important perspectives: i) confirming the general reduction of organic matter in soil for long term treatments in all samples; ii) confirming the importance to know the nature of organic material in terms of high affinity for TE's and its possible consequence in affecting the model.

  The X-Ray Diffraction analysis on soil samples give the possibility to establish that the organic treatments have not introduced exogenous mineral material, especially, in the case of the sewage sludge application. Differently, there are no other data in the manuscript that can establish this statement. These statements are functional to the discussion and give the possibility to have further insights on the TE dynamics in soils fertilized with organic amendments.