Tabelle 1

Reference	Comment
Figur 1	The figure is important to illustrate the failure modes. While capital letters are used for the reference in the figure, lower case letters are used in the caption. The reference is also clear in this way, but consistent use of the same symbols would be cleaner.
Figur 2	The figure with the present and the past photograph is important to provide a picture of the study site. However, the information on the overview map is rather sparse. At least the overview map should contain reference coordinates, a map scale and a north arrow and more information like for example a Google Satellite map.
Figure 3	The figure is important to illustrate the bedrock discontinuities. While capital letters are used for the reference in the figure, lower case letters are used and the stereonet is not referred in the caption. The reference is also clear in this way, but consistent use of the same and of all symbols would be cleaner.
Figure 4	A figure that shows an overview in a map is a pretty idea. However, this map should be cleaned up and completed. Therefore, reference coordinates should be added, the DEM should be either mapped in a more accessible color scale with a legend or removed since it is actually a result and all locations of the field survey should be added.

Reference	Comment
Figure 5	The figure is important to illustrate the mapping of talus deposits. While capital letters are used for the reference in the figure, lower case letters are used in the caption. The reference is also clear in this way, but consistent use of the same symbols would be cleaner.
Figure 6	The figure that shows the talus deposits identified in the study is useful. Reference coordinates on a map are important for later geo referencing. Therefore some reference coordinates should be also added in this map.
Figure 7	A figure with a map for the measurements and a stereonet for the distribution of the discontinuties is crucial. But it requires several small improvements and could be extended by the outcrops. The map should have coordinate references, the color scales should be accessible, the symbols to relate the elements in the caption should be consistent and the area of the outcrops could be shown too.
Figure 8	The figure with a map of the susceptibility is a key results. But it requires several small improvements. The map should have coordinate references, the color scales should be accessible and the symbols to relate the elements in the caption should be consistent.

Reference	Comment
Figure 9	A figure with close up maps that show the talus deposits and the susceptibility can be useful. But it less relevant and would also need some small improvements. Therefore it could be either removed or implemented into a extended figure 8 with the same improvements.
Figure 10	A figure with a map of the rockfall runout is a key results. But it requires several small improvements. The map should have coordinate references, the color scales should be accessible and the symbols to relate the elements in the caption should be consistent.
Figure 11	The figure with the kinetic energy at the railroad track is useful to assess the hazard. But it requires some small improvements and could be extended with the number of passages. The symbols to relate the elements in the caption should be consistent and a secondary x axis on the bottom with the number of passages would allow to plot them as a function of the relative location too.
Figure 12	The figure about the high planar sliding failure susceptibility can be a useful detail. However, it appears as an isolated detail in the structure of the discussion. Therefore it would be better to move this in the results and to combine it with a similar illustration for the block toppling failure susceptibility.

Reference	Comment
Figure 13	The figure with the propagation susceptibility and the location of a recorded event provides an interesting detail. However, it appears as an isolated statement in the structure in the discussion and the added value seems rather low. Therefore, this figure could be also removed whereas in general, a more systematic assessment of how well the susceptibility map match the recorded events would be desirable.
Line 17	Implicitly it is clear from the title that „AK“ stands for Alaska. Foreign readers have to guess this abbreviation. It could be written „Alaska“ or „US-AK“ according to the ISO standard instead.
Line 20	The statement „>300“ is not wrong and one can guess that it indicates the order of magnitude. But it could be more precise since the exact number is known. Therefore it is better to write „337“.
Line 23	The statement „nearly 200000“ is not wrong and one can guess that it indicates the order of magnitude. But it could be more precise since the exact number is known. Therefore it is better to write „197800“.
Line 24	The term „hazard“ has different definitions in literature. A key point of a hazard is, that it reflects a potential and is therefore related to a probability. In this context it would be more appropriate to use the term „susceptibility“ or to substitute the term „highlighting“ by the term „indicating“.

Reference	Comment
Line 30	The main issues of rockfall is described in a concise manner. But the term „rockfall“ is not used and therefore only implicitly defined. An explicit definition would provide more clarity.
Line 34	Implicitly it is clear from the title that „CA stands for California. Foreign readers have to guess this abbreviation. It could be written „California“ or „US-CA“ according to the ISO standard instead.
Line 78	This is a concise description of the rockfall process. But the stop of the rock fragment due to energy dissipation is only implied and the sliding mode is not mentioned. A more explicit formulation that sufficient energy dissipation occurs until the rock fragment stops as well as to explicitly mention bouncing, rolling and sliding would be more complete.
Line 85	This last statement about the runout models applied without accurate quantification of the source areas is crucial. Here it is hidden in a complex sentence that also mixes the term „hazard" and the term „risk“. To start with a new sentence after the citation of „Stock and Collins, 2014“ that highlights this gap would be very useful.

Reference	Comment
Line 90	The statement about the relation between the spatial pattern of glacial erosion and the bedrock discontinuities is important for the argumentation. The use of the term “fabric” and the term „tendency" with the link “or” makes the statement less concise. To be more concise, one could use the term „align“ instead of the term „follow“ and then only the term „fabric“ since it is later used too.
Line 93	It is interesting to mention the presumed connection between small but frequent and large but less frequent events. However, this sentence is cumbersome and it is not clear what the term „cumulative impact“ means. The sentence should be simplified and it should be clarified, which property of the events is actually compared.
Line 101	It is intuitively clear that the term „western“ does not have a geographic but a cultural meaning. Still it maybe confused. Therefore it would be appropriate to write it with a capital letter as it is later in the paper.
Line 115	It is intuitively clear that the term „panhandle“ does not have a culinary but a geographic meaning. Still it may confuse a reader that is not familiar with this region. Therefore it would be appropriate to follow the convention and write it with a capital letter.

Reference	Comment
Line 122	The summary of the identified joint sets in other studies is relevant. But this sentence is kind of cumbersome. In this formulation it needs a comma after the term „Skagway“ and it could make sense to part into two sentences after „Fig. 3c“.
Line 127	It is implied by the figure that the information about the joints originates from field survey. But if not, this statement would need a citation of a source. Therefore it should be explicitly mentioned or even moved to the results.
Line 152	The standard information about the climate are useful. But this sentence is cumbersome and lacks of a citation of the source. Therefore it should be parted into at least two sentences and a citation should be added.
Line 158	The value about the mean annual precipitation is informative. But it lacks a reference of the measurement period a citation of a source. Both should be added to support this information.
Line 161	The information about the forest are useful since it is later considered in the runout scenarios. But the description is inaccurate and does not meet botanical standards. Either the scientific names of the tree species should be used or they should be summarized as coniferous wood.

Reference	Comment
Line 169	The findings of the study mentioned here are important for the later discussion of the results. But this sentence tires to merge to much information and becomes cumbersome. One could start a new sentence after the term „valley“ and substitute „that“ after the term „Skagway“ by „and“.
Line 174	Intuitively it is clear how the relation between the relative activity and the vegetation cover is meant. However, the term „is based“ seems logically difficult in this context. It is the estimate of the relative activity that can be based on the vegetation cover and this statement should probably also be backed up with a citation.
Line 215	The existing lidar from 2014 is an important data source. But it is not clear if it is only available as a DEM or also as point cloud. This should be clarified, furthermore the area of its extent should be mentioned and a space after „DGGS Staff, 2013“ should be inserted.
Line 226	A combination of both DEMs is reasonable for the later analysis. But the term „seamless“ does not fit with the separated area in the referenced figure. This should be made consistent, either in the sentence or in the figure.

Reference	Comment
Line 229	It is important to differentiate if a talus deposition is forested or not. But the term „exposed“ can be misleading in this context. It would be better to use the term „unforested“ as it is later and a comma should be added after the term „both“.
Line 256	The record of the discontinuities in a field survey is a robust approach. But it is crucial to provide additional meta information about the locations. At least the number of locations should be mentioned and they could be shown in a map as points.
Line 262	This sentence that summarize the kinematic analysis applied in this study is useful. But the discontinuity data are not explicitly mentioned. Even though one can guess that they play a crucial role, it should be mentioned additional to the mention of the DEM.
Line 267	Since pixel size, joint spacing and block diameter are all in the same order of magnitude of some few meter, this approach seems valid. But these scales are relevant and large differences may be problematic. Therefore it would be important to explicitly mention these scales and their consistency in this study.
Line 272	The validation of the susceptibility derived from the kinematic analysis is crucial. In contrast, the description of the validation is too vague. Even if it is just based on manual approaches and expert opinion, this should be done systematically and mentioned accordingly.

Reference	Comment
Line 287	It is a good argument to exclude the wedge failure mode from the kinematic analysis since it is not observed or reported. Nevertheless, an evaluation of this mode could be interesting, even if two discontinuities have to be taken into account. At the very least, the more complex evaluation with two discontinuities in each case should be cited as a further argument for not including this module in the study.
Line 290	The orientation and the angle of the dip for the discontinuity and the rock slope are key parameter. How the symbols are assigned to the discontinuity and the surface must be guessed. This should be clarified for example by writing „discontinuity (A)“ and „rock slope (f)“.
Line 325	It is correct, that RAMMS:Rockfall accounts for the energy balance. This only one aspect that does not highlight its sophisticated mechanics. It should be mentioned, that RAMMS:Rockfall accounts for the internal, gravitational and contact forces of a rigid body that can translate and rotate.
Line 334	A minimum size of the polygons that serve as rockfall source areas makes sense for the reasons mentioned. But the area of 25 m2 does not align with the point density of 0.02 1/m2. According to this point density, the area should be 50 m2 to guarantee at least one point per polygon.

Reference	Comment
Line 337	The statement „nearly 5000“ is not wrong and one can guess that it indicates the order of magnitude. But it could be more precise since the exact number is known. Therefore it is better to write „4945“.
Line 341	The forested area is important for the definition of the scenarios for the runout modeling. Here it lacks a description how the forested area is mapped. It should be added if this was done with a manual approach or based on some existing maps for the vegetation cover.
Line 348	To consider scenarios with and without forest is an added value to the study. However, one can only guess that without forest, the ground cover category is also fine talus. Therefore the ground cover category for this case must be explicitly mentioned.
Line 352	The estimate of the block size from points clouds and orthoimagery is a valid approach. However, here it lacks a more detailed description that would be required for a reproduction. Therefore, the method must be either described in more detail or cited in case that it is based on a reference.
Line 359	It is widely observed, that larger blocks tend to travel further. Nevertheless, this statement may be cited and is not relevant in the methods. Supported with a citation it could be moved in the discussion.

Reference	Comment
Line 363	Both, the term „clast“ and the term „block“ can be used for the rock fragments. But it can be confusing when both terms are used without a clear reason. Therefore, in general only one term should be consequently used.
Line 366	The statement „nearly 50000“ is not wrong and one can guess that it indicates the order of magnitude. But it could be more precise since the exact number is known. Therefore it is better to write „49450“.
Line 368	It is useful to constraint the area of the runout modeling. Even more useful would be some quantitative measures. Therefore one could add the total area of the perimeter as well as the area of the considered rockfall sources.
Line 370	A quantification of the likelihood of rockfall runout is important and often conducted by counting rockfall passages. However, as an absolute measure it can not be compared with other sites and with the rockfall initiation susceptibility. One could divide this absolute measure by the total number of simulations to get a relative measure that can be considered as rockfall propagation susceptibility.

Reference	Comment
Line 375	For a hazard at the railroad track it can be interesting to assess the kinetic energy. But this requires the rock density as an additional parameter, which is nowhere mentioned. Even though the rock density can be guessed from the mentioned lithology, it would be more proper to make the assumption transparent.
Line 379	The reference period is crucial for the rockfall inventory. But this sentence contradicts the methods and does not fit in the results. It should be written in the methods, that only newspaper records after 2017 are considered and maybe reasoned why not 2005 like the records of the GeoEvent database.
Line 392	The temporal pattern of rockfall activity can be indeed interesting. However, this statement about the temporal pattern is only qualitative. Therefore it would be desirable to have some numbers and maybe a graphic.
Line 412	The argumentation with the slope steepness is important to highlight the differences in the morphology of the locations. However, it would be useful to provide more quantitative information about the steepness. Since the slope angles are know from the DEM, one could provide the ranges of slope angles to quantify the steepness of the morphologic features.

Reference	Comment
Line 437	The identification of clusters and grouping into sets is crucial for the characterization of the discontinuities. The fact that this was done and how it was done belongs in the methods and not in the results. Therefore this content should be moved and supplemented by more details about the approach that was used.
Line 459	The argumentation with the slope steepness is important to highlight the differences in the susceptibility due to the rock slope orientation. However, it would be useful to provide more quantitative information about the steepness. Since the slope angles are know from the DEM, one could provide the ranges of slope angles to quantify the steepness of the mentioned rock slopes.
Line 469	The combination of the talus slope maps and the susceptibility zones is crucial to define the source zones for the runout modeling. Nevertheless, this belongs to the methods and not to the results and should be described in detail. Even in case that this is done by manual approaches and expert opinion, it should be mentioned already in the methods.

Reference	Comment
Line 488	It is helpful to have an introduction sentence that connects the results to the corresponding methods. But this sentence has some need for improvement. There should be a comma after the term „initiation“, the term „used“ could be substituted with the term „applied“ and it instead of „nearly 50000“ it would be better two write „49450“.
Line 490	That the total number of passages allow identify zones with high rockfall susceptibility is a crucial point. However, this sentence is kind of cumbersome. At least a comma should be added after the term „pixel“.
Line 492	It can be useful to argue with the number of passages to highlight zones with high and low susceptibility. But this should be done more systematic because like this one have to remember the setup of the model to interpret statements like „~10 specific chutes or paths of likely rockfall runout“. The definition of a relative propagation probability would be the basis to solve this issue.
Line 520	It is correct, that the forest cover and the clast size influences the rockfall runout. But several terms in this sentence could be misleading. Instead of term „dense forest“ one should use the term „forest cover“, instead of the term „determining“ one should use the term „influencing“ and instead of the term „risk“ one should use the term „hazard“

Reference	Comment
Line 532	One can conclude from the rockfall inventory, that rainfall initiation thresholds are likely not successful. But such a statement must be better founded on data and contextualized in literature. The statement should be at least constraint to the study site, it should be reasoned better by the underlying mechanisms and a quantitative analysis of the rockfall inventory should be conducted,
Line 551	The greater relevance of the block toppling failure over the planar sliding failure is an important finding of this study. It is already assumed in the methods and shown on the maps in the results, but not yet with hard numbers. Therefore it would be desirable to use quantitative measures like for example the average susceptibility and the susceptible area for a more sound argumentation.
Line 563	The consistency of the susceptibility maps with the field observations is a crucial finding of this study. However, this statement does already appear in the results but lacks a systematic foundation. In general in should be founded with a more systematic analysis and here in the discussion it should be contextualized with other studies.

Reference	Comment
Line 566	It is correct, that the vegetation can one possible factor that can contribute to crack widening. But in this formulation it appears like a finding and that the vegetation is the most prominent factor. Therefore it should be written more as an assumption, contextualized with other studies and the other processes should be explicitly mentioned.
Line 570	The numbers of the mentioned erosion rate seem plausibel and are an interesting geomorphological information. But here it is not clear how these numbers are derived. Either there must be a yet hidden method that should be added or some literature that should be cited.
Line 574	The patchy pattern of rockfall susceptibility along the ridge is an important finding of this study. But this sentence seems more like a final sentence of the previous paragraph, even though the runout discussed in this paragraph also shows a patchy pattern. Based on this relation, one could formulate both, a closing final sentence for the previous paragraph and an adapted opening sentences for this paragraph.

Reference	Comment
Line 592	It is correct that the assessment of the risk would be a further step based on this susceptibility assessment. But a statement like this would fit better in the end of the discussion and must be more concise. Therefore it should be moved to the next paragraph and it is important to mention, that the risk does not only need the estimate of the damage but also of a temporal component of occurrence while the susceptibility does only have a spatial component of occurrence.
Line 603	The rockfall runout likely to be connected to the morphology of bedrock slopes and the orientation of joint sets based on the presented findings. However, this sentence should be more concise with the terms and the logic. The study assess the susceptibility but not the hazard and it is important to mention that the runout susceptibility is on hand dependent from the initiation susceptibility but also from the slope morphology during the runout.
Line 605	It is reasonable to assume that the orientation and extent of glacial erosion is not independent of the joints. But the reasoning seems incomplete and lacks a contextualization with the literature. One could also assume a relation between the orientation of the joints and the ridges due to the tectonic situation and anyway both assumptions should be compared with other studies.

Reference	Comment
Line 609	Indeed the study provides key constraints for identifying areas at risk. But in this context, this is a rather specific value for this study site while the mentioning of more general value of this study is missing. Therefore, one could mention the added value from the combination of the kinematic analysis with runout modeling, which could be groundbreaking in general since the susceptibility of the source area is often neglected.
Line 617	The evidence of the structural control in all sub sites of the study site is an important statement. But this sentence is kind of cumbersome considering the logic of its statement. Either one should use the term „evident“ instead of the term „reflected“ or to extent it to „reflected by the findings“.
Paragraph 2	This paragraph is important and has a clear opening sentence. However, it lacks a clear final sentence as well as the closing sign. In conclusion, one could refer to the advantages and disadvantages of the methods mentioned and also define the term “susceptibility” as a relative likelihood of triggering rockfall at a particular location.

Reference	Comment
Paragraph 5	This paragraph is crucial and has a clear opening sentence. However, it lacks a clear final sentence that summarize this important basis for the paper. It could be concluded, that this observed relation between the orientation of the valley and the discontinuities supports the application of a kinematic analysis over an extensive area to estimate rockfall susceptibility.
Paragraph 6	This paragraph is interesting and closes the introduction section. Nevertheless, it anticipates content instead of completing the introduction. The details about the study site could be moved into the study site section so that the content could summarize the key points of combining kinematic analysis with runout modeling and compare with empirical evidence in a case study.
Paragraph 9	Both, the information about the climate and about the forest is useful to characterize the study site. Here they are mixed in one paragraph. Even though they are related, it would be more clear to separate this into two paragraphs.
Paragraph 12	An overview for the methods can be useful if many parts are nested. Here is no more information than in the titles of the sub-sections and it also contains parts about the motivation of the study. Therefore, this paragraph respectively sub-section could be either removed or more informative like for example with an illustration of the workflow.

Reference	Comment
Paragraph 13	The rockfall inventory provides important empirical data about the susceptibility. But the paragraph respectively the sub-section lacks of relevant meta data. It needs the area considered in addition to the time span, an estimate of the accuracy for localization and a systematic indication of the type and attributes of the inventory data.
Paragraph 15	It is legitimate to use manual approaches and expert opinion for mapping the talus deposits. However, there is no systematic scheme mentioned for generating the polygons, which makes it difficult to reproduce this important data. A systematic scheme would define a scale for spatial units in which the information from the various basic data would then be evaluated according to defined criteria for the separation of talus deposits.
Paragraph 16	The data about the discontinuities are the key for the kinematic analysis. But it is not explicitly described, which parameter are effectively measured. One can guess that these parameter are the orientation and the angle of the dip and maybe the distance, but this should be clarified and supplemented with a measurement error.

Reference	Comment
Paragraph 21	This paragraph contains interesting information about the sources of discontinuity data for kinematic analyses. But it is unfavorably positioned in this sub-section and interrupts the flow. These information should be better moved to the beginning of this sub-section.
Paragraph 22	The susceptibility for the two failure modes derived from the kinematic analysis is a solid and pretty approach. Nevertheless, the question arises about a combined susceptibility that accounts for both failure modes. Because it cannot be ruled out that a discontinuity for a particular rock slope is susceptible to both failure modes, a probabilistic union could be used for the calculation.
Paragraph 29	The rockfall inventory provide important data about the rockfall activity in the study site. But a more systematic and quantitative assessment would be desirable. By clearly defining the reference period and the reference area, one could estimate the rockfall activity as events per time and area which could be compared with other studies.
Paragraph 30	The analysis of the pattern of rockfall events to identify trigger conditions would be indeed interesting. But this should be conducted in a more systematic and quantitative manner. Either some statistical approaches should be used or this side topic should be excluded from the study.

Reference	Comment
Paragraph 32	It is useful to provide quantitative data about the talus deposits identified in the study. But the data provided in that paragraph are not systematic and therefore not complete. For all of the five locations showed in the figure, at least the number and the area of the talus deposits should be provided.
Paragraph 36	The additional assessment of the kinetic energy at the railroad track can be interesting for a hazard analysis. Nevertheless, this is on the edge of the scope of the susceptibility analysis that could be more detailed instead. One could considered to remove this part about the kinetic energy but to focus on a more quantitative analysis of the susceptibility that provides data about the area of the runout zone and the relative propagation susceptibility.
Paragraph 41	Indeed the rockfall pattern along the railroad are an important finding to be discussed. Here it seems more like a repetition of the results instead of a discussion. It would be important to discuss the reasons for this pattern and, in particular, the influence of slope morphology on runout.

Reference	Comment
Paragraph 43	A summary of the findings can be indeed useful. But this would be better placed in the beginning of the discussion while the conclusions are missing. The main conclusion could be, that the combination of the kinematic analysis and the runout modeling matches well to the data of the field survey and provide the basis for a sophisticated approach in rockfall hazard assessment.
Section 1	The introduction fulfills its purpose to introduce into the topic and creating a territory and a niche. However, there is potential for improvement with regard to occupying the niche. Instead of the summary in the end, one could highlight the potential of the proposed approach and state a research question about its predictive power for the observed pattern in this case study.
Section 2	The section about the study site is important and useful since the paper strongly focus on Skagway. But it is a rather long section and only structured by kind of stand-alone paragraphs. Similar to the methods, sub-sections could also be introduced to structure the content more clearly.

Reference	Comment
Section 3	The methods provide a well structured overview about the conducted work and the applied tools. However, certain aspects could be improved and one aspect could be added. While the rockfall inventory and the geomorphic mapping could be more quantitative also regarding a comparison with the modeling, to couple the initiation susceptibility with the runout susceptibility would add a great value.
Section 4	The results provide a well structured presentation of the findings from this study. Nevertheless, it would be desirable to have more quantitative facts and less interpretation in this section. This improvement could be valuable in general but in particular in the assessment of the rockfall inventory and the comparison of the geomorphic mapping with the modeling approaches.
Section 5	The discussion links back again to aspects from the introduction. But its structure should be improved and some crucial aspects are missing. The structure should be more straight forward in linking methods and results with the introduction while a critical appraisal like for example of how to deal with less consistent discontinuity orientations but also the development potential like for example to link susceptibility with hazard should be added.

Reference	Comment
Section 6	The conclusions provide a concise summary about the findings of the study. However, it should be also concluded, what these findings mean. One could highlight, that the proposed approach to estimate the susceptibility match well to the field observation and in combination with a magnitude-frequency relationship it could be also used for hazard assessment with a simple but robust approach to incorporate the rockfall sources.
Table 1	An overview of the rockfall inventory is indeed useful. But a table that only contains the smaller part from the newspaper records is less helpful. One could make a graphical overview that captures the location and the time of the events.