



Reassessing the impacts and the atmospheric circulation of the large storms over Portugal

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The present work was made possible after the recently development of a database of flooding and landslide events that occurred in Portugal during the 20 century. This database was collected through careful analysis of most available daily Portuguese newspapers at the time, namely “Diário de Notícias” and “Século” describing the consequences of important hydro-geological hazards during the 20 century. Therefore it is possible to evaluate the impact of these events through relatively detailed reports of the most affected places, including; number of deaths, dislodged and evacuated people, and even involved rescue entities or costs.

On the other hand, the analysis of meteorological conditions for these events was made possible through the recent development of the 20 Century Reanalysis dataset from National Oceanic & Atmospheric Administration (NOAA) (Compo et al., 2011), that covers the entire period in study. This long-term database allows re-evaluating the atmospheric conditions not only at the surface but also at several levels of the atmosphere, enabling a new approach to the studied events. Moreover, the new reanalysis is also more extended in time, with available data from 1871 until 2008 which makes it possible to represent and study the weather events before 1948 with a new perspective.

In this work it is analysed in detail the most important and devastating storm that took place since 1871, including the strongest sequence of storms ever observed in early December 1876 that lead to catastrophic floods in river Guadiana and Tagus. Other extreme events episodes that took place throughout the 20 century and never studied before are also analysed (albeit in less detail), namely on the 22 December 1909, 20 November 1937, 23 January and 1 February 1941, 19 November 1945, 2 January 1962 and 25 November 1967 the deadliest flood ever that occurred in Portugal.

For each event it was computed the sequence of 6 hourly weather fields of precipitation rate and mean sea level pressure fields. Additionally a number of other fields were computed and shown in common graphics, namely precipitation rate and CAPE, wind speed and wind divergence at 250 hPa and at 850 hPa geopotential height levels, air temperature at 850 hPa and geopotential height at 500h Pa and finally wind speed barbs and specific moisture content.

Compo G. P., Whitaker J.S., Sardeshmukh P.D., Matsui N., Allan R.J., Yin X., Gleason E., J.r., Vose R. S., Rutledge G., Bessemoulin P., Brönnimann S., Brunet M., Crouthamel R.I., Grant A.N., Groisman P. Y., Jones P. D., Kruk M. C., Kruger A.C., Marshall G. J., Mauerer M., Mok H. Y., Nordlki, Ross T.F., Trigo R. M., Wang X. L., Woodruff S. D., Worley S. J. (2011). The Twentieth Century Reanalysis Project. *Quarterly Journal of the Royal Meteorological Society*, 137(654), 1-28. doi:10.1002/qj.776