Reviewer 1

On a general point of view, this paper is interesting because it concerns two types of snow avalanches and a quite long record to perform nice analysis. However, I recommend some corrections, which could be done quite rapidly considering my point of view.

The first sections are good, but I propose a major reworking of the results and the discussion sections. First of all, the results of the PCA did not convince me about the importance and necessity to present these results. Secondly, I recommend to present separately the two types of snow avalanches in two different sections clearly identified Wet snow avalanches and Dry slab avalanches. Thirdly, in the Discussion section, each of these types of avalanches should be discussed separately about the best predictive variables and their significance on a statistical point of view, but also on physical process for triggering of SA and all the literature review concerning both types of avalanches.

The last section of the discussion should concern the limitations of the modeling processes and I recommend to use, for example some specific points as follow:

Limitations related to the avalanche database (validity of the observations in time, etc.) Limitations related to the weather variable (number of stations, location, interruption, etc.) Limitations related to the modeling processes used: DT and RF models Limitations and validity of the results about climate change (comparison with scientific literature depending of the geographic location, trends in Europe or elsewhere, challenges to better cope with the changing climate, etc.) Recommendations at various scales: for the Mountains studied, government for weather monitoring, snowpack records, avalanche expert in modeling, climate change adaptation, snow avalanche hazard assessment, etc.

In addition, please see my several comments on the pdf version of the manuscript. Some relationships between weather variables and wet or slab avalanches need to be improved on the basis of the physical process that governs the release of avalanches.

Some figures could be improved, but most of them are useful, the tables are useful and the literature cited is sufficient and pertinent. Finally, my recommendation concerns more a reworking of the structure of the paper and a deeper discussion than remodeling wet and slab avalanches with weather variables. The work that have been done appears sufficient for publication, but the presentation of the results and their discussion could be improved.

Hope my opinion and comments will help the authors to improve their interesting paper about snow avalanche modeling.

Good luck

Author's Response: Dear Dr. Daniel Germain, thank you for your constructive and valuable comments and suggestions. We will revise the manuscript carefully and implement your comments within the updated manuscript and believe that it will improve our article significantly to meet requirements for successful publication. We appreciate your suggestion regarding the manuscript's structure and will create separate sections of wet and slab avalanaches in the results. Furthermore, we plan to use your recommended structure in the discussion, including the limitation points. Additionally, the PCA analysis and all related discussion will be removed from the manuscript and replaced with trend analysis suggested by RC1. Thank you for your detailed comments in the pdf regarding content, clarity and typos. Below we respond to comments made in the pdf regarding content or clarity.

Line 132 Sorry, but this is not so obvious on the Figure 1. In addition, the avalanche level is not easy to understand. The red color = high danger but if I am rigth it is located downslope in the runout zone, where the return period of avalanches is certainly longer than in starting zone, which in turn is blue (low danger level) but certainly characterized by a higher frequency of events!

Author's Response: The sentence in line 132 will be referred to the new table/figure not Fig. 1. Yes, you are correct. The polygon's colours are reverted. Hight avalanche danger is red colour and should be assigned to the smallest avalanche length. The red/yellow/blue polygons describe return periods = high (10 years), medium (30 years) and low frequency (100 years) of avalanche events is reached 10/30/100 in Fig. 1. It was counted with the Rapid Mass Movement model (RAMMS) avalanche module by Blahůt et al. (2017).

Line 248 "Sorry but I do not understand what these years refer to"

Author's Response: These years refered to 0 avalanche records (winter 2010-11) and 77 records (winter 2005-2006). The original sentence will be replaced by: "This number varies greatly year–to–year and ranges from 0–77 records (no records in winter 2010–2011, 77 records in 2005–2006)".

Line 254 You mean during this time interval? Please remove the word again since it is the first time a decrease occured.

Author's Response: Yes, We meant this as a time period. This sentence will be rephrased: "It was revealed that the number of wet avalanches classified in the cadastre as wet, i.e., C=2 (186 Aval), were increasing during the period 1961–2011". The word "again" will be removed.

Line 278 Ok, because with snow depth, rain, sunligth duration and precipitation, almost all the weather variables are correlated to snow avalanches, which makes difficult to construct a simple predictive model. This is why at this point of the paper, I am questioning the pertinence to rpesent the PCA analysis!

Author's Response: After reconsidering the updated concept of the manuscript, the PCA analysis and all related discussion will be removed from the manuscript and replaced with trend analysis suggested by RC1.

Line 288 Do you have any explanation for the wind effect? Because it concerns wet avalanches, certainly with a higher occurrence in spring time, could it be related to warming effect of a hot wind such as the Foehn effect? Or, conversely, related to snow overlaoding depending of the wind direction and slope aspect?

Author's Response: We assume it could be both, depending on wind direction. Prevailing western winds accumulate snow on leeward slopes and create cornices and deep snow pillows. We can also document the highest wet avalanche activity on the SE and E slopes, while the proportion changes over time. We will add a new figure displaying avalanche activity on different slope aspects. The phenomenon of anemo-orographic systems: the relationship between the relief and the dominant wind direction is explained in (Jeník, 2008, 1961) and is related to the Krkonoše mountains. The key part of anemo-orographic system is open valleys on the windward sides of the mountains, which play the role of corridors. These valleys are followed by plateaus, where the wind speed is accelerated. As a result, the snow is redistributed on the leeward sides of anemo-orographic systems. In leeward valleys, the wind slows down due to turbulence and the subsequent deposition of snow. We already considered the possible foehn effect in Discussion in Line 349. The dry, warm wind, known as "föhn", can cause very intense melting or avalanches. .

Line 296 So, you mean that with at least a snowfall of 13 cm the probability of avalanching increase significantly in 3-day period ? This valeu seems quite low to me considering on one hand, the altitude of the starting zones near 2000 m, and the other hand, the high frequency I imagine than a snowfall of 13 cm over 3-day period migth occur in this mountain area !

Author's Response: We assume the the probability of avalanche occurrence could possibly arise. However, the performance of DT is lower than RF and it is related to very low percent of used data. Furthermore, related to anemo-orographic systems, the actual measured value at the LBOU windward station might be lower than the actual ammount of snow on leeward side of avalanche paths

Fig. 5 I sugget to put more details about the numbers presented in this DT. 1 and 0 = avalanche day and non-avalanche day? Not clear to me what is the meaning of the percentage and probability ? I don't know exactly how you split your DT, but it could also be useful to show the number of Ad and Nad in order to see if 5 splits appear to much.

Author's Response: Yes, 1 and 0 = avalanche day and non-avalanche day. The number "0.38" is probability and means if the SD_value < 99 there is a 0.38 probability the avalanche will not be released. If ($SD\_value \geq 99$), there is a 0.38 probability it will be released. The percentage means how many percent of data is influenced by the split node - in this case 100 % of the wet avalanche dataset. The caption of the figure will be altered into: The Decision Tree of weather variables triggering wet avalanches. Numbers 1 and 0 = avalanche day and non-avalanche day. The single value means the probability of occurrence/ non-occurrence of avalanche release. The percentage signifies how many percent of data is influenced by the split node from the wet SMOTE avalanche dataset.

Fig. 6 - See my comment on Fig. 5

Author's Response: The caption of the figure will be altered into: The Decision Tree of weather variables triggering slab avalanches. Numbers 1 and 0 = avalanche day and non-avalanche day. The single value means the probability of occurrence/ non-occurrence of avalanche release. The percentage signifies how many percent of data is influenced by the split node from slab SMOTE avalanche dataset is used.

Line 313 Maybe you should give the percentages in brackets, it will help.

Author's Response: The percentage will be inserted into the existing sentence: "The wet avalanche slab model predicts 84 from 91 avalanches (92.3 %) and 6555 non-avalanches from 6588 (99.5 %). RF model correctly predicts slab avalanches 254 (true positives) / 271 (93.7 %) and 5813 (false negatives) / 6643 (87.5 %) slab avalanche days".

Line 329 This last part of the sentence is not appropriate with the previous one about hypothesis.

Author's Response: After thorough consideration and RC1 comments, the hypothesizes will be removed from the revised manuscript, and only the aims of the manuscript kept.

Line 332 Not sure the PCA results are very helpful here once again.

Author's Response: After reconsideration, the PCA analysis and all related discussion will be removed in the updated manuscript.

Line 341 Ok these results are important, but you did not discuss deeply enough. Why for example is it the case in theses mountains What are the geographic, environment, or climatic characteristics that could explain, at least partially, these results?

Author's Response: We will further discuss it in the revised manuscript.

Line 345 Once again, you need to discuss the limitations of your results in regard to the location of the weather station and so on.

Author's Response: We will add your suggested chapters regarding the limitations.

Line 350 With a databse of 60 avalanche paths, you prabably have different slope aspects ? Did you natice any trend or difference between wet and slab avalanches. Usually wet avalanche are more sensitive to south slope aspect with direct solar radiation, etc. Conversely, slab avalanche migth related to snow overlaoding on the lee-ward slope. All these points need to be more thorougly discuss in this section.

Author's Response: We will add the figure of slope orientation of wet and slab avalanche activity. Both, wet and slab avalanches are mainly eastern, south-eastern, south and north-eastern slope oriented.

Line 382 You mean that for example the condition such as cloudy sky is decreasing?.

Author's Response: Yes, possibly, but we can not directly say. The expression "proxy of solar radiation" can be deleted as we do not have the cloudiness data to verify it. If we find cloudiness data, we will reformulate the sentence.

Fig. 10 Could it be possible to have a bias in the weather dataset ? You recorded a decrease and then an increase in rainfall sum in the same manner of sunligth duration. generally speaking, less rain should be correlated to more clear sky and sunligth, and conversely, but ut does seem the case with your data. Do you have any explanation?

Author's Response: We presume it is not likely, but we will check this possibility. In case we find bias, we will replot the figure in the updated manuscript.

References

Blahůt, J., Klimeš, J., Balek, J., Hájek, P., Červená, L., and Lysák, J.: Snow avalanche hazard of the Krkonoše National Park, Czech Republic, Journal of Maps, 13, 86–90, https://doi.org/10.1080/17445647.2016.1262794, 2017.

Jeník, J.: Alpinská vegetace Krkonoš, Králického Sněžníku a Hrubého Jeseníku: teorie anemo-orografickỳch systém, Nakl. Cěskoslevenské Akademie Věd, 1961.

Jeník, J.: Anemo-orografické systémy v evropskỳch pohořích, Geografické rozhledy, 2, 4–7, 2008.