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Use of crowd source, Open Data and EO-based information in flood damage assessment: the 2014 urban flood in Genoa.

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The need for rapid scenario-based flood damage assessment is urgent. The simulated assessment depends on three factors (flood scenarios, vulnerability and exposure), which cannot be always estimated with the same level of reliability. While flood hazard scenario maps based on hydraulic modeling of inundation is now a common practice, computation of damage assessment is often limited by the lack of exposure data and specific vulnerability curves.
In this context, crowd sourced and Open Data in combination with EO-based information can play an important role in the characterization of the flood prone assets and more in general for Multi-Risk assessments. A simplified methodology for damage assessment based on these data sources was applied to the recent urban flash flood, which took place in October 9th, 2014 in Genoa. Hazard, exposure and damage were computed separately and validated against observations or official data. The total simulated damage was then compared with the official damage assessment obtained through citizen claims and municipal authorities surveys.
Hazard mapping obtained by 2D dynamic models (complete shallow water equations) or more simplified 2D models (diffusive approximation of shallow water equations) showed negligible differences in terms of maximum water depth for the purpose of damage assessment and both well represent the real flood extent, as confirmed by the comparison with water marks registered during a field survey.
Damage simulation seems much more sensitive to the assets characterization. Starting from existing vulnerability curve libraries, new curves were adapted to fit construction typologies of Genoa city center. Different categories were created taking into account most influencing construction typology and occupancy parameters. Two assets characterizations were created: the first one based on official governmental data used as benchmark; the other obtained through the combination of Open Data (such as Open Street Map, Street View) and EO based information (optical imagery). The comparison showed that good results in terms of exposure characterization can be obtained using Open Data and EO-based information. Different damage modelling chains were tested and validated. Simulated direct damages obtained by the different modelling chains showed little difference in comparison with the official figures, justifying the approximation of the hydraulic simplifications and demonstrating the usefulness of Open Data and EO-based information.