

Interactive comment on “Delineating riparian zones for entire river networks using geomorphological criteria” by D. Fernández et al.

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C1 → Three different valley morphologies considered in the analysis: are there any references or also previous analysis/research about such valley morphology classification? This is really a critical point that needs to be clarified since, as the authors at the end suggested, the “optimal threshold value for geomorphological criterion is valley-type dependent”

We have chosen 3 different valley morphologies because of three reasons:

(i) After performing PAM clustering with different pre-established numbers of clusters (3, 4 and 5 valley types), we notice that increasing the number of clusters didn't produce

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an increase in classification strength (measured as average silhouette width). (ii) The lower the number of valley types, our methodological approach gain in simplicity. (iii) The three types highly reflect valley morphologies in our study area (Figure 5 has been added)

These impressions have been incorporated to the manuscript at the end of new section 3.3.1 (river types) and at the start of new section 4 (results).

C2 → DEM: a 5 m DEM was considered in the analysis. Please motivate such resolution, the data used, and the vertical accuracy. Does this resolution represent a critical issue in the performance of the presented methods?

We have used a 5-m spatial resolution and 1-m vertical accuracy DEM because it was the higher resolution available for the whole study area with the following characteristics. This information has been incorporated in the new version of the manuscript. Geomorphological floodplain surfaces were derived again using a 30-m DEM, in order to determine the influence of DEM spatial resolution. Results have been compared with those obtained with the 10-m DEM. The manuscript has been modified accordingly and figure 9 has been added.

C3 → Drainage in low relief area: please clarify better how the authors enforce the drainage in low relief area. There are different works reported in literature about the treatment of DEM and sink filling for low relief areas. Did the authors consider these?

We have included this information in the manuscript: “To solve this problem, we enforced drainage in low relief areas (slope less than 30%) by lowering two meters the elevation of stream cells in the DEM using GIS data on channel real locations.”

C4 → Bankfull depth and in general, the geomorphological attributes: the authors have to better clarify. At the beginning did the authors make an analysis with few field data? Is it possible to present some data in order to have an idea about the accuracy and consistencies of such analysis?

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Regarding the bankfull depth regression model, the following paragraph has been added:

“This model has been used in other recent applications (Benda et al. 2011) and it was the only one available at the time of pursuing this study for the Cantabrian region. However, it should be noted that BFD estimates might present deviations from observed values ($p < 0,001$; $R^2=0,12$), as BFD is highly sensible to local channel morphology (REF) and the present model only includes catchment area and mean annual precipitation.”

Also results and discussions has been rewritten considering the fit of this model.

C5 → Methods: for a better reading and understanding it should be better reorganize this section, with a flow diagram (or also a table) showing a schematic illustration of the two methods proposed, and in general about the step-by-step analysis conducted. Right now, one has really some difficulties to follow all the steps considered for the analysis.

Methods have been reorganized and figure 2 added.

C6 → HEC-RAS, HEC-Geo RAS: very few information is reported about such modeling application. It would be appreciated if the authors report some numbers related to the parameters used in such hydraulics modeling.

That paragraph has been rewritten as follows:

“In this study hydrological modelling with HEC MHS (US Army Corps of Engineers, 2000) was used to derive flow data. A high resolution DEM (5-m spatial resolution, 1-m vertical accuracy), long series of precipitation data (more than 30 years) and information about land-use and soil type (1:50 000 scale) were used as model inputs. For each river basin, flow was calculated at several points that were representative of homogeneous sub-basins. On the other hand, river hydraulics modelling was performed using HEC-RAS (US Army Corps of Engineers, 2005) and HEC-Geo RAS module, which

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allows use of a DEM to derive required cross-section data. This model required as input several parameters influencing flow behaviour: Manning's number (in this study the authors used 0.04 for the channel and 0.06 for floodplains, although variations were introduced where more detailed information was available), coefficients of expansion (0.3) and contraction (0.1) and boundary conditions (the water level at the river mouth cross-section was that of the highest equinoctial tide)."

C7 → Line 24-25 ("from 50 to 350 using steps of 50"): why such numbers? Please clarify.

We have added this sentence: "This range was determined by querying the values of several PD-raster cells (covering all river types) which coincide with the edge of the 50-yr flood"

C8 → "BDF*1.25": what about "1.25"? These sentences are not so clear, again see my previous comment at "methods" section.

We want to maintain the BFD×X and PD-Y nomenclature system as using only the numbers will make the reading difficult, despite BFD and PD present different range of thresholds. However, for simplifying this system we have replaced BFD×X with BFD-X, so now is the same as PD-Y.

C9 → Eq. (2), line 20 (in the same page), Eq. (3): why 100?

We agree with the reviewer, the denominator in Eq. 2 is dispensable and comparison with total area values is improved by removing it. Therefore, Eq. 2 has been changed as follows:

Minimum exceeding score = T50EA + GSEA

C10 → Line 31 (beginning of the Results chapter): where the authors presented the cluster analysis? Or they presented just box plots related to the three valley types?

We think that the most relevant issue about the cluster analysis is the characterisation

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of the resulting groups, and boxplots meet this objective. However, the introduction to old Fig.2 (new Figure 6) is confusing because it refers to the cluster, not to the box plots. So we have moved the position of the calling to this figure in the text and we have also added the following sentence in the methods:

“PAM clustering was performed using different pre-established number of clusters (3, 4 and 5). Then, we analysed the characteristics of each cluster (geomorphological type) with respect to the four geomorphological attributes using boxplots.”

Moreover, the spatial distribution of the three considered river types is shown now in Figure 1 also.

C11 → Discussion and conclusion: the authors underline that “However, attention should be paid when using DEMs with a spatial resolution different from that used in this study, as thresholds are suggested to be also dependent on this parameter”. So the methods presented are grid-cell size dependent? If so, it should be appreciated making an analysis on different thresholds derived by using different grid cell sizes.

Geomorphological floodplain surfaces were derived again using a 30-m DEM, in order to see the influence on DEM spatial resolution. Results have been compared with those obtained with the 10-m DEM. The manuscript has been modified accordingly and figure 8 has been added.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/9/C3754/2012/hessd-9-C3754-2012-supplement.pdf>

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