

egusphere-2023-2458 (NHESS)

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

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GENERAL COMMENTS

The paper presents the development of a simple modelling system for the detection of urban drainage network overflow. The drainage system consists of artificial drainage and storage basins. The model has been developed and applied on the urban outskirts of Dakar, Senegal. It aims to propose a method capable of modeling flows at fine resolution (5m²), over the entire area, and providing a rapid diagnosis of how the drainage network is operating for design rainfall intensities. The steps followed to the development of the modelling system are: i) determination of drainage directions, ii) application of a hydrological model for estimating flows at the outlets of elementary catchments, iii) the implementation of a hydraulic model for propagating these flows through the drainage network and iv) application of a simple storage model for the simulation of retention basins. The network overflow points are calculated as the difference between the calculated flows and the network's capacity to evacuate them.

My major and minor comments are presented in the next paragraphs.

Major Comments

There are many points that should be clarified before considering the paper for publication.

1. A flow chart of the methodology should be used to present the methodology. This will help the reader to understand the proposed modelling system.
2. It is not clear to me whether the drainage system (i.e. stormwater drainage network and retention basins) is constructed or it is planned. It is strange to me that the drainage network is a network of open channels of orthogonal cross section. Stormwater drainage network is usually underground and consists of pipes. If the network exists then the dimensions are set and known otherwise the dimensions of the drainage network elements (i.e. pipes and canals) is a matter of design. The authors should clarify this issue.
3. In continuation of the previous comment, more information about the study area should be presented, e.g. climate, historical extreme rainfall and flood events, hydrology, DEM, etc.
4. More information about the Kinematic Wave (KW) flow routing model should be given in Section 3.4. The governing equations of KW to be solved should be presented.
5. Section 3.5. Why a simple linear storage model is not used for water retention structures?
6. All areas have the same soil characteristics as found in the experimental site. It would be more realistic to have a soil map of the area or CN maps to estimate the

- parameters of SCS rainfall abstractions (or effective rainfall) model.
7. What is the basin response time (T_r)? Is it the time of concentration or the time lag? In Equation 11, please explain what is T_m (transfer time). Why T_r is not estimated by widely used common and typical equations?
 8. Give the general equation of IDF curves as $i=CT^nD^{-k}$
 9. How and why a 4-hour rainfall is selected? Is 4 hours the critical duration of a storm? Please explain.
 10. Why the spatial distribution of design rainfall is not considered? The same design hyetograph is applied over the study area.
 11. A major drawback of the study is that the methodology has not been validated against historical flood events. The results presented are purely theoretical and could be fictional and not representative. The authors should simulate one or two events for validating the method and the modelling system.
 12. Conclusions. The authors correctly write the deficiencies of the methodology but they should outlined and discussed these deficiencies earlier in the paper.
 13. There are many awkward hydrological terms. Proper hydrological terms should be used. Some of them are indicated in the minor comments bellow.
 14. English language needs improvement. In some paragraphs, the English writing is poor.

Minor comments

1. There many improper hydrological terms. For example:
 - a. Line 93. "...hydrological production" Please revise to ".....flow generation...."
 - b. Line 97. ".....injected in the model....." Please revise to ".....used as input data to the model..."
 - c. Line 199. "...production model..." Please revise to "....hydrological model...."
 - d. Line 308. ".....project..." Use the term "design"
And others.
2. Equation 5. Not "si". It is "if"
3. Line 180 and elsewhere. What is the OC model? It has not been described.
4. Table 2. It is not understandable. Use the equation of reservoir level-storage volume-outflow curves.

The presented study falls within the scope of NHESS. However, the paper is not ready for publication and needs at least *major* revisions before it would be acceptable for publication in the journal of NHESS.