Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-114-RC2, 2019

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Snow gliding and glide snow avalanches: recent outcomes from two experimental test sites in Aosta Valley (NW Italian Alps)" *by* Margherita Maggioni et al.

Anonymous Referee #2

Received and published: 12 June 2019

General comments: The manuscript analyzes snow gliding processes on two experimental sites in the Aosta valley and describes how soil water content and soil temperature affects the formation of glide avalanches. The investigations may be a substantial contribution to improve our understanding about the major driving factors for snow gliding processes. However, there are some ambiguities (especially in the context of data gathering and measurement methods) which should be considered prior to publication. I recommend major revisions.

Specific points: Page2, line 11: The terms 'cold temperature events′ and 'warm temperature events′ were defined by Clarke and McClung (1999); thus the appropriate

Printer-friendly version

Discussion paper

citation should be included at this point

Page2, line 26: The authors should indicate the location of the weather station D' Ejola

Page2, line 28: On line 28 the authors used the term 'cumulative snow'; what is the meaning of this term (sum of new snow?)

Page3, line 4: The authors should indicate the location of the weather station 'Gressoney-S.J. - Weissmatten'; however, it is doubtful, if these data (the station is 12km away from the study site) are representative for the experimental site

Page 3, line 6: The authors should indicate the location of the weather station 'Gressoney-S.J. - Lake Gabiet'; as snow distribution depends on the site (and is subject to strong variations) it is doubtful to use the new snow amount from Lake Gabiet which is 4 km away from the study site.

Page 3, line 7: The abovementioned remark is valid in particular for the application of snow profiles, which were taken from site Sant' Anna (1 km away from the study site).

Page 3, line 11: As gliding is subject to strong variations it is probably not enough to have only two glide shoes per study area.

Page 3, line 14: The authors note, that they used Campbell Water Content Reflectometers for measuring liquid water content. According to figure 3 the device was also used for measurements in the snowpack (10 cm above ground). I doubt that the device is suitable to measure water content in the snowpack, since it was especially designed for measurements in the soil.

Page 3, line 20: The authors note, that the periods for the analysis were chosen according to the specific snow situations, but these situations were obviously not gathered on the relevant study sites (as indicated in chapter 2.2. they come from the surrounding weather stations).

Page 3, line 23: How was the instrumentation reset?

Page 4, line 18: What is the meaning of a ROS event? Is it a rain-on-snow event?

Page 4, line 23: The statement that 'the warm temperature events often occurred after a snowfall followed by a sharp increase in air temperature, resulting in a decrease in the snow depth' cannot be figured out from Figures 4-7. According to Figure 6 there was a strong increase in gliding in autumn 2014. However, that rise was clearly before reaching the maximum snow depth and there was no sharp increase in air temperatur

Page 4, line 30: The authors note that in autumn 2013 snow gliding occurred earlier in PN than in SA. In order to identify these findings in the relevant Figures, it is necessary that the x-axis in Figures 4 and 5 have the same scale.

Page 4, line 38: Feistl et al. (2014) is missing in the References (I think it should be 'Feistl, Bebi, Dreier, Hanewinkel, Bartelt: Quantification of basal friction for technical and silvicultural glide-snow avalanche mitigation measures').

Page 5, line 7: The authors note that there was no snow at the ground between the event on Nov. 24th and Jan. 14th. There are two points which should be explained by the authors: 1) according to line 1 (page 5) the relevant event occurred on 21st of November and not on the 24th. 2) according to line 10 (page 5) there was a snowfall on Dec. 19th; so why was the site free of snow from November 2013 until January 14th.

Page 5, line 10: Wherefrom is the number of 30 cm of new snow, when there are no snow measurements in close vicinity to the study site (according to chapter 2 the snow measurements come from the 'Lake Gabiet' station which is approximately 4 km away from the experimental site).

Page 5, line 22: What do the authors mean with the sentence '. . .the soil was cooled by the upper snowpack'. A mighty snowpack provided, soil surface temperatures should remain more or less stable (near to 0°C) over the whole winter season

Page 6, line 22: The Discussion is missing.

Page 6, line 38: A cooperation of snow and soil scientist was proposed already by Höller (2014); thus the appropriate citation should be included at this point.

References: Feistl et al. (2014) is missing (I think it should be 'Feistl, Bebi, Dreier, Hanewinkel, Bartelt: Quantification of basal friction for technical and silvicultural glide-snow avalanche mitigation measures').

Figure 3: According to Fig. 3 the Campbell Water Content Reflectometers were also used in the basal snowpack (10 cm above ground). I doubt that these sensors are suitable to measure LWC in the snowpack, since they were designed in particular for measurements in the soil.

Figures 4 – 5: To enhance comparability the x-axis in Figures 4 and 5 should have the same scale.

Figures 4 – 7: The registered 9 glide snow avalanches should be indicated by additional arrows. Thus it would be easier to compare the snow glide measurements with the relevant events.

Figures 4 – 7: The glide measurements indicate extraordinary values (about 2000 cm (20 m) in Fig. 4 and 5) and up to 15000 cm (150 m) in Fig. 6 and 7. I am wondering if such values can be measured with the Sommer-device, since the length of the wire is only 4 m in total.

Figure 6: According to Fig.6 the liquid water content in the snowpack is approximately 20

Table 1: The specified periods in Tab. 1 do not correspond with the indicated cold and warm periods in Fig. 4 – 7. The last column of Tab. 1 shows the number of data (N), but it is not clear what these numbers means in the context of snow gliding.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2019-114, 2019.