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Discussions

Interactive comment on "Direct local building inundation depth determination in 3D point clouds generated from user-generated flood images" *by* Luisa Griesbaum et al.

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Dear colleague,

Thank you for your valuable comments on our manuscript.

Our research is meant to show the applicability and benefits of user-generated flood images for the purpose of documenting local building inundation in cases where either traditional information gathering systems are inapplicable, or we lack adequate reconstruction tools to process the data that exists. Urban floods are especially difficult to document. A 2D floodline often does not suffice to depict the extent of flooding in an urban area because of the highly complex structure and topology of cities and towns.

The need for both spatially and temporally high-resolution data presents a particular challenge in connection with measurement of urban floods. Due to the increasing distribution of information technologies and the correspondingly increasing virtual participation in flood mitigation activities, many – still difficult-to-document – urban flood events are now being indirectly documented by means of user-generated, geotagged flood images (Fazeli et al., 2015). So far, common flood reconstruction methods have lacked the ability to extract local flood information from such images. Our method, however, does enable the extraction of relevant inundation depth values for flooded buildings depicted in these images. In this sense, we understand this publication as proof of concept, which can yet be further automated in order to make it an operational tool for non-technical users.

The major benefit of this 3D approach in comparison to 2D approaches for flood level evaluation lies in its ability to determine inundation depths at single objects/buildings. This information is valuable for building damage assessment. Many flood loss models are based upon – amongst other parameters – a depth-damage function. For example, one typical model for damage assessment is the so-called Flood Loss Estimation Model for the Private Sector (FLEMOps), which is employed for micro-scale applications (i.e. at the building level). Besides building type and quality, one major input parameter for that model is the inundation depth of single buildings (Thieken et al., 2008). Moreover, this third dimension of flood information could be beneficial to local authorities by complementing manual measurements, which are usually captured only on the basis of visual flood markers, such as mud lines at building façades, to provide records on the impact of the event. This newly acquired inundation data of single buildings could then be used for further flood simulation, flood-map generation, or flood risk analysis.

We agree that an implementation of the proposed workflow in form of a (web) service or mobile app would be highly beneficial for local authorities, disaster managers, engineers, and insurance assessors. Eye witnesses may upload flood images taken during or in the immediate aftermath of a flooding event, which could yield a large data set of inundation depth values. Furthermore, the integration of already existent data sources, such as Mapillary (https://www.mapillary.com/), which provides large sets of non-flood images, is feasible, however requires further research.

Best regards,

Luisa Griesbaum, Sabrina Marx and Bernhard Höfle

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