

Earth Surf. Dynam. Discuss., referee comment RC1
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Comment on esurf-2021-49

Anonymous Referee #1

Referee comment on "Sediment export in marly badland catchments modulated by frost-cracking intensity, Draix-Bléone Critical Zone Observatory, SE France" by Coline Ariagno et al., Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2021-49-RC1>, 2021

GENERAL COMMENTS

The manuscript esurf-2021-49 titled "Sediment export in marly badland catchments modulated by frost-cracking intensity, Draix-Bléone Critical Zone Observatory, SE France" presents a really interesting study based on a long-term database collected in a humid badland area located in the SE France. The manuscript presents interesting information and results, and I consider that it could be published after moderate changes. In my opinion, there are some major/moderate issues that should be checked before a new revision in Earth Surface Dynamics.

- In general, the manuscript presents new ideas and new data, analysis and results, but I will encourage the authors to highlight the novelty of your manuscript at the end of the Introduction section. In this paragraph, you should also improve the presentation of the general and specific objectives.
- I think that it is really relevant the long-term dataset that you present in this manuscript. As you briefly mentioned in the manuscript, there are few sites well monitored and with such long-term dataset. In that sense, I think that in the introduction section, it should be remarked, and also in the discussion section (line 270). You can also include other areas/references where this kind of information is recorded (Tabernas in SE Spain, Vallcebre in NE Spain...).
- In the study area, and throughout the manuscript (also in Figure 1) you present two experimental catchments (Laval and Moulin), but in most of the analysis (for example Figures 3 and 4) you only present data and information about the Laval catchment. This issue should be corrected or clarified in the manuscript.
- Line 115 and also check along the manuscript. You present the results about sediment yield in different units (tonnes, also erosion rates in mm/yr), I think that these results should be presented in specific values (tonnes per Km² or ha), as the catchment sizes vary. Please, homogenize this information.
- It is also not clear how do you record the data in the field (around line 129). You explain that you record data during events but, do you have a continuous temporal record? It is true that the maximum sediment export values are recorded during flood

events, but it would be necessary to understand how have you measured the data during all the study period. In that sense, it is always an interesting information to indicate which % of the sediment have been exported during the flood events, or even which % of the sediment have been exported during the maximum events... in that sense the high variability presented in Figure 3 could be better understood.

- Information provided in lines 128-130 is already a result. In that sense, I suggest two options: (i) to remove from this section and move to the results section; (ii) or to add some reference where this information is already presented.
- Temperature depths and temporal range. Lines 134-140. I think you should better justify the selection of the different depths why (1, 6, 12 and 24). Do you have any reference to add to justify this selection? Or previous knowledge about it in the study area? I'm also surprise about the time period selection, as you limited the information from mid-October to the end of March. I understand your decision and your justification, but it is true that in humid badland mountain areas there can be low temperatures (below 0°C) also in April or beginning of October.
- Lines 144-152. More information about the reconstruction of the temperature data should be provided (even as supplementary material). Maybe, more info about this process should be included adding a plot with the calibration and reconstruction analysis.
- I think that there is also some confusion about the period you used in the analysis. Some times you indicate 2005-2019 (line 160) but then you indicate 2003-2019 (2010). Maybe, as suggestion, it would be nice to include a table (maybe in the Supplementary material) with information about the variables that you have used, where (south-facing or north-facing, high-low slope), and the period that have been used for the analysis. In that sense, it would be really clear.
- In that sense, it is also not clear which information have been obtained and analyzed in north- and south-facing slopes. It is really important, as the literature already have shown that there are significant differences between both expositions. So, if you only calculated some indices for south-facing slopes, some part of the history is missing and it is a pity. Please, think about it because in lines 250-255, you indicate that better correlations are obtained in south-facing slopes, but I think it is not totally true, as one of the variables have not been measured/calculated in the north-facing slope.
- I suggest to include the complete temperature database (or at least the period you consider) in the manuscript and not only 2-3 months (Figure 2). I think it is really important to show the temperature pattern in this area, at different depths, once you have already measured this variable. And also the information about the different temperature variables that you have measured (maybe boxplot or similar plots). I'm also really surprise about the high temperatures you recorded in the winter months (January temperature higher than 30°). In Figure 2, you should indicate if these data are average daily temperatures.
- In the analysis presented in Figure 6, and also explained and discussed in the text, it is not clear what is the meaning of rainfall above 50 mm. Please could you define it? Rainfall events, flood events with rainfall > 50 mm. In that sense, Figure 6 X axis is the number of rainfalls above 50 mm/h. Please specify it in the figure caption and clarify in the manuscript.
- Discussion sections 5.2 and 5.3. Once I have read the discussion 5.2, I really miss some information about geomorphological dynamics in humid badland areas and explanations about weathering processes, including some references with similar studies in humid badland areas worldwide. It is true, that then once I started reading section 5.3 I partially found this information. I suggest to link both sections and organize the ideas presented in both previous sections.
 - In that sense, some significant references that I missed in the manuscript and that could be checked are:
 - Clarke and Rendell, 2006. Process-form relationships in Southern Italian badlands: erosion rates and implications for landform evolution. ESPL 31.
 - Clarke and Rendell, 2010. Climate-driven decrease in erosion in extant

Mediterranean badlands. ESPL 35.

- Nadal-Romero and Regüés, 2010. Geomorphological dynamics of subhumid mountain Badland areas- weathering, hydrological and suspended sediment transport processes: A case study in the Araguás catchment (Central Pyrenees) and implications for altered hydroclimatic regimes. *Progress in Physical Geography* 34.
- Gallart et al., 2013. Thirty years of studies on badlands, from physical to vegetational approaches. A succinct review. *Catena* 106.
- Gallart et al., 2013. Short- and long-term studies of sediment dynamics in a small humid mountain Mediterranean basin with badlands. *Geomorphology* 196.
- Bollati et al., 2019. Alpine gullies system evolution: erosion drivers and control factors. Two examples from the western Italian Alps. *Geomorphology* 327.
- Llena et al., 2020. Geomorphic process signatures reshaping sub-humid Mediterranean Badlands: 2. Application to 5-year dataset. *ESPL* 45.
- Llena et al., 2021. Do Badlands (always) control sediment yield? Evidence from a small intermittent catchment. *Catena* 198.