

Interactive comment on “The contribution of land-use change versus climate variability to the 1940s CO₂ plateau: Former Soviet Union as a test case” by Ana Bastos et al.

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We have fully revised the manuscript taking in consideration the issues raised by the previous editor, the two referees, the new review by referee #2, as well as the comments in EC3. In this regard, the main changes to the manuscript, apart from a thorough revision of the writing and section restructuring to improve readability and clarity are:

- Better description of the motivation for this study in the introduction, including the rationale behind the two hypotheses (climate vs land-use) proposed in Bastos et al. (2016). Particularly, we discuss in more detail the spatial and seasonal warming anomalies in

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the 1940s and provide a justification for the choice of FSU as a study case;

- Improved the description of the LUC datasets, their characteristics and limitations, and better justification for collecting official statistics;

- Detailed explanation of the two scenarios and of the conversion from FSU totals to spatially-explicit maps, with reference to previous works using similar methods; - Justification for running the simulations up to the late 20th century (in order to compare our simulated Cstocks and fluxes with observation-based data);

- We now discuss the 1930's crisis. We would like to note that our collected data do not show a big decrease in cropland area during this period, for the reasons already mentioned by the Editor. Nevertheless, our data shows a small decrease in crop area between 1930 and 1933, which is not captured in LUH1. In the absence of alternative data, we decided to keep the values from the official statistics;

- We have dedicated special attention to the dynamics of soil C following abandonment and introduce now a Table with reference values of C-sequestration in former arable lands after the post-FSU abandonment in the 1990s. We would like to point out that all these studies point to a C-stock increase, rather than decrease, even in the first years following abandonment(1,2), at least in the Russian territory;

- We now show the spring and summer warming anomalies together with the annual values, and discuss how spring warming combined with mild summers might have contributed to such a strong enhancement of the terrestrial sink.

We are confident that these changes address the main issues raised regarding the motivation for this study, the relevance and reliability of the new LUC data collected, the ability of the model to simulate Russian C-stock dynamics following abandonment. We have chosen to focus the analysis on the available data and avoid introducing speculation about bombings and fire impacts on C-stocks. We provide a revised version of the manuscript with track changes highlighted. All authors have approved the revision

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of the manuscript.

1 Kurganova, I.; De Gerenyu, V. L.; Shvidenko, A. & Sapozhnikov, P. Changes in the organic carbon pool of abandoned soils in Russia (1990–2004) *Eurasian Soil Science*, 2010, 43, 333-340.

2 Kurganova, I.; Lopes de Gerenyu, V.; Six, J. & Kuzyakov, Y. Carbon cost of collective farming collapse in Russia *Global change biology*, Wiley Online Library, 2014 , 20 , 938-947.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-267/bg-2017-267-AC3-supplement.pdf>

Interactive comment on *Biogeosciences Discuss.*, <https://doi.org/10.5194/bg-2017-267>, 2017.

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