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Interactive comment on “Polycyclic aromatic hydrocarbons in post-pyrogenic soils of drained peatlands in West Meshchera (Moscow Region, Russia)” by A. S. Tsibart et al.

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Received and published: 17 June 2014

This is a great manuscript. It reports field measurements of PAH concentration in the soils of Russian peatland affected by fire. The topic of PAH produced by boreal peat fire is of great importance and it is related to the larger context of fire emissions from smouldering of drained/dry peatlands, which is known to be one of the largest natural emitter of carbon. The work of Tsibart et al. is most welcome since there is so little in the literature on PAH from peat fires and hence this manuscript is novel and is leading the topic. I think the manuscript would be a great contribution to Solid Earth and I recommend its publication after revision. The points that need to be address are:

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- The paper needs to be proof read by an native English speaker. It can be understood more or less but the quality of the data is high and that needs a high quality English, which currently is lacking.

- There is a general confusion between flaming combustion and smouldering combustion in the text (marked in the annotated file). Whereas a peat fire would have seen both combustion types taking place at different times, there is overwhelming evidence that smouldering combustion is the most interesting for PAH production. First, because smouldering consume most of the peat. Second, because smouldering is of lower temperature and thus does not burn off airborne PAH. And third, because smouldering drives the spread of the pyrolysis front where the PAH is produced. I would like to direct the authors to the only review on the topic of smouldering peat fires where they can learn more about this ("Smouldering Fires and Natural Fuels" DOI: 10.1002/9781118529539.ch2, I am its author, sorry for the self-promotion).

- Figures 1, 5 and 7 are of low quality and difficult to read. Given the importance of Figure 5 and 7, I recommend each of these is split into two bigger plots (A and B).

- There are two mechanisms for PAH accumulation (or accumulation of any combustion product): The first one is in-situ accumulation because the gases the combustion have to diffusion across the char and ash layers of the soil before being released into the atmosphere. These char and ash layers act as filters of the gases. The second is airborne accumulation when the combustion gases have been released to the atmosphere and travel some distance with the wind and are deposited somewhere else. These two mechanisms could be mention in the paper because they probably lead to speciation (lighter gases are airborne, heavier compounds get filtered in the soil) .

- I think the use of "post-pyrogenic" across the manuscript to mean "post-fire" is misleading. Unless I am wrong, the literature uses "post-fire" to refer to the residue found after a fire event, and "pyrogenic" to refer to what was created by the fire event. "post-pyrogenic" would then mean what is left after being created by a fire which is the same

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as "pyrogenic" for a field study. This seems confusing and I recommend removing "post-pyrogenic" from the title and the text.

- There is no justification for the choice of soil types investigated. What is the rationale for investigating histic podzol, sod-podzols and histosols? I am sure there are very good reasons for this choice, but not being a soil expert, I have no idea what this choice tells me. A short justification of what these soil types bring to the study and how this affects the conclusions would be most welcome.

- There is so little work published on the soil chemistry of peat fires that the very recent work of Zaccone et al. in *Geochimica et Cosmochimica Acta* (doi:10.1016/j.gca.2014.04.018) would be a great addition to this Tsibart et al. Zaccone et al. looked into the general chemistry of the laboratory soil residues and there is plenty of data there to help explain more the PAH measurements of Tsibart et al.

I attached a pdf with annotations for the specific comments.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/6/C631/2014/sed-6-C631-2014-supplement.pdf>

Interactive comment on *Solid Earth Discuss.*, 6, 1265, 2014.

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