Response to comments # RC2 on "High-resolution automated detection of headwater streambeds for large watersheds" Francis Lessard, Naïm Perreault, Sylvain Jutras

Dear Authors,

The developed approach is interesting and might be applicable for different landform and climate contexts. The presented work is also a good basis for further studies, which may consider streamflow regimes and shallow groundwater processes to detect headwater streambeds. However, I think the manuscript must be improved prior to its publication, especially regarding to the presentation of results. Please, see below my suggestions and comments:

1. Describe in detail the specific objectives of the study.

More details about specific objectives have been added. This will give a better understanding of the method and why it's a novelty.

2. You should provide some photographs highlighting the main characteristics of the study area as supplementary material.

Field photographs have been added as supplementary material to show the gradient of stream types according to hydrological process.

3. In the text, you mention several times the word "permanent" relating to "stream". However, I think you mean "perennial".

The term have been modified to be consistent with the literature.

4. Table 1: I do not think that roads and urbanized areas have high infiltration rates.

In fact, none of the streams surveyed in the field are located on roads or in urbanized areas. It has been modified to focus on Quaternary deposits rather than land use.

5. Please, provide a flowchart with the methodological steps of the work in the beginning of the methodological section. A short introduction of the applied approach is also valuable.

A simple flowchart has been added in the beginning of the methodological section with a short introduction to ensure ease of understanding.

6. Figure 3: show y-axis in logarithmic scale.

Since the figure represents channels head, the range is limited, and the logarithmic scale is not the best way to show drainage area. However, the limits of the y-axis have been modified to provide a clearer visualization of the data.

7. You found that PROB is negatively correlated with TPI, with an R of -0.57. Does this multicollinearity have no impact on the presented classification tree models in Fig. 4?

No, multicollinearity is not an issue in classification trees because they make binary decisions based on individual variables, independently selecting the most informative variables for splitting at each node.

8. Please, improve the presentation of your results, giving more details about them. Moreover, what else can be explored or assessed from the surveyed data? Are there any spatial patterns? What if you compare the results from the different natural provinces?

We went into more detail on how to interpret the results and try to make connections according to spatial patterns. Unfortunately, it will not be possible to compare the results with other natural provinces, as we do not have field data to confirm these results.