



Heavy rainfall and flooding in Central Portugal in autumn 2006: Climatological and hydrological analysis of three extreme events

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The higher frequency of flash flooding affecting small drainage basins during the fall season is an important feature of flooding risk in Portugal (Ramos and Reis, 2002). The rainy character of the last fall season was remarkable in the western part of the Iberian Peninsula, and considering the seasonal precipitation records of several Portuguese meteorological stations, this period can be classified as the wettest autumn of the last five decades. The central regions of Portugal were been affected by long wet spells, some of them with high intense precipitation amounts for daily and hourly time durations. In the last fall season, some flash floods in small drainage basins of Central Portugal were induced by these intense rainstorms. In this research, three notable heavy rainfall events as well as the major connected flash floods are analyzed. These events were occurred in the 25th October, 4/5th November and 24/25th November, causing floods in several basins, namely in Arunca and Nabão rivers catchments. The extreme nature of the rain is quite well documented in the firstly mentioned event. The daily amount of precipitation observed in the station of Pombal (Arunca river basin) in the 25th October 2006 (104,8 mm) is the highest precipitation record since its creation, in 1943, and reached 1/9 of the average annual rainfall, that is 925 mm. The return period of this daily precipitation was estimated in 190 years. In the same rainstorm and location, the maximum hourly precipitation exceeded 50 mm, and 75 mm were accumulated in less of two hours.

This paper aims to analyze the main meteorological causes of these extreme rainstorms, to quantify the extreme nature of their correspondent daily and hourly precipitation records in some stations of Central Portugal and to establish the relationships

between these data the floods occurred in the previously mentioned river basins. The synoptic atmospheric environment associated with the rainstorms is characterized, using composite charts of NCEP re-analysis grid-data. Additionally, sounding data from Lisbon/Gago Coutinho station is analyzed to derive indices and parameters describing the instability conditions that were been important to the development of convective cloud systems, identified in Meteosat imagery. A climatological study of the three events is performed by comparison to previous precipitation records and estimating return periods trough extreme value analysis. The rainfall spatial patterns associated with these events are also analyzed in order to explain the distribution of the floods. Finally, the hydrologic behaviour of two streamflows affected by flash flooding will be analyzed using discharges data collected in the stations of Agroal (Arunca river) and Ponte da Matrena (Nabão river).

Reference

Ramos, C. ; E. Reis (2002) - "Floods in Southern Portugal: their physical and human causes, Impactes and Human response", *Mitigation and Adaptation Strategies for Global Change*, vol.7, n° 3, Kluwer Academic Publishers, p. 267-284