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The Cryosphere Discussions

Interactive comment on "The role of cornice fall avalanche sedimentation in the valley Longyeardalen, Central Svalbard" *by* M. Eckerstorfer et al.

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Referee comment on "The role of cornice fall avalanche sedimentation in the valley Longyeardalen, Central Svalbard" by Eckerstorfer et al.

General comments

This is a very interesting, elaborated paper on the geomorphological significance of avalanches for talus accumulation and rockwall retreat. The authors present a record of maximum 7 yr of avalanche sedimentation rates from a total of 13 catchments which is a rare and valuable data body; there are currently only few comparable records worldwide. This fact makes the paper significant in a broader context beyond a local

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case study. The paper is well-structured; sites, methods and results are laid down in sufficient detail to support the conclusions. Avalanche sedimentation is obviously of high geomorphic significance in Svalbard, the reported rates clearly outmatch most values from the literature which seems to be due to the specific setting (low precipitation mainly as snow, frost-susceptible bedrock, no significant fluvial activity). I recommend acceptance with minor to moderate revisions which should concentrate on condensing and shortening of the paper (see below).

There is one problem throughout the paper: it is rather long and gives too many details. Of course it is desirable that all steps leading to the results and conclusions are transparently presented. However, the reader is sometimes overloaded with detail information and it's an arduous task to find the way through. Some of the figures are rather "busy"; not each figure and not each of the many small inset pictures are actually needed. All in all, the paper might be shortened by approx. 20%. Some incomplete examples:

- Page 13 could probably be reduced by 50% - Table 1 should be deleted without replacement as the paper is on avalanche transport and not on geomorphological landform units - Fig. 4 d+e are not particularly helpful (we know what debris looks like) - Consider to leave out Fig. 5b, 6b, 7b (picture), 8b (pictures) and reduce the corresponding text (e.g. P12 L23 ff) - Leave out Fig. 9 a, d, f - Table 2: The data of the second half of the table are confusing rather than helpful - Table 3 is also much too busy. Leave out the section at the top and consider leaving out the first section of the main table. Concentrate on retreat rates.

There are certain concerns as to the significant differences between this paper and several other papers by the same authors and on the same sites and processes. Some of the titles sound in fact very similar. However, the Eckerstorfer et al. (2012) paper in ESPL is on the process of debris production and entrainment, the current one is on sedimentation and transport rates (of course with a certain overlap) and there are some further papers by the author which are on the dynamics of the snowpack itself

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(of course with a certain overlap, again). You might find this good or bad, however, this is what the Citation Index pressure teaches us to do. Honesty demands to say that it would be hard to combine all aspects (snow pack development, erosion and accumulation) in one paper. In any case, the data on debris accumulation and retreat rates has, to my knowledge, not been published before.

Browsing the articles usually published in The Cryosphere, one could argue that a geomorphology-related journal would be more suitable (e.g. Zeitschrift für Geomorphologie, Geomorphology etc.). Considering that the paper is much about snow, The Cryosphere is still OK even if the paper is not fully within the main scope of the journal.

Specific comments

P6 L10: You define avalanche sedimentation as "the transport and deposition of rock debris by avalanches forming distinct avalanche fans". – Why? Avalanche debris without the specific landform is still avalanche debris!

P8 L24: The visible rock debris content was classified into three classes. . . Would it be good to see exemplary photos of those classes? (despite the fact that I suggested to shorten as far as possible. . .)

P10 L16 ff: "To receive avalanche fan-surface accretion rates (mmyr−1), the volume was calculated by dividing the total avalanche sedimentation rate (kgyr−1) by the mean rock density of 2250 kgm−3" – this is not correct as the bulk density of the debris cone is lower than bedrock density. However, it is OK to do so if you want to directly compare rockwall retreat and talus accretion.

P11 L7: "4.1 The geomorphology of the Nybyen and Larsbreen slope systems" – this section doesn't warrant to be presented as "results", it might well be integrated into the study site description

P15 L8: Leave out this sentence (it took me two minutes to understand what it tells us, and it is in fact not interesting enough). Next sentence: is it possible to reduce the

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monster term "annual average maximum avalanche snow depositional areas" to "mean runout area" or so?

P15 L25: "the annual avalanche fan-surface accretion rates we present for each catchment are comparably high" – please provide some values from other papers for comparison!

P19 L1: "This keeps the rockfall contribution small and makes the rockwall retreat rates annual rates." – I don't understand this sentence.

P20 L4: "sampling locations were chosen to be where large quantities of rock debris were seen - the mode of extrapolation to the entire deposition area has not become fully clear. (Back to P9: to which surface area is the debris extrapolated? It is unlikely that the observed highest concentration is valid for the entire avalanche cone.)

Discussion: If the majority of the debris is plucked from the crest of the slopes, what does this mean for long term slope evolution? Shouldn't a convex upper slope be the final result of this mass waste, which is less and less suitable for cornice formation?

Table 2: I don't see why the table is arranged in this confusing order. Better use the same columns for Nybyen and Larsbren (i.e. one below the other). Trying to save space doesn't make things more lucid. As far as I can see, the date of the second half of the table is confusing rather than helpful, reduce to the most important units.

Table 3: What is missing is a brief reference (in the table or in the text) to avalanche-driven rockfall retreat rates from the literature.

Technical comments:

The English is good and I've found no typing errors.

Interactive comment on The Cryosphere Discuss., 6, 4999, 2012.