



Hydrological analysis of the extreme precipitation event of June 2011 in the Parma basin, Italy.

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On June 11th 2011, in the afternoon, Emilia Romagna Region has been interested by intense thunderstorms on different areas. In particular an extreme event occurred around 5 pm and located between Taro and Parma basins, causing hydrogeological disesest with large damages on two small water course, will be analysed and described. This event covered an area of about 10 km² and had a duration of less than 2 hours. Statistical analysis of available raingauges data has been calculated for duration of 1, 3, 6, 12 and 24 hours. In particular, a comparison between annual and seasonal maximum analysis has been carried out. The maximum return period has been found for 1 hour cumulated rainfall at Medesano station, with an amount of 42.6 mm and a return period of 17 years. Visual inspection of radar rainfall images showed that the storm centre was located in an ungaged area between Taro and Parma basins. Preliminary numerical analysis of radar images was carried out leading to an estimated total amount of rainfall of about 100 mm for 3 hours duration, with a return period of more than 100 years in the storm centre. Soil moisture content before and during the storm played a rule both in runoff generation and in solid matter dynamics linked with anthropic conditions and the special coupling of input precipitation characteristics and catchment response times. Estimation of soil moisture in the sub basins has been carried out through antecedent and actual precipitation. Precipitation during the storm has been evaluated using real time rain gauges data and radar maps.

The available meteorological forecasting model run (COSMO-LAMI) of day 11th June 2011 has been also analysed in terms of hourly mean rainfall on the flooding area. It is shown that the meteorological model was not able to predict the event due to its temporal and spatial scales and characteristics, typical of an extreme convective event.

Finally, hydrological-hydraulic real time forecasting results from a Flood Early Warning System are shown. This system is operative in real time for flood forecasting on the whole Po river catchment. Three hydrological-hydraulic chains are available (Mike Nam-HD, Hec Hms-Ras and Topkapi-Sobek), giving new real time flood forecasting results every three hours on a number of sections of the main course of the Po river and on main tributaries as well. It is shown that, again due to temporal and spatial scales of the event, the actual forecasting system was unable to predict or even simulate the event occurred on June 11th 2011.

The development of further hydro-meteorological modelling applications, e.g. feeding the model with radar QPE, is introduced to cope these extreme events, improving the overall forecasting architecture in the next future.