

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

M. Eckerstorfer et al.

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Dear Oliver Sass,

Thank you very much for reviewing our manuscript.

Response to the overall comments:

It is nice that you find our study a valuable contribution to the field and as it combines a multidisciplinary approach (geomorphology, sedimentology, avalanche science), we think that it can also be a valuable contribution to the journal. We believe that the geomorphological role of cornice fall avalanches for rockwall retreat and avalanche fan

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formation / rock glacier formation is of interest to a broad readership, thus we chose to submit to The Cryosphere. The Cryosphere covers periglacial slope processes, snow avalanches, seasonal snow and permafrost and is thus fitting. Additionally, we believe in the open-access policy of the journal.

In response to your comment about the length of the paper, we do disagree in general, but will most likely take some of your comments and shorten certain paragraphs as well as simplify some of the figures. In general, the final length of the paper will correspond to +/- 10 pages, which is in the frame of what is considered normal. We believe that the complex topic of rock erosion, transport and accumulation, its interannual variations, its influence on the slope system evolution and larger scale periglacial landscape evolution and the complex monitoring and measuring of it all demands a full and proper description and discussion. The contribution is only of value if the reader understands how rock debris transport by avalanches was monitored and quantified and how rockwall retreat rates were finally calculated. As we further argue very strongly that cornice fall avalanche sedimentation is the most dominant process on the slopes, we think it is important to also describe the geomorphology and sedimentology of both studied slope systems in more detail. These maps in Figures 5 and 6 are the basis of the discussion about differential rockwall retreat rates between chutes and sites, contribution of rock debris from other slope processes and the current activity and magnitude of cornice fall avalanching. However, we will consider how we can condense some of the figures or even delete them, as you suggested with Figures 4 d+e, 7b, 8b, 9.

We are rather surprised by your comment about our other recent publications. The majority of the publications (which also forms part of a Ph.D. study, which is approved) are on the avalanche and snow climate of central Svalbard, seen from a geographical and meteorological point of view. Only the paper by Eckerstorfer et al (2012) ESPL is the companion paper to this manuscript, but the ESPL paper clearly deals with the erosional work of cornices as well as the seasonal cornice dynamics themselves. We assume in the ESPL paper that rock debris plucking by cornices leads to

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high avalanche sedimentation, but only in this contribution are we able to quantify this hypothesis. Thus the comment that we publish similar results to overcome the publication and citation pressure we are rather sorry about, and feel that this is a sort of accusation of scientific misconduct, which we do certainly not agree with you on.

Response to the specific comments: P6 L10: The sentence should be read in connection with the next one. There we write that the rock debris transported by avalanches can have different origin. We have rewritten both sentences to clarify.

P8 L24: We gave percentages of rock debris visible in the avalanche debris corresponding to our classification. It is possible to state the class in the figure captions where we show examples of rock debris. If we do not delete them as demanded.

P10 L16ff: We didn't account for different bulk densities in the first place as we want to directly compare rockwall retreat with avalanche fan accretion. However, based on lab measurements, we know that there is a volumetric compensation factor of 0.65. In light of this review comment, we are considering to discuss this the section about possible errors.

P11 L7: These are results of the geomorphological / sedimentological mapping we carried out for this study. However, we agree it would fit also in study site description.

P15 L8: Sentence deleted. Terminology changed.

P15 L25: we included RRR from other publications for the purpose of comparison

P19 L1: We reformulated the sentence. As the upper depositional areas and the transport colours got swept by avalanches annually, we can assume that the contribution of rockfall to the fan accumulation is minimal. Also, we did not calculate rockwall retreat rates taking into account rock debris that was deposited over several years.

P20 L4: It is correct that the measured highest concentration of rock debris can be extrapolated to the entire avalanche cone. However, as we discuss, this is the only method to calculate rockwall retreat rates and we conclude that they are maximum

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rates. Although the snow inventories are biased by the sampling location, they are in the range of the permanent sediment traps. Thus we conclude that they are representative.

Discussion: There is likely an asymmetric valley evolution, but we do not have data to back up this hypothesis. There might be other factors also contributing (geology, glacial history). Based on the literature, cornices can also accrete on ridges of slope inflections with a smaller change in slope inclination.

Table 2: The way the table is designed keeps it at a minimum length. Again, for reasons of transparency, we included all calculation steps. We are considering to shorten the table and give more information as supplementary material.

Table 3: We included a reference.

Sincerely,

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

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