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Flood damage analysis: uncertainties for first floor elevation yielded from LiDAR data

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The use of high resolution ground-base light detection and ranging (LiDAR) datasets provide the spatial density and vertical precisión to obtain Digital Elevation Models (DEMs) highly accurate. As a result, reliability of flood damage analysis has been improved significantly, as accuracy of hydrodinamic model is increased. Additionally, an important error reduction also takes place in estimating first floor elevation, which is a critical parameter to determine structural and content damages in buildings. However, justlike any discrete measurement technique, LiDAR data contain object space ambiguities, especially in urban areas where the presence of buildings and the floodplain determines a highly complex landscape that is largely corrected by using data ancillory information based on breaklines. Here, we provide an uncertainty assessment based on: a) improvement of DEMs to be used in flood damage based on adding breaklines as ancillary information; b) geostatistical estimation of errors in DEMs; c) implementing a 2D hydrodynamic model considering the 500 yr flood return period; and d) determining first floor elevation uncertainty. As main conclusion of this study, worth to outline the need of processing raw LiDAR in order to generate efficient and high-quality DEMs that minimize the uncertainty of determining first-floor elevation and, as a result, reliability of flood damage assessment is increased.