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Integrated nowcasting of flash floods and related socio-economic impacts: The French ANR PICS project (2018-2021)

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Flash-flood forecasting is of crucial importance to mitigate the devastating effects of flash-floods. However, its development has experienced serious setbacks, due to the large number of affected catchments, their small surface areas (1 to 500 km^2), their very short response times (limited to a few hours), and the limited knowledge of the assets being exposed. First operational flash flood warning systems have recently been implemented in France and other countries. Nevertheless, the capacities of these systems can still largely be improved (limited anticipation, limited geographic coverage, impacts not represented).
In this context, the PICS project (2018-2021) proposes a step forward by designing and evaluating integrated forecasting chains able to anticipate the impacts of flash-floods with a few hours lead-time. This objective will be reached through interactions between teams of varied scientific domains (meteorologists, hydrologists, hydraulic engineers, economists, sociologists) and operational actors (civil security, local authorities, insurance companies, hydropower companies, transport network operators). The integrated short-range forecasting (or nowcasting) chains designed in the project will incorporate the following components: high resolution quantitative precipitation estimates and short range precipitation forecasts (or nowcasts), distributed rainfall-runoff models designed to simulate river discharges in ungauged conditions, DTM-based hydraulic models for the delineation of potentially flooded areas, and finally several impacts models aiming to represent varied socio-economic effects: insurance losses, inundation of critical infrastructures, and also dynamic population exposure and vulnerability.
The project will work towards: effectively coupling these various modelling components, evaluating these components in terms of uncertainties and complementarity, and finally assessing the capacity of these nowcasting chains to meet the end-users needs. A particular attention will be put on the consistency across the various components of these chains, in terms of variables used, spatial and temporal resolutions, application scale, and uncertainty level.
One critical aspect of the project will also be the validation of the results based on case studies. The small ungauged basins context, indeed, is generally synonym of serious data scarcity. For this reason, a particular effort will be devoted in the project to gather appropriate validation datasets (impacts, flood areas, etc.) and to define relevant validation strategies.
The project will also entail significant efforts to improve and adapt the different components involved in the modelling chains: improvement of distributed hydrological modelling in ungauged conditions, qualification of uncertainties on discharges estimates based on rainfall observations and nowcasts, improvement of 1-D approaches and test of a 2-D model for large scale automatic hydraulic computations, and finally adaptation of the impacts models to take benefit from information on flooded areas provided by the forecasting chain.
Considering this work program, the project should enable significant breakthroughs in the field of integrated flash floods impacts nowcasting. The wide representation of potential end-users in the project, as members of the end-users group and as project partners, should finally facilitate the transfer of project results towards operational applications.
The presentation will detail the main objectives of the project, the choice of the case studies and the outcomes of the first exchanges with end-users.