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Peak discharge evaluation of five exceptional winter flash floods of 2004-2008 in Central-East Sardinian karst areas and their geomorphological effectiveness (Italy)

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In five subsequent winters (2004-2008) extreme meteorological events have occurred in karst areas of Central East Sardinia, leading to flash floods in several watersheds. Codula Ilune and Flumineddu experienced the most severe flash flood in December 2004, Codula Fuili in December 2006 and Codula Sisine in December 2008.
The scars of these flash floods are still well visible in the river bed morphology, caused by the huge quantities of water that have passed the river reaches during these extreme floods. Since no gauges are present in none of these watersheds, the only possible way of estimating the peak flow is a combination of geomorphological and hydraulic observations. Three different methods for the estimation of peak flow velocity have been applied in several river reaches of 4 karstic watersheds (Codula Ilune, Codula Fuili and Codula Sisine in the Gulf of Orosei and Riu Flumineddu in Supramonte), using the Manning's equation, the similar Jarrett's formula and the Costa's method (1983) that make use of the mean diameter of the biggest by the flood water transported boulders. These estimates allow to quantify the peak flow of the floods in different river reaches, and also to have an idea of where and how much water penetrates into the karst aquifer, thus feeding the underground karst river network.
Based on measurements from raingauges close to the study area, a statistical analysis of the rainfalls that have caused these flash floods has been also carried out. Total volume of water has been estimated for these four watersheds in the 5 events.