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Building a Multimodal topographic dataset for flood hazard modelling and other geoscience applications

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In remote sensing, benchmark and CalVal datasets are routinely provided by learned societies and professional organisations such as the Committee for Earth Observation Satellites (CEOS), European Spatial Data Research (EuroSDR) and International Societies for Photogrammetry and Remote Sensing (ISPRS). Initiatives are often created to serve specific research needs. Many valuable datasets disappear after the conclusion of such projects even though the original data or the results of these investigations might have significant value to other scientific communities that might not have been aware of the projects. Initiatives such as FAIR data (Findable, Accessible, Interoperable, Re-usable) or the European Open Science Cloud (EOSC) aim to overcome this situation and preserve scientific data sets for wider scientific communities.

Motivated by increased public interest following the emerging effects of climate change on local weather and rainfall patterns, the field of urban flood hazard modelling has developped rapidly in recent years. New sensors and platforms are able to provide high-resolution topographic data from highly agile Earth Observation (EO) satellites to small low-altitude drones or terrestrial mobile mapping systems. The question arises as to which type of topographic information is most suitable for realistic and accurate urban flood modelling and are current methodologies able to exploit the increased level of detail contained in such data?

In the presented project, we aim to assemble a topographic research data repository to provide multimodal 3D datasets to optimise and benchmark urban flood modelling. The test site chosen is located in the South of Luxembourg in the municipality of Dudelange, which provides a typical European landscape with rolling hills, urban, agricultural but also re naturalised areas over a local stream catchment. The region has been affected by flash flooding following heavy rainfall events in the past.

The assembled datasets were derived from LiDAR and photogrammetric methodologies and consist of topographic surface representation ranging from medium resolutions DEMs with 10m GSD to highly dense point clouds derived from drone photogrammetry. The data were collected from spaceborne, traditional airborne, low-altitude drone as well as terrestrial platforms. The datasets are well documented with adequate meta information to describe their origin, currency, quality and accuracy. Raw data is provided where intellectual property rights permit the

dissemination. Terrain models and point clouds are generally cleaned for blunders using standard methods and manual inspection. However, elaborate cleaning and filtering should be done by the investigators to allow the optimisation towards the requirements of their methodologies. Additional value-added terrain representations e.g. generated through data fusion approaches are also provided.

It is the intention of the project team to create a 'living data set' following the FAIR data principles. The expensive and comprehensive data set collected for flood hazard mapping could also be valuable to other scientific communities. Results of ongoing work should be integrated, and newly collected data layers will keep the research repository relevant and UpToDate. Sharing this well-maintained dataset amongst any interested research community will maximize its value.