Relevance of using ensemble forecasts of flash-flood impacts for an emergency service: an evaluation for the October 2018 flood event in the Aude river basin, France

Maryse Charpentier-Noyer[1,2], Pierre Nicolle*[1], Olivier Payrastre[1], Éric Gaume[1], François Bouttier[3], and Hugo Marchal[3]

[1]GERS/LEE – Univ Gustave Eiffel, Nantes, 44344, France – France
[2]DREAL Centre – SHPECI, Orleans, France – France
[3]CNRM – Université de Toulouse, Météo-France, CNRS, Toulouse, France – France

Résumé

Flash floods (FF) represent an important part of flood damages and fatalities in the world. Today, operational FF nowcasting and warning systems are often based on the use of precipitation weather radars, and therefore still offer limited anticipation. They also generally rather represent the intensity of the flood events than their severity in terms of impacts, which may limit emergency services capacity to take relevant decisions.
This contribution aims at evaluating the value of a new ensemble FF impacts forecasting chain for the decision making of an emergency service. The case study corresponds to the Aude River flash floods that occurred on October 15 and 16, 2018, and which are among the most important FF observed in southeastern France in the recent years. This event is responsible for the death of 15 people (99 people injured), as well as particularly large material damages.

The tested FF impacts forecasting chain combines three new rainfall ensemble forecast products (provided by CNRM), specifically designed for short-range forecasting (0-6h), and a highly distributed rainfall-runoff model (Charpentier-Noyer et al., 2022). A simple impacts model is built and applied for each river reach based on a catalog of 8 inundation scenarios corresponding to return periods of 2 to 1000 years. Impacts are represented in terms of a number of inundated buildings.
The value of the ensemble impacts forecasts is finally evaluated based on the implementation of a multi-agent model, for the simulation of the field decisions taken by an emergency service. This new evaluation approach, based on simple but realistic hypotheses, allows to illustrate and measure the gains associated with a better anticipation of impacts, and the costs associated with false alarms, which lead to the unnecessary mobilization of rescue teams, to the detriment of really impacted locations. In case of extremely limited means for safety operations (low number of rescue teams), the decisions based on a naive zero future rainfall scenario may sometimes appear better than those using ensemble rainfall forecasts. Nevertheless, in all the simulated cases, the decisions taken from the ensemble rainfall forecasts appear more efficient than those based only on field observations.

*Intervenant

Mots-Clés: Flash flood, Impacts, Ensemble forecasting