

## ***Interactive comment on “Past freeze and thaw cycling in the margin of the El’gygytgyn Crater deduced from a 141 m long permafrost record” by G. Schwamborn et al.***

### **Anonymous Referee #2**

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Review of G. Schwamborn et al., "Past freeze and thaw cycling in the margin of the El’gygytgyn Crater deduced from a 141m long permafrost record"

Schwamborn et al., report on the results of a study of 141 m long core drilled into sediments on the margin of Lake El’gygytgyn, a crater lake in the Russian arctic. They use the sedimentology of the deposits along with hydrochemistry of the associated permafrost to interpret the history of permafrost development. The sediments themselves are described elsewhere (Schwamborn et al., 2012), while this manuscript focuses on the chemical characteristics of the permafrost. Schwamborn et al. suggest that the uppermost ~9m of the permafrost contain a record of paleoprecipitation from approximately the Allerød through the Holocene. The lower 130 m of the permafrost are

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interpreted to reflect three relatively recent (MIS 7, MIS 5 and Allerød) freeze/thaw cycles and talik development driven by lake level changes that flooded the depositional area during those time periods.

I must say that I do not envy the author's task of attempting to make a specific interpretation of the very large data set they have put together on permafrost chemistry. I say that because while their interpretation is reasonable, it is also hardly the only or perhaps even most plausible interpretation that might be drawn. The greatest problem they have is a near total lack of chronologic control on either the host sediments or, of course, the 'age' of the basal ice. For example, the authors state that sandy layers within unit 3 "have been interpreted to represent two flooding events (Schwamborn et al., 2012). The lower sandy beds presumably formed during marine isotope stage (MIS) 7 according to an age estimate based on the pollen load (Andreev et al., 2012)." But in the paper of Andreev et al (2012), and even in Schwamborn et al (2012), the identification of these sediments as MIS 7 is admitted to be ambiguous. Andreev et al (2012) state that the pollen assemblage might be MIS 7 one of many interglacial periods. Thus, to conclude that MIS 7 warming is responsible for flooding, talik development, and homogenization of the ground ice chemistry cannot be supported. The same is actually true for the interpreted flooding and talik development ascribed to MIS 5. Given the uncertainty in the age of the sediments, I do not feel the authors conclusions regarding the timing of flooding of the core site are supported by their data.

The authors also discuss in detail the various chemical and isotopic values of the basal ice from different layers. Again, given the lack of chronological control, I do not see a great deal of value in this discussion as I cannot see how one can come to any firm conclusion about the origin of the various zones, at least with respect to the timing of their development. The most interesting data are those from the top of the core, where some age control does exist. The AD/YD/Holocene sequence of ice appears to be relatively well preserved. I suggest that the authors concentrate on discussing these data, including using figures that focus on this shorter time interval. Please note also

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that the figure and figure captions do not match in the submitted version.

In short, I think this manuscript needs substantial revision before it can even be considered for publication.

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Interactive comment on Clim. Past Discuss., 9, 3993, 2013.

**CPD**

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