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Interactive comment on "Strategy of valid ¹⁴C dates choice in syngenetic permafrost" *by* Y. K. Vasil'chuk and A. C. Vasil'chuk

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Referee #1: This is a rather unusual manuscript and in my opinion pre-mature to be published. It is not properly organised and large part of it have to be rewritten before doing an in depth review. The quality of English is poor and it is sometimes quite difficult to follow the manuscript.

Authors reply: Proofreading of the paper has been done by Proof-Reading-Service com LTD, UK, internet: http//www. proof-reading-service.com

Referee #1: The abstract is not very helpful. It is written in a very general way and hard facts are missing

Authors reply: Ok The abstract re-arranged (p.1 lines 7-24) Abstract. The main problem of radiocarbon dating within permafrost is the uncertain 7 reliability of the 14C ages. Syngenetic sediments contain allochthonous organic deposit that 8 originated at a distance from its present position. To establish ice wedge formation ages the strategy 9 for the most authentic radiocarbon age selection for syngenetic sediments is considered on the base 10 of a model of yedoma accumulation and distribution of reworked material related to the flood and 11 aeolian transport. The re-deposition of organic material discussed in terms of cyclic syngenetic 12 sedimentation of yedoma. The ice wedges are considered as key subjects for 14C dating of yedoma, 13 as there are no any exchange processes between the environment and the ice wedges. 14 The advantages and the complications of dating of ice wedges from ice wedges by the 15 accelerator mass spectrometry (AMS) method are discussed applying to true age of dated material 16 search. Radiocarbon ages of different organic materials from the same samples are compared, it is 17 demonstrated that the difference between ages of the fractions from the ice wedges consist of about 18 9 kyr in Seyaha ice-wedge complex in Yamal Peninsula and about 5 kyr in Bison yedoma, Kolyma 19 River valley. The principle of the choice of the youngest 14C age from the set and from the layer is 20 proposed for yedoma. The younger age of the yedoma from cross-sections of Duvanny Yar in 21 Kolyma River (35–37 kyr BP to 13–10 kyr BP), and Mamontova Khayata in the mouth of Lena 22 River (55 kyr BP or later to 10.8 kyr BP) is substantiated due to the principle of the choice of the 23 youngest 14C from the set.

Referee #1: The introduction part is in my opinion too long and a lot of the same type of information is repeated. A kind of incoherent and loose list of C-14 data is listed

Authors reply: The introduction is re-arranged

Referee #1: Furthermore, after the long introduction the reader does not know which are the research questions or the hypotheses. The main scope of the paper remains unclear - only at the end of the manuscript one has a kind of a vague idea. Authors reply: The research questions and the hypotheses are presented at the in the beginning

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of the Introduction (p.1-2. Lines 31-38) The objective of this paper is to consider the problem of 14C dating of syngenetic permafrost sediments taking into account old organic material accumulation at syngenetic permafrost. In accomplishing this objective, the paper will provide a model of yedoma development and describe the distribution of reworked material related to the flood and aeolian transport. The main hypothesis of the paper is as follows: 1 - 14C dating of the yedoma is required selection the youngest ages from every stratigraphic unit; 2 - the syngenetic ice wedges contain the organic material simultaneous to their time formation; 3 - resulting comparison of the 14C dates from ice wedges and their host sediments may be done at the base of the model of yedoma formation.

Referee #1: As a reader one realises quite soon that a lot of C-14 date inversions may occur. Ok. And now? The title surmises that a general and new strategy will be presented (maybe even by presenting a kind of scheme with decision nodes). But nothing like that is shown.

Authors reply: Yes done fig 7 Strategy (p.28, lines 854-857)

Referee #1: The authors try to show that a 'principle of the youngest age' exists. But no convincing data and arguments are shown. Some references are given to 'proof' this fact (and as reader, one is forced to obviously read all these papers and find the arguments). '. . .as obtained by the authors (Vasil'chuk, 1992, 2006, 2007, 2009, 2013; Vasil'chuk and Vasil'chuk, 1997, 1998; Vasil'chuk et al., 2000a, b, 2004) and published elsewhere (Sulerzhitsky, 1982; Pewe et al., 1977; Fukuda et al., 1997; Schirrmeister et al., 2002a, b, 2003, 2008, 2010; Wetterich et al., 2009, 2014 and others) has revealed the important role of ancient redeposited material in syncryogenic sediments throughout the Russian Arctic, as well as offering the principle of choosing the youngest date as the most reliable.' Based on this the final conclusion is derived that 'The youngest 14C date from the data set in the particular horizon is closest to the actual time of accumulation and freezing of the yedoma sediment.' As a reader, one has no chance to follow the argumentation.

Authors reply: All examples are shown that in syngenetic permafrost the youngest ages are close to maximum limiting age if contamination with modern carbon will be excluded at the sampling and pretreatment. Presence only 10% of dead carbon in modern age sample gives oldering of the age about 800-2000 yrs (Olsson, 1974; Aitken, 1990). However if the same 10% of dead carbon to add into the sample of 30-28 kyr age the oldering will be about 60-80% (our interpretation Olsson's, 1974 curves). In real situation in permafrost during syngenetic accumulation, the participation of old 307 organic material may consist of 90-95%. The fresh-looking peat sampled at the beach near Sabler Cape is dated 13,600 $\pm$ 400 (GIN-1529), while at a distance of several hundred meters at a rather flat low surface of Fus Cape the peat sample is dated 2,860 $\pm$ 150, and a peat sample from the beach between these points is 7,400 $\pm$ 60 (GIN-1287). It has been shown that the age difference between samples from simultaneous layers in the permafrost area could be more than 10,000 yr (Fig. 5). It may be suggested that the content of old organic matter in the sample near Fus Cape is approximately 30%, and near Sabler Cape is approximately 80% or slightly more (according our interpretation of Olsson, 1974 curves). The 14C age of this layer of beach sediments after a short time does not objectively correspond to the time of accumulation. Nevertheless, the youngest age is closest to the actual time of sedimentation from the series of ages from this horizon.

Referee #1: Consequently, I strongly recommend the authors to rearrange the manuscript in a way that also others can easily follow their argumentation. The manuscript seems to be a kind of a review paper (something that is nowhere stated). I think that the paper has a certain potential and that some valuable information could be shown. But with the actual state of the manuscript, this is unfortunately not possible.

Authors reply: ok

Figure 1 (in the paper this is Figure #7). Strategy of valid radiocarbon ages choice in syngenetic permafrost

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Please also note the supplement to this comment:
http://www.the-cryosphere-discuss.net/8/C2998/2015/tcd-8-C2998-2015-supplement.pdf

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Interactive comment on The Cryosphere Discuss., 8, 5589, 2014.

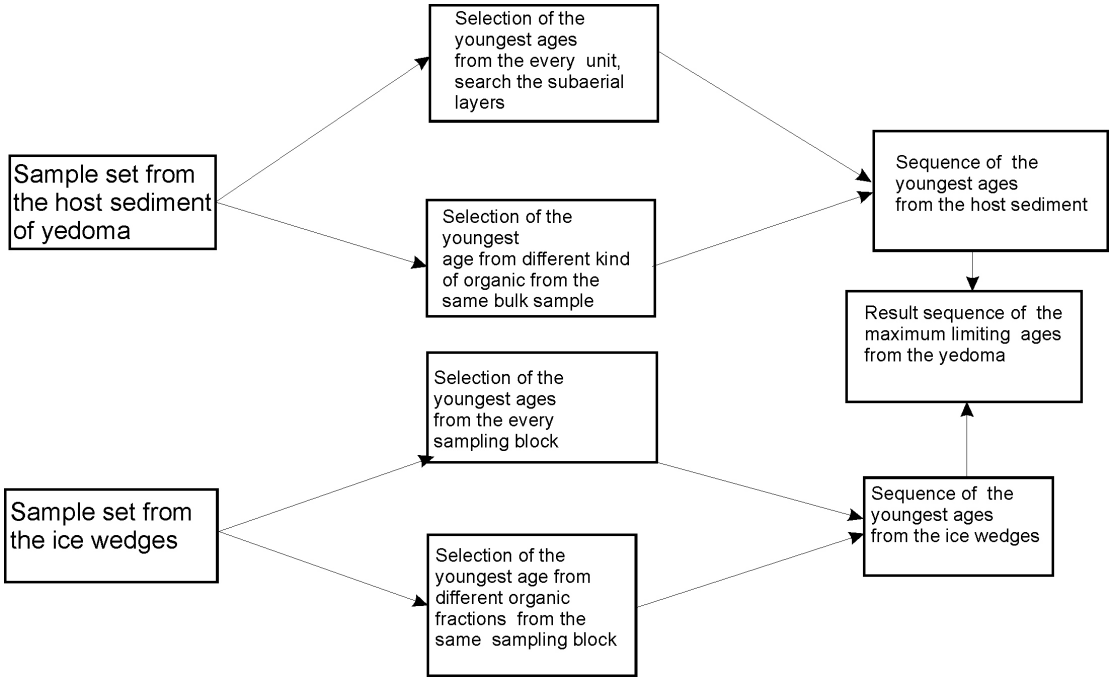

Fig. 1.

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