Application of the AIGA flash flood warning method to the 15th of June 2010 event on the Nartuby and Argens rivers (South of France)

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Flash flood forecasting at ungauged sites is one of the most difficult tasks in operational hydrology. The post-event analysis of catastrophic events offers the possibility to really appreciate the usefulness of warnings emitted during the crisis. This poster presents results obtained by the operational AIGA warning method during the dramatic 15th of June 2010 flood on the Nartuby and Argens rivers (South of France, 25 human losses).

> Description of the event

During the 15th and 16th of June 2010, an exceptional rainfall event occurred in South of France, with more than 300 mm recorded in 24 hours on a wide area. The downstream part of the Argens catchment was the most affected (Fig. 1a and 1b). Rainfall return periods were locally greater than 100-years (Fig. 1c).
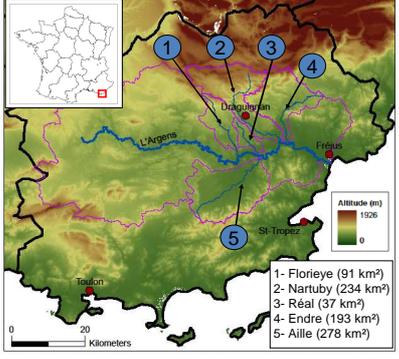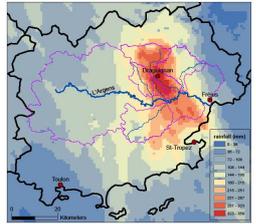

Fig. 1b: Total radar rainfall (uncorrected data)
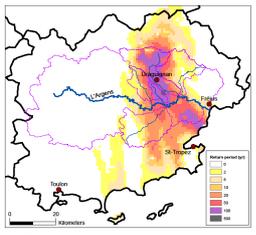
Fig. 1c: 6-h max. rainfall return period (calculated from uncorrected radar data)

1- Florieye (91 km²)
2- Nartuby (234 km²)
3- Réal (37 km²)
4- Endre (193 km²)
5- Aille (278 km²)

Fig. 1a: The Argens catchment (2 760 km²) and some of its sub-catchments

The Nartuby @ Draguignan

The Nartuby @ Trans-en-Provence

The Florieye @ Taradeau

The Argens @ Le Muy

The Réal @ Les Arcs

Fig. 4 : Damages observed after the flood

> The AIGA method

The AIGA method (Fig. 2) combines rainfall radar measurements, a simple distributed hydrological model, and references quantiles (flood and rainfall). It provides in real time maps characterizing the ongoing situation according to its return period, and dedicated to operational services (Fig. 3).
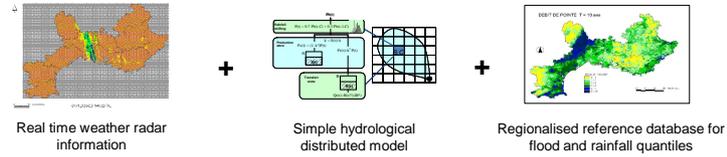

Real time weather radar information + Simple hydrological distributed model + Regionalised reference database for flood and rainfall quantiles

Fig. 2 : Description of the flood warning AIGA method (see Javelle et al. 2010 for more details concerning the model)

15:00   17:00   19:00   21:00

23:00   01:00   03:00
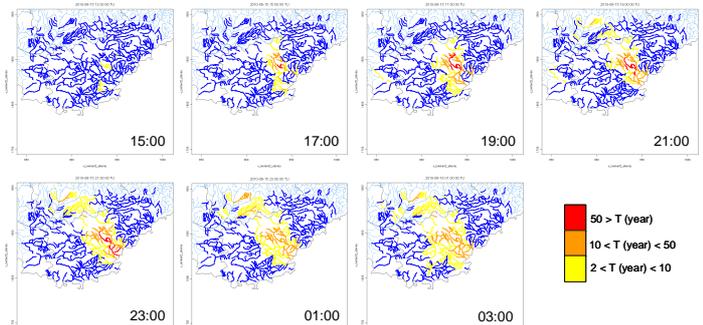
50 > T (year)
10 < T (year) < 50
2 < T (year) < 10

Fig. 3: AIGA rivers characterization during the 15th-16th of June event (loc. time)

> Comparison with observed damages

The method correctly identifies the rivers where the most damages were reported: Nartuby, Florieye, Réal, downstream Argens (Fig. 4). However, due to quick basins response, the anticipation is quite short: only half an hour between the "red" warning emitted at Trans-en-provence near Draguignan on the Nartuby river, and the entrance of the water into the village (Fig. 5).
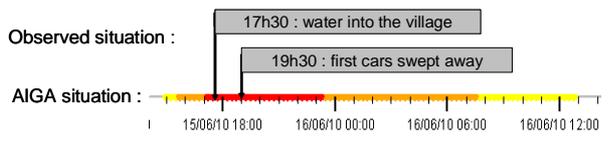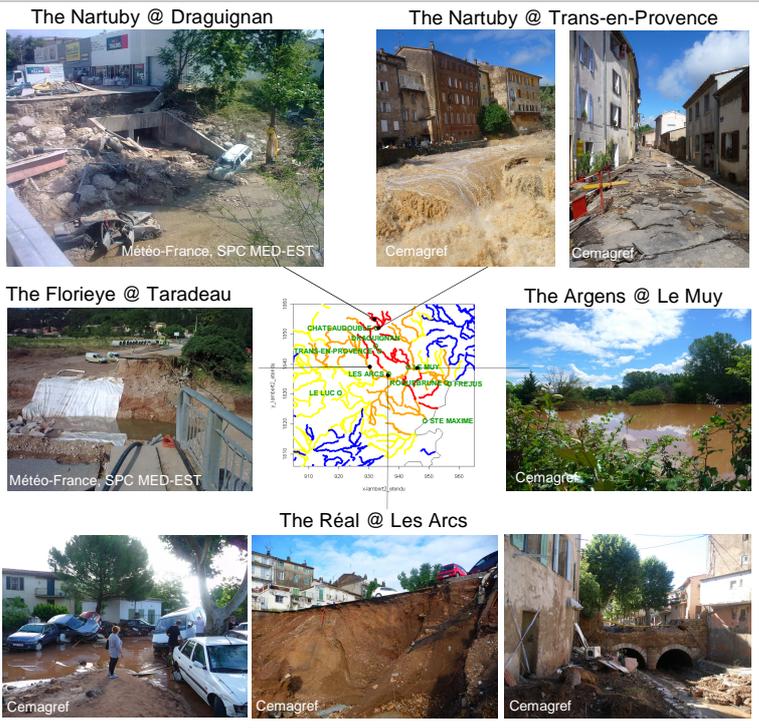

Observed situation :
17h30 : water into the village
19h30 : first cars swept away
AIGA situation :
15/06/10 18:00   16/06/10 00:00   16/06/10 06:00   16/06/10 12:00

Fig. 5: Comparison between the AIGA warnings and the observed situation at the flooded village Trans-en-Provence on the Nartuby river (local time)

> Further investigations

An extensive post-event campaign coordinated by the French central flood forecast service (SCHAPI) was carried out in order to estimate peak discharges at different locations. This information will be compared with discharges calculated by the model. The same procedure must be applied to future events, in order to validate the method at ungauged locations.

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