Biogeosciences Discuss., 12, C8952–C8954, 2016
www.biogeosciences-discuss.net/12/C8952/2016/

Biogeosciences Discussions

Interactive comment on "Ideas and perspectives: why Holocene thermokarst sediments of the Yedoma region do not increase the northern peatland carbon pool" *by* G. Hugelius et al.

Anonymous Referee #3

Received and published: 11 January 2016

In this contribution Hugelius et al. discuss estimates of organic carbon stored in Yedoma regions by criticizing some of the conclusions made in a recent study on the subject (Walter Anthony et al., 2014). The discussion focuses on the question whether there is a systematic underestimate of peat carbon in the Northern Circumpolar Soil Carbon Database (NCSCD). Due to differing definitions of "peat" in the soil and geologic sciences, the question arises of how to account for the carbon deposits in thermokarst sediments as quantified by Walter Anthony et al. (2014).

I think the contribution of Hugelius et al. is helpful in avoiding a misinterpretation across different geoscientific disciplines by clarifying conflicting definitions and terminologies

of what is understood by "peat", "peatland", or "organic soils". I would recommend broadening the discussion of the terminology a bit further. As Hugelius et al. stress, carbon accumulation in alas sediments should be contrasted to accumulation in circumarctic peatlands. It would be helpful if the authors would shortly comment on the differing pathways of peatland formation (peludification and terrestrialization) in combination with a qualitative discussion of differences in sensitivities of the corresponding carbon stores to future carbon release after permafrost degradation. Such a discussion would emphasize that not only the amount of permafrost carbon is a key factor for potential future release but also the lability of stored organic matter. Therefore, systematic differences in sensitivity to decomposition between organic matter stored in soils classified as histels and in thermokarst lake sediments should be discussed (e.g. with reference to incubation results from Schädel et al. (GCB, 2013). Such a discussion could stress the argument of the authors that organic carbon stored in thermokarst sediments should not be counted as part of "peat" permafrost carbon classified as histel. Further, such discussion could underline the need of considering those carbon deposits as separate pools for studies which aim at simulating the permafrost carbon feedback. A second issue of the contribution by Hugelius et al. concerns the question of overlap in C estimates, especially in view of deep carbon deposits in Yedoma regions: "...In brief, earlier studies did not include a pool of OC stored taberites, an in situ thawed, diagenetically altered Yedoma deposit, and applied bootstrapping approaches to calculate OC stocks while Walter Anthony et al. (2014) use arithmetic means." A one-to-one comparison between the newer numbers by Walter-Anthony et al. (2014) with previous estimates (based on Strauss et al., 2013) is not feasible, given the mentioned methodological differences in calculating OC stocks (concerning mean estimation). Based on the discussion in Strauss et al. 2013 (arithmetic vs. bootstrapped mean) one could assume the same systematic difference to hold for comparing the numbers in Walter Anthony et al. (arithmetic mean) and Strauss et al. (bootstrapped mean) to correct for methodological biases. This would allow a more straight-forward comparison which would further clarify the additional amount of carbon stored in thermokarst lake sedi-

ments, which is so far not accounted for in present permafrost carbon inventories.

Minor comments: Page 18093, line 28: 53-58 Pg: A short explanation of which carbon stores exactly these numbers describe would be helpful.

Interactive comment on Biogeosciences Discuss., 12, 18085, 2015.