Author response to 'Anonymous referee #2', 18 Dec 2013

Reviewer comments in black; author response in red.

This short communication presents observations of a so far not documented surge of Khurdopin glacier in the Shimshal valley during the 1970s. It is a good example that investigating satellite archives can reveal new information and help understand also long term changes. The mehod is well established and even though the errors are large, the results are convincing. The main interesting point is that velocities can reach very high values also for glaciers in the Karakoram with a typical temporal evolution. The results of this analysis are well presented, but the context is lacking important information and the conclusions are not well based.

Major scientific issues:
The title is misleading, because the observations cannot support general surge characteristics of Karakoram glaciers

We agree that the title could better reflect the content of the paper and have amended it to "On the magnitude and frequency of Khurdopin Glacier surge events".

Abstract: The observation of one repeat period is not sufficient to conclude on general surge periods. Taking into account historical observations might help to better characterise the general situation of Khurdopin glacier.

Thank you for pointing this out. Our suggestion of a 20-year return period for this glacier is now supported in the text by reference to historical observations.

Introduction, last paragraph: I doubt that a general return period can be given for the Karakoram glaciers. Even if there are indications that climatic conditions drive surge activities, the individual characteristics of the glaciers will lead to very different response time with respect to surge initiation. However, the need for more information about the surge cycles of glaciers in the Karakroam is undisputed.

We did not intend to suggest that a general return period could be given for all Karakoram glaciers, rather to illustrate that they are in fact very different on a glacier-by-glacier basis (and still poorly constrained). We have modified the paragraph to clarify this.

The Khurdopin glacier and the surge of 1979, first paragraph: A more detailed description about historical observations would be beneficial. The looped moraines of the glacier tongue indicate several surges in the past. This indicator would also deserve an extra sentence.

We have included some historical analysis, as suggested, and also make reference to the distinctive looped moraines.

Description of the uncertainties: Tab. 1 would benefit from additional information of the mean velocity on the used central flowline, to demonstrate the significance of the results. What is the image source of the 1986 images (the usage of the Spot image should be mentioned)?

Thanks for the suggestion. We have added this information to table 1 and mention the use of the Spot image in the caption.

P. 5180, l. 27ff: Involvement of the whole glacier surface in the surge is not shown or demonstrated. The profile of Fig. 2 reaches only about half way of the full glacier length. This is also in contradiction with the figure caption of Fig. 1 (minimal impact beyond 15 km from the terminus).

Thank you for picking this up. We have corrected the text to state that it had affected the lowermost 15 km of the glacier rather than the whole glacier.

Discussion and conclusion: The conclusion of underestimation of Karakroam glacier surges is misleading. This one observation is a good indication that high velocity surges occur in the Karakoram. But the timing of surge cycles needs more research, especially also from historical sources, in order to relate this one observation to the general conditions. Again the comparison of the 1979 and 1999 surges cannot be used for a general statment about a decreasing surge intensity. This would only be possible within a general framework of surge observations, which is very patchy at the moment.

We agree, and have consequently removed this statement in our revisions.

North Gasherbrum glacier is not really predominantly debris-free. At least the lowermost 6 km show at least 50% of debris coverage.

Apologies, this is our error. We have changed the text to read ‘not so heavily debris-covered’ [as the Khurdopin Glacier].