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Interactive comment on "Soil erosion and organic carbon export by wet snow avalanches" *by* O. Korup and C. Rixen

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Authors' Reply to Review by Anonymous Reviewer 1

We thank the referee for the positive and constructive comments on our manuscript. The suggested couple of additional references (Stanchi et al., 2014; and Confortola et al., 2012) nicely add to the sparse literature on the topic of soil erosion and organic carbon transport by snow avalanches, and we have included these case studies in the reference list accordingly. We have also carried out the one technical correction, and replaced "fine soil" by "fines" in page 5 line 16.

We further welcome the reassuring comment that our sediment yield estimates are consistent with the range of values reported in the literature. We acknowledge that our estimates of organic carbon yields from wet snow avalanches are higher than available data of particulate organic carbon (POC) or large woody debris (LWD) transport in rivers elsewhere (Fig. 6B). Possible explanations, other than we mention in the text, for this trend include (1) effects of study-area size; (2) sampling artefacts; (3) extrapolation errors; or (4) biogeochemical controls.

Re (1): We note that our study areas are much smaller (<1 km^2) than those in the studies shown in Fig. 6B. Clearly the wet snow avalanches that we investigated are point sources of organic carbon input to river systems, whereas the POC yields from mountain rivers (Beusen et al., 2005) are from a worldwide study that uses data integrated over much larger catchment areas, i.e. 20,000 to >5,000,000 km^2. We expect that these regionally averaged POC yields take in many point sources but also include significant areas of little or no POC contribution that contribute to depressing the overall estimates. We note that work on smaller mountainous catchments has produced much higher POC yields, i.e. >10^1 t km^{-2} yr^{-1} (e.g. Carey et al., 2005; Leithold et al., 2006) that go well beyond our maximum probability density estimate in Fig. 6B. Hence we surmise that the ratio of POC source areas to overall catchment areas may be play a role when gauging the overall POC yields in rivers. The LWD data from Japan (Seo et al., 2008) are also from mountainous catchments (with areas between 6 and 2,600 km^2), but are surprisingly low. Yet we expect that the overall POC yields from these catchments are much higher given that the remainder of the biogenic carbon was not included in this reference.

Re (2): Our field sampling scheme was based on a random selection of measurement points and we duly recorded the thickness of organic cover on the snow-avalanche deposits. Fig. 3B highlights that most of our measurements included very thin or nearly negligible debris. Our inferred surface concentrations of organic material are consistent with published data on soil organic carbon contents if adding excess organics from forest-floor litter (that is likely to be entrained in snow avalanches as well). Please note that we excluded any LWD from this study such that we treat our calculations as minimum estimates.

Re (3): We have devoted a lot of attention to propagation a number of pertinent errors into our Monte Carlo simulation. These are duly reflects in the broad probability density estimate (Fig. 6B). This indicates that the likelihood of our estimates being consistent with the lower POC yields of published data is nearly equal to the likelihood of being higher.

Re (4): Apart from these systematic and statistical effects, we cannot fully exclude any biogeochemical controls. At least we did not find any significant linear correlations between the sediment and POC yields and a number of catchment topographic parameters. Given the size of our study areas and the episodic nature of snow avalanches we also do not expect any such correlations.

We hope that this reply is helpful in that it sufficiently answers the questions raised in the review.

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