Response to the Reviewers Comments

Author reply to RC2 egusphere-2023-2458 (NHESS)

Paper title: Detection of flooding by overflows of the drainage network: Application to the urban area of Dakar (Senegal)

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We sincerely thank the reviewer for providing these comments on this manuscript. Below, we address all of these comments. The reviewer comments are displayed in blue, while the author response are displayed in black colour.

Reviewer's report: Referee #2

General comments

This study aims to model a fine-scale run-off model of the urban area and assessment of the response of the storm drainage network (canals and retention basins) to different rainfall events. The methodological approach is based on a preliminary reconstruction of the drainage directions modified by urbanization and the implementation of combined hydrological and 1D hydraulic models calibrated to the city's urban conditions. My minor and major comments for this manuscript are as follows.

1. Minor comments

Grammatical errors

Line 42 – 44: There is a repeated sentence here.

The sentence will be deleted

Figure 1. Please insert the north arrow into the map

The north arrow was inserted into the map in Figure 1. An altitude map and a soil types map will be also added to provide a better description of the study area.
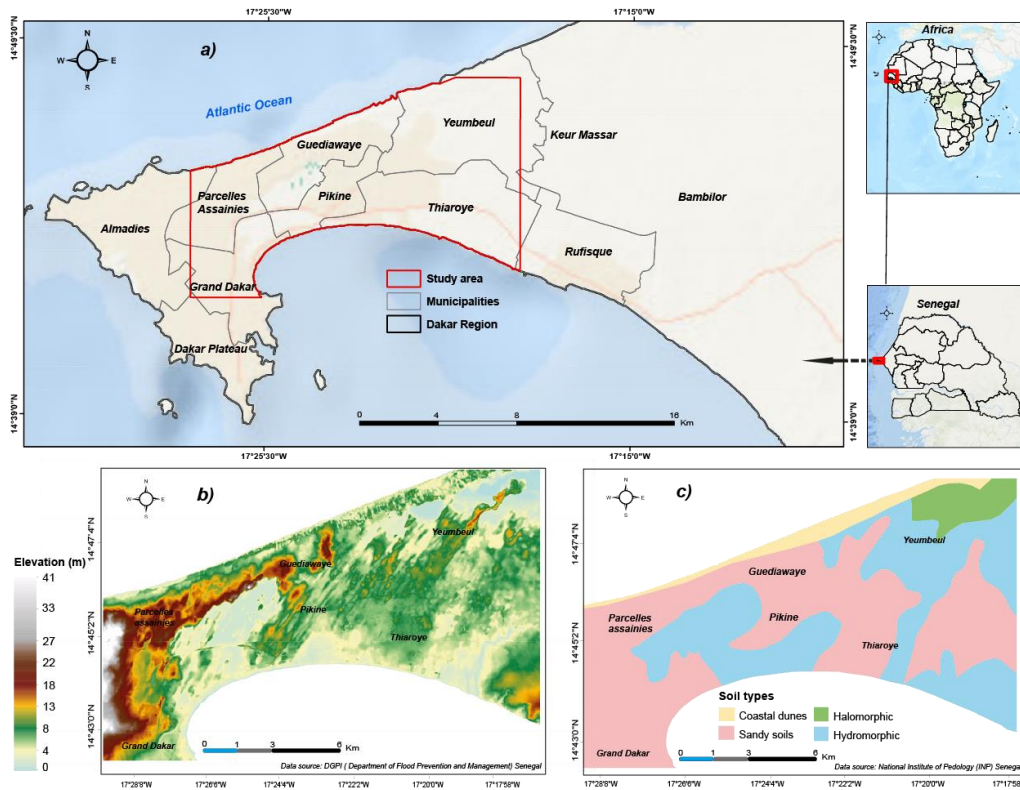
Figure: (a) Location of the study area; (b) Digital Terrain Model; (c) soil type distribution

2. Major comments

- The title does not match the main objectives of this study. The authors should confirm the aim of this study focusing on the detection of floods or modelling of drainage networks.

We propose to change the title "Detection of flooding by overflows of the drainage network: Application to the urban area of Dakar (Senegal)" to "**Modelling urban stormwater drainage overflows for assessing flood hazards: Application to the urban area of Dakar (Senegal)**"

- Please insert a flow chart of data processing

A flow chart of the method will be inserted in section 3.
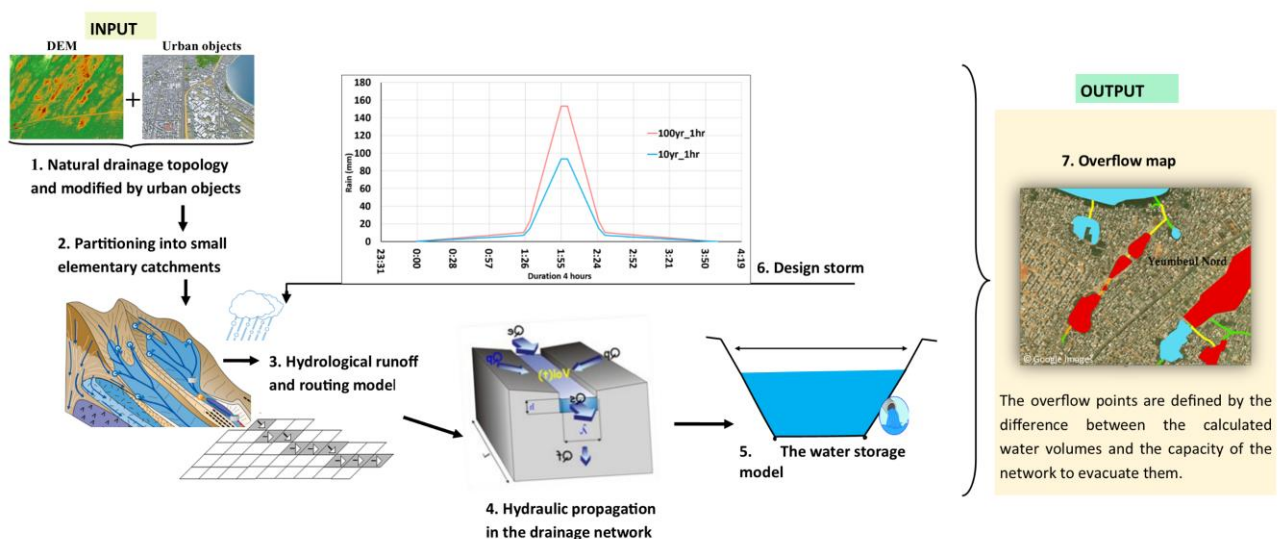
- The study should integrate the validation of flood simulation results using accurate reference data.

Indeed, a key limitation of this study is the lack of validation of the simulation results, as it was pointed out in the discussion. Although it is of major importance, the validation task cannot be undertaken at the moment. However, we hope that the methodological aspects of the simulation should be of enough interest to be published. The validation task is a priority and a perspective for our future work. We have added the following sentence to the discussion section:

"As things stand at present, it was not possible to get the necessary data for the validation of the method, which means on the one hand sub-daily rainfall data, and on the other hand flood maps for the recent events that occurred in Dakar. The imminent installation of a rain gauge radar in Dakar, as part of the integrated flood management project in Senegal, could help to facilitate this. Flood maps could be obtained by exploring citizen science tools (Sy et al., 2020) or ordering a high-precision satellite image to map out flooded areas."

- Section 3.1. please give a brief explanation about ATHYS modelling that was applied in your study

In addition to the internet link to the ATHYS platform, a brief description of ATHYS has been added at the beginning of section 3. The sentence is as follows:

"The modelling chain was built in the ATHYS platform, developed by Hydrosciences Montpellier. ATHYS enables a range of hydrological and hydraulic GIS-based models, as well as geographical (VICAIR) and hydrometeorological (VISHYR) data processors. ATHYS is a free software, available from www.athys-soft.org."

- What is the source of the DTM data and soil map used in this study? Please explain in detail about the resolution as well as the accuracy of these data.

Source and details of the DTM and soil map will be added in section 2.

- Line 155: how the model calculates the average velocity of the flow (Vo) is not specified.

The parameter Vo (velocity of the surface flow) was determined using data from the Fann-Mermoz gauged catchment. These data allow us to set a fixed velocity of 1.1 m/s (Lines 235-239). The velocity Vo is used to determine the transfer time Tm (Eq. 3) integrated in the model (Eq. 5).

- Section 5 – Results and discussions part also does not match the main objectives of this study. Section 5.1 should robustly specify the results of flood simulation using the ATHYS modeling method as three methodological steps shown in the abstract.

The discussion section will be revised. Additional details on the identified method validation strategies will be included.