

Interactive comment on “Onset of intense permafrost conditions in Northern Eurasia at ~ 2.55 Ma seen in a cryogenic weathering record from Lake El’gygytgyn” by G. Schwamborn et al.

Anonymous Referee #1

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General comments. The manuscript covers an interesting issue of permafrost research, in particular the determination of the beginning of permafrost formation in the NE Eurasian Arctic. It is an interesting approach to use a thoroughly investigated long sediment core from Lake El’gygytgyn, which provides an almost continuous record of paleoenvironmental development of the study area, instead of studying local permafrost outcrops representing only limited time windows into the past.

The study is based on two methods, which are applied on two combined sediment cores (5011-1 and Lz1024): The determinations of (a) quartz grain morphological features, and (b) the cryogenic weathering index (CWI) and the subsequent calculation of a linear trend, which is interpreted in terms of permafrost conditions ($CWI > 1.0$), and

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non-permafrost conditions ($CWI < 1.0$). Therefore, the reference value 1.0 at 121.8 m depth is used and is interpreted as onset of permafrost formation.

Although the approach seems to be reasonable I have basic concerns about the applicability of the CWI to determine the beginning of permafrost formation, as the CWI only gives information about the weathering intensity, which depends on the number of F/T cycles. And, the linear trend with a determination coefficient of $R^2=0.4682$ is weak. Moreover, there are shortcomings concerning the performance of the methods. Especially the differences in core sampling (Lz1024: in 4 cm intervals; 5011-1: mixed samples in 1m core intervals) and the different grains size fractions (Lz1024: $< 63 \mu\text{m}$ (comprising clay and silt), $63\text{--}125 \mu\text{m}$ (fine sand); 5011-1: $32\text{--}63 \mu\text{m}$ (coarse silt), $63\text{--}125 \mu\text{m}$ (fine sand) are very questionable. In contrast, the quoted article from Konishchev (1998) uses the fractions $10\text{--}50 \mu\text{m}$ (coarse silt) and $50\text{--}100 \mu\text{m}$ (fine sand) to determine the CWI. In the case of the quartz morphological studies, the sample selection (samples from the top (Lz1024) and samples from the bottom (5011-1, 318–350 m)) is insufficient as samples at the transition from non-cryogenic to cryogenic conditions were not analysed. Concerning the scientific quality, there are several problems e.g. the methods are not sufficiently described and the results are very short. In addition there are technical shortcomings in the text as in the figure captions (like missing core name in Fig. 2, missing sample depths in Fig. 3). Mainly because of the methodological shortcomings I do not recommend the manuscript of Schwamborn et al. of for publication in Climate of the Past.

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