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The GIS Database of floods in Northern Portugal, between 1865 and 2011

Monica Santos (1), Carlos Bateira (2), Carlos Hermenegildo (2), and Fátima Matos (2)

(1) IGOT, Universidade de Lisboa, Lisboa, Portugal (monica.s.m.santos@gmail.com), (2) Universidade do Porto, Porto, Portugal

Natural hazards, such as floods, cause considerable damage to the human life, material and functional damages every year. Thus, we created a GIS (Geographic Information System) database of floods recorded in the Northern Region of Portugal between 1865 and 2011. The research focused on the study of occurrences in newspapers of national and regional reference that caused some kind of damage. The results show that of the total of 1867 records in 147 years in analysis, 27% of occurrences have resulted in direct consequences on the population, i.e. killed, injured, missing, displaced or evacuated. These occurrences, 65% correspond to river flooding, 16% to flash floods and 18% to urban flooding. In period of analyses, there were 201 killed, 58 injured, 34 missing, 1813 evacuated, and 15924 displaced.

By the natural breaks method of classification of data, we can divide the data series into 3 classes: until 1930, 1931-1971 and 1972-2011. Until 1930, the average number of occurrences per year is 5. Thereafter, until 1971, there was a significant increase for 24 occurrences per year. In the period 1972-2011, the average number of occurrences is 13.5 per year. The entire series, we highlight the years 1909, 1939, 1955 and 2001 with over 80 occurrences / year.

We applied the Mann-Kendall (Kendall, 1976; Salmi, Määttä, Anttila, Ruoho-Airola, & Amnell, 2002) non-parametric test to detect long term trends in the occurrences. In order to estimate the magnitude of the trends, we used the algorithm that corresponds to an extension of the original test put forward by Theil (1950) and Sen (1968)(Sen, 1968). The results suggest a small upward trend, statistically significant, between 1865 and 2011, an increase of 0,066 occurrences per year. However, this general trend presents significant oscillations, when analysed over shorter periods of time. In terms of geographical distribution, the urban centres and the areas along major rivers concentrate most of the occurrences. The biggest number of occurrences occurs in Oporto metropolitan area, followed by the Braga, Ponte de Lima and Viana do Castelo municipalities. The Douro river basin is the watershed with more occurrences. This database is primarily intended to support the development of studies on the risk associated with these occurrences, analysing their spatial and temporal distribution, the susceptibility of the territories and the vulnerability of the elements exposed.

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