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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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Dear Sir,

I have received your 'Referee Report' and, on behalf of the co-authors, I would like to thank you very much for your tireless effort in reviewing the manuscript and for your valuable comments, which will certainly improve our manuscript. We value the comments received greatly, as they have pointed out a number of issues to be addressed. We have answered all the comments of the reviewers. Answers are attached to this

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letter. Along with the answers we are explaining all the changes we have done. We did modifications to the initial manuscript based on the suggestions of the reviewers. We hope that the editor will find the paper suitable for publication. Thank you very much for your kind consideration of this resubmitted version of our manuscript.

Sincerely yours,

Paulo Victor do Nascimento Araújo (On behalf of the authors of the manuscript)

ANSWERS TO REVIEWERS COMMENTS

MINOR CORRECTIONS: All minor corrections indicated by reviewers have been ACCEPTED by the authors and ALREADY MODIFIED.

GENERAL COMMENTS: 1) [Editor]: Authors has used flood simulation model, however the description of model to prepare the flood hazard map is missing. [ACCEPTED AND MODIFIED] [Authors]: The flood simulation model is based on the fill of the DEM calibrated at the river level orthometric heights, linked to a common geodetic reference system [included in text, page 5, line 1]. A flowchart was drawn up and included in the new text (figure 4).

2) [Editor]: Authors have utilized SRTM DEM 1 arc data set. Although DEM of a study area has not been provided in form of figure or map. It is important to include. [ACCEPTED AND MODIFIED] [Authors]: A figure was drawn up and included in the new text (figure 7).

3) [Editor]: How the SRTM DEM is used to prepare the flood hazard maps? It is important to describe. [ACCEPTED AND MODIFIED] [Authors]: Digital Elevation Model (DEM) is a set of digital data describing elevation values of Earth ground surface (or any other surface) which contains additional information about the character of this surface and interpolation algorithm, which is the best for approximation (modelling) of the real topography [According to (Szypuła, 2017)]. A DEM is a complete representation of a land surface which means that heights are available at each point in the area of

interest [According to (Hengl and Evans, 2009)]. In this study, was taken as the topographic model the SRTM DEM. However, it was submitted to the calibration process for adjustment to the local reference geodetic system [included in text, page 6, line 3]. For better understanding, a flowchart was drawn up and included in new text (figure 4).

4) [Editor]: What is Geoprocessing? Which geoprocessing technique has been used by authors to prepare a flood hazard maps? Explain. [ACCEPTED AND MODIFIED] [Authors]: Geoprocessing is a set of techniques based on the study of spatially distributed information in order to describe the characteristics of the phenomenon under investigation at the whole area of interest [According to (Costa and Lourenço, 2011)] [included in text, page 2, line 12]. Digital Image Processing (DIP), digital cartography and Geographic Information Systems (GIS) are undertakings of geoprocessing. In this work the use of geoprocessing techniques was extremely important to reach the results. And we use following techniques: [included in text, page 8, line 5] (a) Geographic Information System (GIS): Technique most used practically throughout the work. All data was served to implement a robust GIS; (b) Digital Cartography: During the elaboration of the maps; Digital Image Processing (PDI): Applied technique to improve the visualization of the historical flooding in the CBERS-4/MUX satellite scene; (c) Precision Geodesy: During the obtaining of the points of land controls and linkage of the river level to the Brazilian Geodetic System; (d) Geostatistical: During the evaluation and calibration of the Digital Elevation Model. Reference: Costa, S. B. and Lourenço, R. W.: Geoprocessing applied to the assessment of environmental noise: a case study in the city of Sorocaba, São Paulo, Brazil. Environmental Monitoring and Assessment, 172, 329–337, doi: <https://doi.org/10.1007/s10661-010-1337-3>, 2011.

5) [Editor]: Any rational of selections of flood hazard classes in Table 1 and Fig 6, if so, please explain. [ACCEPTED AND MODIFIED] [Authors]: To determine the classes of flood hazard mapping, a descriptive analysis of the orthometric heights time serie (annual maximum fluvial levels records) of Uruguay River was performed (minimum, maximum, quartile and percentile). The determination of the classes was closely linked

to the probability of occurrence of height annual maximum fluvial of Uruguay river [included in text, page 7, line 12]. At this stage, 5 classes of flood hazard were determined as described in table 1.

6) [Editor]: Table 2, Kendall's tau statistic 0.167, what its correlation with flood hazard mapping? It is important to explain significance of Mann Kendall test in flood mapping. [ACCEPTED AND MODIFIED] [Authors]: The nonparametric Mann-Kendall test, also known as Kendall's τau test or the Mann-Kendall trend test, is widely used to evaluate trends in time series. In recent years with growing concerns over environmental degradation and about the implications of green-house gases on the environment, researchers and practitioners have frequently applied the non-parametric Mann-Kendall test to detect trend in recorded hydrologic time series such as water quality, streamflow, and precipitation time series (Yue and Wang, 2004). Although it has no influence on the flood geohazard mapping; the Mann-Kendall test was applied to investigate if the elevation of the Uruguay river is showing any upward or downward trend [include in text, page 5, line 24].

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-212/nhess-2018-212-AC2-supplement.pdf

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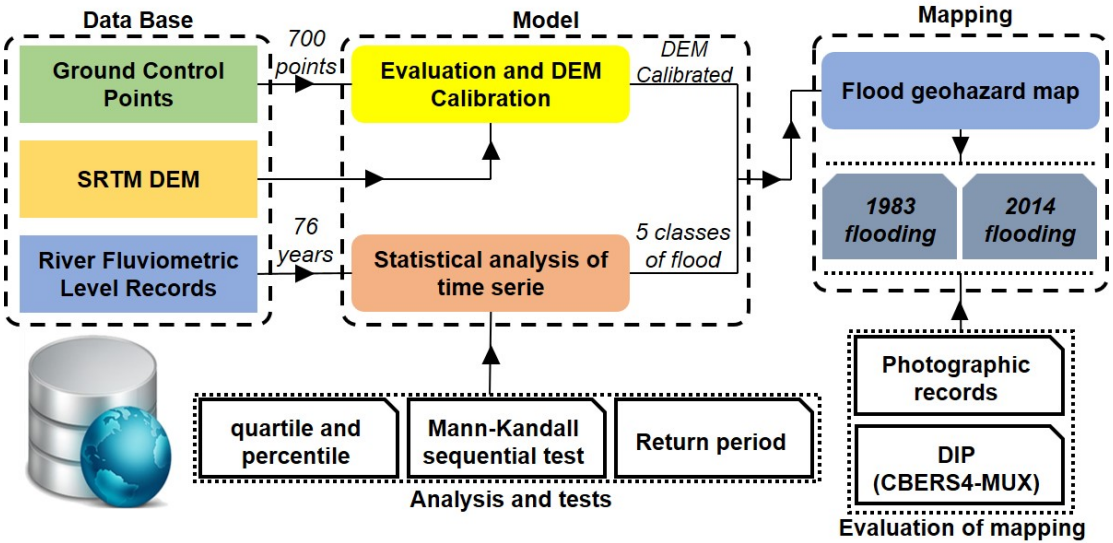

Fig. 1. Figure 4: Flowchart of the proposed approach for delimitation of flood geohazard mapping.

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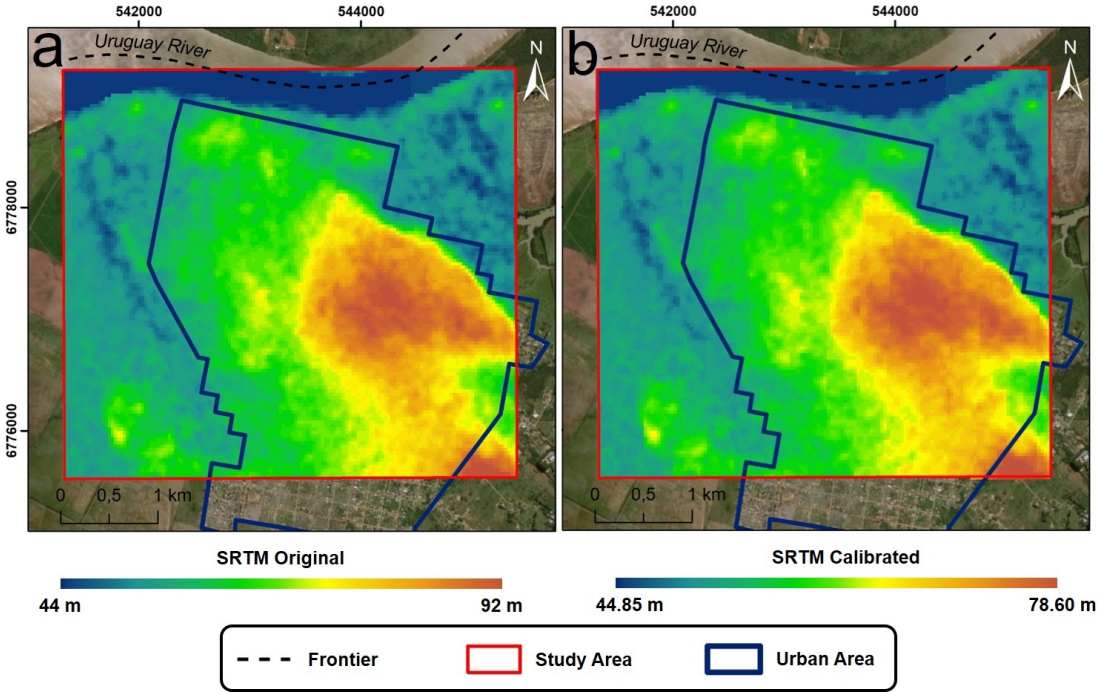

Fig. 2. Figure 7: Digital Elevation Model (DEM): a) SRTM Original; b) SRTM Calibrated.

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