Flood forecast technological platforms: an adaptive response to extreme events

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Floods are natural phenomena with great destructive power that happen suddenly and sometimes unexpectedly. Although advanced technological tools are available for extreme events prediction, floods and inundations still occur every year, causing thousands of deaths and heavy economic losses. Climate change (Pachauri et al., 2015) adds severity to intense precipitation phenomena, making it increasingly important to forecast their potential effects in a timely manner in order to minimize their impacts.

Different entities responsible for minimizing the impacts of floods have been implementing and using hydroinformatic platforms throughout the world (eg. Werner et al., 2012, Schwanenberg et al., 2013, Gibertoni et al., 2014) for flood risk management. These platforms are responsible for the automatic incorporation of all meteorological and hydrological information, for their validation and for the respective processing required in the modelling tasks and consequent emissions of alerts.

This work presents the use of the Delft-FEWS platform (Werner et al., 2012), illustrating its application in an early warning system for two sub-basins of the Portuguese River Ave. A one-dimensional hydrological and hydrodynamic model for the sub-basins was developed at this initial phase of the work, which was integrated into the platform (FEWS-AVE). The system was implemented based on hydro-meteorological data series from the Portuguese Hydrometric databases and meteorological data and atmospheric model results from Meteogalicia. Hydrological and hydrodynamic simulations were performed using the following deterministic precipitation predictions: National Oceanic & Atmospheric Administration (NOAA), Global Forecast System (GFS), and MeteoGalicia's Weather Research and Forecasting (WRF). The first presents precipitation forecasts for ten-days horizons with a spatial resolution of 0.1º lon x 0.1º lat at six-hour intervals on a global scale. In the second, the forecast horizon is four days with a spatial resolution of 4 km x 4 km, with hourly resolution for a region that covers Galicia and Northern Portugal.

Figure

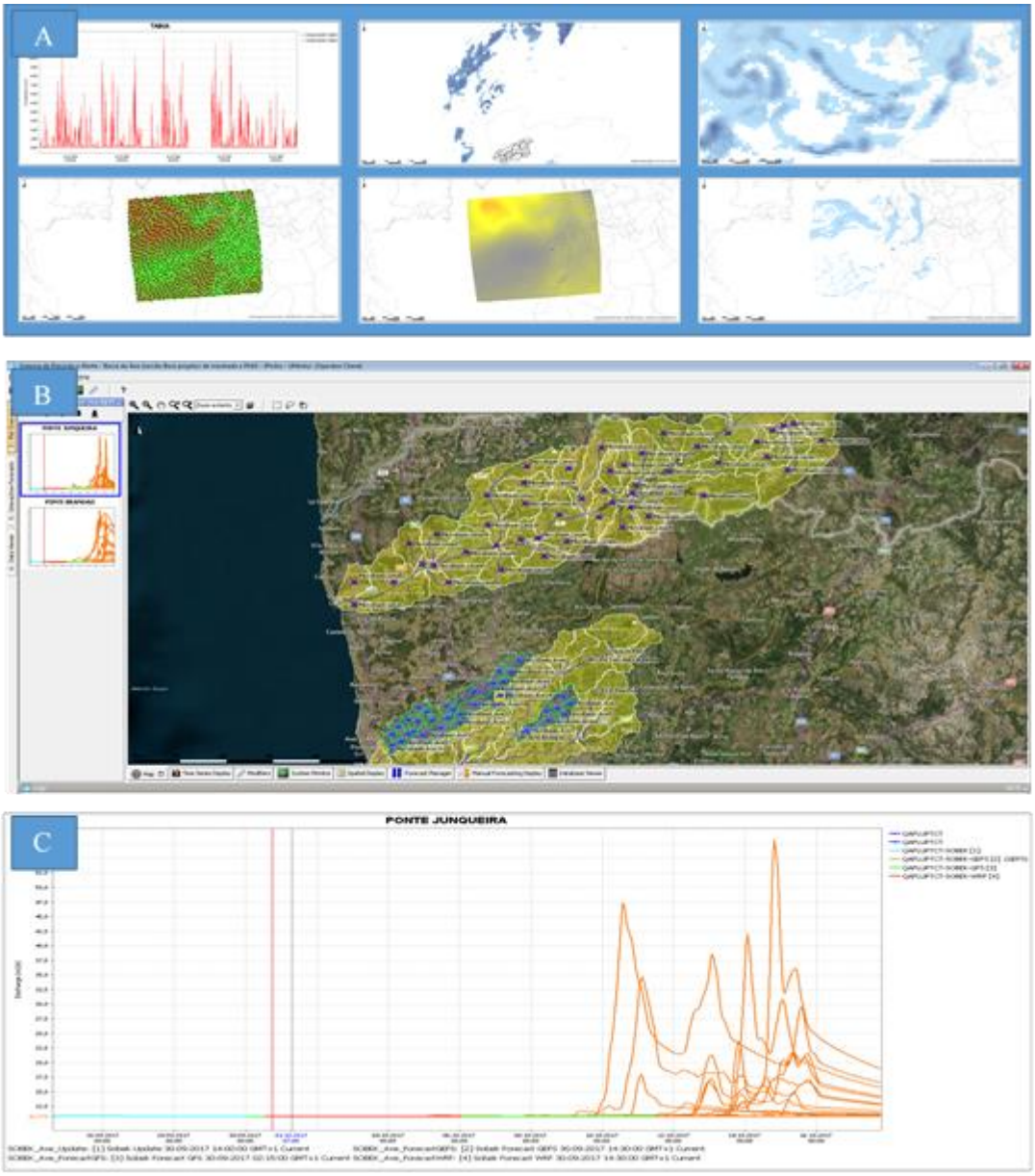

Figure 1 Flood forecasting system for the NW Portuguese region. A) historical and forecasted data, B) hydrological sub-basins for river Lima and river Ave basins, and C) predicted river Ave flow rates at Ponte de Junqueira.