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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Using geomorphometry for hydro-geomorphological analysis in a Mediterranean research catchment" *by* D. Guida et al.

Anonymous Referee #1

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The paper presents interesting results of application of the object-based geomorphometry for hydrological analysis and therefore is within a scope of the HESS journal and worth of publication, especially in this special issue. Further, the study impressively combines detailed field work aimed at monitoring and collecting of several hydrological data within the research catchment (complemented with authentic pictures) with modern methods of digital terrain analysis, showcasing how useful linking these two disciplines can be.

All the results show sufficient support to the interpretations and conclusions. Especially the results of the modelling of variability of the contribution area based on combining field data from a selected storm event with the "object-based hydro-geomorphotype

map" are very interesting. Most of the experiments and methods are described precisely, except for the part about segmentation resulting in "hydro-geomorphotypes" objects in the classification process (detailed comment please see in the Specific comments and suggestions section).

The authors give proper credit to the related hydrological work with clear indication of their new contribution, but some theoretical background about object-based image analysis and multi-resolution segmentation as well as some previous work related to the application of this method in geomorphology or geomorphometry should be mentioned (e.g. important papers which encouraged authors to apply it). Suggested literature is mentioned in the Potentially useful literature section. The title clearly reflects the contents of the paper, however, I might suggest for consideration adding the term "object-based" before "geomorphometry" for more precise specification.

Apart from the small errors mentioned in the Technical corrections section, the paper is well written and structured with reasonable figures and tables. Overall, it is written in good and understandable English, although it could benefit from reading and corrections by a native English speaker.

Specific comments and suggestions:

1. Fig. 1 is a bit difficult to read and understand, especially some features of the "Monitoring system". Adding colours at least to these symbols would improve the readability.

2. Although, according to the authors and the stated reference (Peckham, 2009), use of grid spacing of 5 meters seems suitable (page 7, line 18), in the Results section the authors state that contribution area anomaly of the riparian corridor could be attributed also to the DEM resolution (page 16, line 8). There are other methods how to correctly determine DEM resolution (e.g. Hengl, 2006). Resolution of 2.5 meter could be calculated using the simplest equation in Hengl (2006) based on the working scale. Of course, increased resolution would increase computation time of other analyses (especially segmentation), but this anomaly might be avoided this way. I would suggest to

at least mention it in the discussion.

3. Page 7, line 24 as well as page 16, line 29: Was the mentioned expert-based geomorphological map created based on the segmentation input layers or taken from a previous study? Either way, it would be useful to have it described there and perhaps even more useful to display it as a figure to directly see the mentioned agreement between these two maps.

4. Several crucial pieces of information about the performed multi-resolution segmentation (page 7, starting in line 25) are missing, especially the value of scale parameter and a method of its determination. For readers would be also useful to know the used values of shape and compactness parameters. Were the aspect layers used as an input into the segmentation or only the plan and profile curvature, whose values were later used in the classification? It is not clear from the text.

5. Are the objects resulting from segmentation displayed in Fig. 7 (A) classified based on a sum of plan and profile curvature? If yes, I would suggest to mention it in the figure caption.

6. I would suggest to use darker tone of colour for "contributing area" or perhaps to add black outline to make it more readable in Fig. 9 - 13.

Technical corrections:

- page 1, line 20: I would replace "plane" with "plan" to have the correct term for this curvature. Please apply also in the rest of the text

- page 6, line 3: I would replace abbreviation "zob" with full "zero order basin" as it is in the figure under it or in page 3, line 14 or page 11, line 5

- page 7, line 5: typing error "." at the end of the first sentence should be removed

- page 7, line 16: I suggest to replace "5 mt. cell size" with "5-meter cell size"

- page 7, line 17: I suggest to replace "Arc-Gis" with "ArcGIS" as it is the official name

- page 7, line 20: there is a reference to (Peckam, 2011) but in the list of references is (Peckam, 2009), please correct it; I would replace "Starting from this DEM" with e.g. "This DEM was used in"

- page 7, line 25: I suggest to replace "e-Cognition" with "eCognition Developer" as it is the official name

- page 8, line 4: caption for Fig.7, please be consistent with the name of the segmentation. Here is "multi-resolution", in the previous text is "multiresolution"

- page 8, Table 1: I think that in the last row it should be "SPPC" instead of "SP=C"

- page 9, line 5: I suggest to replace "Saga" with "SAGA" and "QGis" with "QGIS" as these are the official names

- page 10, Fig. 8: I would say there is one extra "Transition-Wet" in the legend, otherwise it is not recognisable in the figure if it should represent other type of transition area

- page 11, line 16: I think there should be "Table 3" instead of "Table 1"

- page 12, line 1 and 2: caption of Fig. 10, there should be added "approximately" before Q and EC values as it is in captions of Fig. 11 – 13

- page 16, line 30: typing error "," at the end of sentence should be removed

Potentially useful literature:

Anders, N.S., Seijmonsbergen, A.C., Bouten, W., 2011. Segmentation optimization and stratified object-based analysis for semi-automated geomorphological mapping. Remote Sens Environ 115, 2976–2985. doi:10.1016/j.rse.2011.05.007

Baatz, M., Schäpe, A., 2000. Multiresolution SegmentationâĂŕ: an optimization approach for high quality multi-scale image segmentation, in: Strobl, J., Blaschke, T., Griesebner, G., Wichmann-Verlag, H. (Eds.), Angewandte Geographische Informa-

tionsverarbeitung XII. pp. 12–23.

Dragut, L., Blaschke, T., 2006. Automated classification of landform elements using object-based image analysis. Geomorphology 81, 330–344. doi:10.1016/j.geomorph.2006.04.013

Dragut, L., Csillik, O., Eisank, C., Tiede, D., 2014. Automated parameterisation for multi-scale image segmentation on multiple layers. ISPRS J Photogramm 88, 119–127. doi:http://dx.doi.org/10.1016/j.isprsjprs.2013.11.018

Dragut, L., Minár, J., Csillik, O., Evans, I.S., 2013. Land-surface segmentation to delineate elementary forms from Digital Elevation Models, in: Geomophometry 2013. pp. 2–5.

Eisank, C., Smith, M., Hillier, J., 2014. Assessment of multiresolution segmentation for delimiting drumlins in digital elevation models. Geomorphology 214, 452–464. doi:10.1016/j.geomorph.2014.02.028

Hengl, T., 2006. Finding the right pixel size. Computers & Geosciences 32, 1283–1298. doi:10.1016/j.cageo.2005.11.008

van Asselen, S., Seijmonsbergen, A.C., 2006. Expert-driven semi-automated geomorphological mapping for a mountainous area using a laser DTM. Geomorphology 78, 309–320. doi:10.1016/j.geomorph.2006.01.037

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