Earth Surf. Dynam. Discuss., 3, C448–C451, 2015
www.earth-surf-dynam-discuss.net/3/C448/2015/
© Author(s) 2015. This work is distributed under
the Creative Commons Attribute 3.0 License.

Earth Surface Dynamics Discussions

Interactive comment on "Estimating the volume of Alpine glacial lakes" *by* S. J. Cook and D. J. Quincey

S. J. Cook and D. J. Quincey

s.j.cook@mmu.ac.uk

Received and published: 23 November 2015

Interactive comment – Reply to Reviewer 2, J. Herget (ESurfD-3-C346-2015)

Firstly, we thank the reviewer for his thorough consideration of our manuscript, and we are pleased that he sees value in our contribution. The reviewer appears to be in broad agreement with our primary arguments. The reviewer focuses his critique of our work around 3 themes. We deal with these points here in turn. Responses to reviewers are requested in the following format: (1) comments from Referees, (2) author's response, (3) author's changes in manuscript. We follow this structure for each of the questions outlined above.

Issue 1 (1) The reviewer recommends that we consider adding further data from two

Russian reports to enrich the dataset presented and analysed in the manuscript.

(2) The reviewer makes a valuable point that previous publications have tended to ignore potentially useful datasets if the source of the information is written in a language that differs from that of the author(s). Specifically, it is recommended that we consider adding lake measurement information published in Glazirin et al (2013), and from two Russian reports by Nikitin (1987) and Tsarev (2003). We would like to acknowledge the reviewer here, because he provided us kindly with hard and electronic copies of Glazirin et al., which is greatly appreciated.

Inclusion of the lake information published in Glazirin et al. (2013) would be problematic. Firstly, one key element of data that we require for part of our analysis (such as in Fig1 and Table 1) is lake depth, which is not presented in Glazirin et al. (2013). Secondly, the lake area information in Glazirin et al. (2013) is approximated by the area of an ellipse, where lake length and width are the input data. We have avoided area approximations of this sort in our compiled dataset. Thirdly, the relationship between lake area and volume presented in Glazirin et al. suffers from the same issue of autocorrelation that we have referred to on p914 and 919 in our manuscript, and which has been commented on in an exchange between ourselves and another reviewer (see comments ESurfD 3, C342–C343, 2015 and ESurfD 3, C368–C369, 2015). Hence, we cannot use these calculated volumes in our dataset. Taken together, these issues do not permit the inclusion of the dataset presented in Glazirin et al. (2013). As the reviewer notes, the volume-area relationship published in Glazirin et al. (2013) is derived from two reports by Nikitin (1987) and Tsarev (2003), and the reviewer directed us to a Russian colleague (Prof. Vladimir Konovalov) who could have access to these original reports. We contacted Prof. Konovalov soon after receiving the review and he provided a paper (in Russian) that he thought might help us [Konovalov, VG (2009) Remote sensing monitoring of the outburst hazardous lakes in Pamir]. Again, however, the data presented within are of limited use for our manuscript – Fig 1 of the paper indicates that depths have been calculated rather than measured; depths represent

maximum rather than mean values; and lake volumes are calculated using empirical formulae. Prof. Konovalov kindly sent tables of data from the reports by Nikitin (1987) and Tsarev (2003). Some of these tables provide details of lake area and volume only, and some provide other morphometric information, which we interpret to be depth, moraine height, lake length, etc. We are reluctant to include these data in our compiled dataset because it is unclear to us (1) where these lakes are located; (2) what type of lake or context each datapoint represents; (3) whether the area, depth and volume measurements are estimated (as described above for Glazirin et al.) or measured in some way. For example, it is unclear whether these lakes are ice-contact (moraine-, ice-dammed or supraglacial) lakes, as required for our study, or whether they are lakes that have been abandoned by the glacier (i.e. any lake in an Alpine environment). The latter is not under consideration in our manuscript. (3) Given these uncertainties about the nature of the lake data presented in these studies, we regret that we are unable to include them in our study. We certainly see value in these other contributions and hope that this discussion has highlighted their existence to a broader audience.

Issue 2 (1) The reviewer comments that our selection of the most recent lake data to present in Table 1 and 2 is a poor argument as it hides the variability in the dataset.

(2) Firstly, it is worth re-iterating that relationships derived from any duplicate measurements are already presented in Tables 1 and 2 and Figures 1 and 2. We also state on p914 line 4, line 14 and the caption for Fig1, that duplicate measurements have been presented. We present the additional relationships in Tables 1 and 2 where duplicate measurements from the same lake are removed with only the most recent measurements presented. Our logic for this is simple: the most recent measurements provide the most relevant and up-to-date information on any one lake. It would not be pragmatic to present all combinations of lake data for different duplicate measurements. Interested readers could derive their own graphs and relationships from the Supplementary Dataset if this were of interest to them.

(3) In the revised manuscript we have taken the advice of the reviewer and made the

point that lake areas and volumes can vary seasonally or daily depending on a range of factors. This is now presented in section 2, Data and Methods.

Issue 3 (1) The reviewer requests that we add a value for range in lake area to Tables 1 and 2. (2) Agreed. (3) We have now added ranges in depth and area to Table 1, and ranges in area and volume to Table 2.

Interactive comment on Earth Surf. Dynam. Discuss., 3, 909, 2015.