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Water level and response time of rivers during flash floods derived from a nested network in the Claduègne Mediterranean catchment (43 km2)

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Flash floods are natural hazards that affect the Mediterranean region. They are caused by intense rainfall events but catchments characteristics are also influential on the hydrological response. In order to study the respective roles of rainfall, land use, geology and soil moisture on this hydrological response at various scales, a high space-time resolution hydrometeorological experimental monitoring system was set in the Mediterranean Claduègne catchment (43 km2), located in the Ardèche catchment, south-east France between 2011 and 2014 (Braud et al., 2014; Nord et al., in prep). Rainfall was monitored using a high resolution rainfall network (Hpiconet) composed of 21 rain gauges with 1 min time step covering an area of about 100 km2. The monitoring of surface hydrology include water level measurements at the outlet of 10 subcatchments ranging from 0.2 to 2.2 km2 and hydrometric measurements (water level, discharge) at the outlet of 3 catchments (Gazel: 3.4 km^2, SJ1: 12 km^2 and Claduègne: 43 km^2). The 10 subcatchments as well as the Gazel and SJ1 catchments are all embedded within the Claduègne catchments. The location of the 10 subcatchments was chosen to sample different combinations of geology, land use and pedology within the Claduègne catchment. In particular, 4 of these subcathments are located within the Gazel catchment and 2 are located within the SJ1 catchment. Soil moisture data with a 20 minutes time step at depths 10cm, 20-25 and 30-50 cm is also available at nine locations, sampling different combinations of land use and geology.

Catchment rainfall was computed from the Hpiconet data for each sub-catchment and all rainfall events using the Thiessen polygons method. The corresponding hydrological response was extracted for the whole data sets. For each event, rainfall characteristics describing rainfall amount and intensity, antecedent rainfall (and thus initial soil moisture) were computed. When a hydrological response was observed, reaction time (time between the initiation of rainfall and a significant water level rise) and rising time (time between the water level significant rise and peak water level) were derived. The results are impacted by the cross sections of the river. Some events show that the reaction and rising time follow an expected upstream-downstream propagation into the river network, while, for other events, this is not the case independently of homogeneity and spatial distribution of precipitation cells. Statistical analyses were also performed to search for relationships between rainfall characteristics, antecedent soil moisture, catchments characteristics and the hydrological response.

The results of the analysis are also used to assess the validity of the underlying physical hypotheses of the IRIP method (Intense Pluvial Runoff Indicators, Lagadec et al., 2016) allowing the mapping of areas prone to runoff generation, transfer and accumulation.

References

Braud et al., 2014. Multi-scale hydrometeorological observation and modelling for flash-flood understanding, Hydrology and Earth System Sciences, 18, 3733-376.

Lagadec et al., 2016. Description and evaluation of an intense surface runoff susceptibility mapping method, J. Hydrology, in revision.

Nord et al., in prep. A high space-time resolution dataset linking meteorological forcing and hydro-sedimentary response in a masoscale Mediterranean catchment (Auzon) of the Ardèche regione, France, Earth Systems Sciences Data.