Reply to final review on "Headwater sediment dynamics in debris flow catchment: implication of debris supply using high resolution topographic surveys" by A. Loye et al.

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Response to the final review

Thank you very much for the comments and particularly for the very nice review of the English made by handling associate Editor Ms Susan Conway that improved the readability and clarity of the manuscript. Please find here below a point-by-point reply to the comments, the suggestions and the few minor corrections addressed by her review.

P1/L24: As a willing to keep showing to the reader the contradictory of the behaviour in sediment transfer, the word « equivocal » was changed to « ambiguous » in order to keep the idea « open to discussion » or « to interrogate ».

P2/L6 : Rainfall, snowmelt, intensity, duration, each of these caracteristics of precipitation plays a role by itself, but remains unsufficient to predict debris flow. That's why « intensity » and « duration » are emphasized. The word « precipitation » would be too general. <u>No change was made !</u>

P2/L9-10: The sentence was replaced by the second proposition of the reviewer, which reach the closest of the authors'idea.

P2/L19: Sediment process activity means all what the reviewer suggested : process rates, frequency, volumes, etc. Therefore, the term was replaced with « sediment process and rates and volumes » in order to emphasize the idea « activity ».

P2/L26-27: The confusing sentence was removed as suggested.

P3/L11-12 : The « poor-english » sentence was modified as suggested.

P4/L17: No, this map was made by the first author and has not been published yet (beside in his unpublished PhD manuscript).

P5/L6-7: Yes, this is what we mean. The add was made as suggested.

P5/L19: Yes, this is what we mean. The add was made as suggested.

P5/L28: The proposition of the reviewer is correct. The change was made as suggested.

P6/L4: The standard national grid for France was used. No need to specify the coordinate system in full.

P7/L23-24: Both difference (positive and negative) were included in the sum together. This was specified as suggested.

P7/L24: A reference to the later section defining the treshold was added as suggested.

P8/L12: The correct word is « consistent ». The change was made as suggested.

<u>P9/L13</u>: The suggestion is accurate. It makes sense to show a clear difference. The modification was kept.

<u>P10/L25</u>: It was meant that the gravel-wedges are incised and the related material was entrained and re-deposited further down. The « poor-english » sentence was rephrased by simply combining the two last sentences, that should emphasized the process observed in the field more clearly for the reader. Of course, this sentence could be removed, but the first author thinks that this is important to keep the reader informed of the several main observations made in the field.

P12/L30-31: Yes, this is what we mean, but there are several classes of volume, not just the largest one. A reference to the table 6 was added for clarity.

P13/L18 and L21-23 : By competent, we mean : « capable of transfering sediment downward, but with a relevant amount of sediment, not just a very small transfer of sediment that occurs every time. The word « competent » was replaced by the word « significant » and the word « downstream » was added to show the difference between the up (distal) and down (proximal) part of the torrent.

P17/L12: The reviewer is right, the two concepts are kind of the same. The sentence was rephrased in two distinct sentences to make the meaning clearer. The word « whereas » was written to give an idea of contrast, but there is not much contrast to express. A « and » make more sense.

P17/L14: (same as P13/L18). Here the word « competent » was replaced by « effective » because of the idea of the effectivity and efficiency of sediment transfer.

P19/L6 : ... from the head ? « of the subcatchment ». This was added to the sentence.

P20/L8 : subordinated means in this context « made dependent/conditional ». <u>The word</u> <u>« subordinated » was replaced by the word « made conditional on ».</u>

P20/L9-10: The term « early in the season » was replaced by « early in the year, from winter to spring » and the term « late in the season » was replaced by « later in the year », as suggested to make the temporality more clear for the reader.

<u>Other comments</u>: All minor corrections and changes according to poor english, bad synthaxes and small orthographic mistakes suggested by the associate Editor Ms Susan Conway was integrated to the text of the manuscript without any exception.

Table 2 : The last column is the total surface area of the non-vegetated area in [%] that was covered by the Lidar data survey. This means, for instance in the first row, that the scanned area covers the 84% of the surface of the subcatchment uncovered with vegetation. This is not the same as the third column,

which informs about the vegetation cover of the subcatchment. For clarity, the header of the last column was replaced by « [%] of the non-vegetated surface ».

Table 3 : The comment arises probably because the sentence says not exactly what the authors want to say due to bad english synthax. The authors wanted to say : 1. ... to detect distinctively geomorphic features with topographic changes down to a certain threshold/limit ; 2. By consequence, geomorphic features with a given minimum volume can be detected.

Therefore, the correct sentence that was placed instead, is : « subsequently to detect topographic changes down to a certain minimum volume of geomorphic features ».

More generally to the comment, the authors are convinced that this part was sufficiently detailed in the manuscript. The whole section 3.4 is dedicated to that, which is illustrated by table 3 and figure 6. More precisely, L.18 and L.27 on page 8 treat of this subject and the following lines of L.27 talk about the ability of the process to create a distinct topographic change. But we are aware that point cloud accuracy and limits of detection are two concepts that are not easy to understand for the ones who have never co-registered and co-georeferenced Lidar scanning data.

Figure 1 : The inset is a map of situation showing where the catchment is located. All useful information are in : it shows the country, the region, the names of the different city in the vicinity and it shows the different mountain ranges and it shows that the catchment is located in the prealpine domain at the border with the cristalline belt (also, the Alps). A simple contour map would not have not brought up that much useful informations to the people who don't know the area. <u>The inset was kept unchanged !</u>

The source of the aerial image and DEM were credited.

Figure 3 : As suggested, the location of the rain gauge was added, but in figure 4.

Figure 5 : Some kind of scale, as suggested, was added to part A of the figure. As the part B is a illustration and is schematic, the scale is actually not defined as it can be any scales. So adding something about scale is not really necessary to our opinion. <u>No information about the scale were added !</u>

Figure 7,8,9 : LoD was added in the legends, as suggested, instead of zero.

Other comments : All minor corrections and changes according to poor english, bad synthaxes and small orthographic mistakes that were suggested by the associate Editor Ms Susan Conway in caption and text of the tables and figures were integrated without any exception.

Lausanne, Mai 19, 2016

On behalf of all the authors

Dr. Alexandre Loye