Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-212-RC1, 2018

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Delimitation of Flood Areas Based on Calibrated DEM and Geoprocessing: Case Study on Uruguay River, Itaqui City, Southern Brazil" *by* Paulo Victor N. Araújo et al.

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Received and published: 1 November 2018

Summary:

The authors propose a procedure for the identification of flood-prone areas using a Digital Elevation Model (DEM) calibrated with 700 Ground Control Points (GCPs), historical river level data (76 years of data), and geoprocessing techniques. The study area is a portion of the Uruguay River basin close to the city of Itaqui, Southern Brazil.

General Comment:

The topic is certainly of interest to the readership of this journal and the scientific community. However, I find several concerns that deserve to be addressed and I would like to encourage the authors to answer to the following questions or suggestions in order to promote the performed research before a possible publication in this journal. 1) The introduction is focused almost exclusively on the importance and the role of flood hazard maps. The background of the research has not been delineated. Traditional procedures for flood hazard studies, or alternative methods, and the problems/limits related to both of them are not mentioned. Therefore, it is not clear what is the gap or issue that the proposed research aim to address? In few words, the aims are not clearly defined.Also, data, methods, models, performance measures should be illustrated in more detail. 2) The extent of the study area is not clear. Section "Study area" reports that the full Uruguay basin has a total area of 385,000 km2. Then, it is also reported that the study area corresponds to Ibicui sub-basin, the largest Uruguay river sub-basin, and that this study area has a territorial area of 3,406,606 km2. How can this sub-basin have a drainage area larger than the full hydrographic basin? 3) A SRTM-DEM has been calibrated using ground control points (GCPs) of high vertical accuracy. Can you provide a quantitative indication about GCPs vertical accuracy? 4) In carrying out the visual comparison in Section 4, please, explain more clearly what do you mean with "simulated flood altimetric quota". More details as regards the simulation need to be provided. 5) Section "4.2.1 Digital Elevation Model (DEM) calibration" specifies that in performing the linear regression, GCPs values have been used as independent variable and SRTM data as dependent variable. The independent variable is usually a measurement you are not manipulating in your experiment, and conventionally it is on the x axis. Instead Figure 5 puts SRTM values on the x-axis. Can you clarify Figure 5, the linear function y=0.7031x+13.913 you derived, and how did you use it? 6) As far as I understand, the function obtained in Linear Regression has been used to predict the dependent variable values (the DEM values) as a function of the GCPs. Then the original SRTM DEM and the DEM adjusted with GCPs have been compared and RMSE has been evaluated. More interesting, in my opinion, would be to

make a statistical comparison between the “new” adjusted DEM values against GCPs different from the ones used for the calibration, in order to validate the improvement in accuracy produced by this procedure. 7) As regards the comparison showed in Figure 8 between the results of the proposed approach and CBERS-4/MUX satellite image for 12 June 2017, I suggest complementing this visual comparison with some statistics and performance measures. I believe this validation will improve the manuscript and the reliability of the proposed method.

Minor comments: I am not a native speaker, but in my opinion the paper needs thorough reading and correction of English language and technical language. Below a few examples that I found while reading the manuscript: 1) Line 2, Abstract: replace “historic” with “historical”. 2) Line 15, Abstract: instead of “fluviometric temporal series records” I suggest “temporal series of streamflow records”. 3) Line 15-16, Abstract: Check subject-verb agreement in “The annual maximum. . .were linked to. . .” 4) Line 16, Abstract: “submitted the statistical analysis”. Unclear. 5) Line 18-19, Abstract: “Using the temporal series statistical analysis results, was assessed the spatialisation of flood hazard classes on the calibrated DEM and validated”. Please, rephrase and move the verb “was assessed” after its subject “the spatialisation of flood hazard classes on the calibrated DEM”. 6) Line 23, Abstract: instead of “Were determinate 5 classes of flood hazards”, move the verb at the end of the sentence and correct it in “were determined”. 7) Line 28, Introduction: check subject-verb agreement: “causes” instead of “cause”. 8) Page 2, lines 3-7, Introduction: “These geohazards can be prevented and reduced by providing reliable information to the public about the flood hazard through flood inundation maps (Alaghmand et al., 2010; Demir, 2015). Information about the flood’s extension is extremely important to evaluate the hazard of flood-prone areas and to help the rescue operations during these events (Cook and Merwade, 2009). Flood hazard mapping is one of the tools used to help communities avoid or mitigate such losses and damages (Arrighi et al., 2013; Savage et al., 2014; Speckhann et al., 2017). Flood hazards maps need therefore to be created as they provide a basis for the development of flood risk management plans”. 9) Please, rephrase and avoid

repetition of the same concept. 10) Page 2, lines 15-16, Introduction: use “high vertical accuracy” in “topographic data. . . must possess vertical highly accuracy altimetric”. 11) Page 3, line 16, Study area: “official” instead of “oficial”. 12) Page 3, line 15, Study area: correct “rive” with “river”. 13) Page 4, Line 4, Section “3 Previous studies in Itaqui city on flooding”: Check subject-verb agreement and grammar in “The flooding process of Uruguay River in Itaqui city are a natural phenomenon that afflicts the riverside population for decades”. 14) Page 4, Line 6, Section “3 Previous studies in Itaqui city on flooding”: “risks” instead of “riscks”. 15) Page 4, Line 15: “fulfill” instead of “fulfil”. 16) Page 4, Lines 15,16: “priming in the use on the high elevation accuracy of altimetric and fluviometric data to the modelling of flood geohazard mapping”. Revise English. 17) Page 4, Lines 20-22: “was submitted the statistical analyses”. Unclear. 18) Page 5, line 26: “Was considered as GCPs only the orthometric altimetry points acquired from high accuracy Geodesy which data were based in Global Navigation Satellite System (GNSS)”. Revise English and subject-verb agreement. 19) Page 6, lines 28-29: “temporal series descriptive analysis of the orthometric heights’ annual maximum fluvial levels records”. Revise structure. 20) Page 6, lines 29-30: “It was assumed” or “we assumed” instead of “Were assumed that if . . .” 21) Page 7, line 15: move the verb “Was performed” at the end of the sentence. 22) Page 8, line 25: “. . .shows” instead of “This return period shown”. . . 23) In the whole manuscript, I suggest just using “flood hazard”, instead of “flood geohazard”.

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