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Climatic extremes in Portugal in the 1780s based on documentary and instrumental records

Marcelo Fragoso[1,*], David Marques[1], João A. Santos[2], Maria João Alcoforado[1], Inês Amorim[3], João Carlos Garcia[4], Luís Silva[3], Maria de Fátima Nunes[5]

[1]Centre for Geographical Studies, Institute of Geography and Spatial Planning (IGOT-UL), Universidade de Lisboa, Lisboa, Portugal

[2]Centre for the Research and Technology of Agro-Environmental and Biological Sciences, CITAB, Universidade de Trás-os-Montes e Alto Douro, (UTAD), Vila Real, Portugal

[3]Transdisciplinary Research Centre 'Culture, Space and Memory'(CITCEM), Faculdade de Letras, Universidade do Porto, Portugal

[4]Centro Interuniversitário de História das Ciências e da Tecnologia (CIUHCT), Universidade de Lisboa, Lisboa, Portugal

[5]Universidade de Évora, (IHC-CEHFCi.UE), Évora, Portugal

ABSTRACT: The final stage of the Little Ice Age in Europe was characterised by strong climatic variability. New documentary sources containing information referring to weather and climate are used in this study to reconstruct and to describe climate conditions in Portugal during the 18th century, mainly in the 1780s. Indexation of documentary data concerning hydric and thermal conditions was based on C. Pfister's methodology and early instrumental data (1780s and 1790s) were used to verify the reconstruction. Precipitation and temperature were highly variable throughout the 18th century: an alternation of extremely hot to extremely cold months was found. Very cold years occurred mostly in the first 2 decades of the 18th century, but several other cold winters were also detected. Precipitation information is far more frequent than for temperature, and allowed yearly and seasonal indexations. The highest variability was detected in the 1730s and the 1780s. The early 1780s were very dry: during the winter and spring of 1781 and the spring of 1782 several drought episodes occurred, as confirmed by 'pro-pluvia' rogations. In contrast, heavy precipitation prevailed from 1784 onwards. The year 1786 was the rainiest in Portugal, triggering floods in northwestern and central Portugal. The year of 1788 was extremely wet and rainfall caused floods along the largest rivers: Douro, Mondego and Tagus. A storm that struck Northwestern Iberia between 23 and 24 February 1788 is analysed in detail.

KEY WORDS: Climate variability · Little Ice Age · Extreme events · Storm · Portugal

1. INTRODUCTION

According to the IPCC fifth assessment report (2013) and its 'Special report on managing the risks of extreme events and disasters to advance climate adaptation' (IPCC 2013), southern Europe is a climate change hot spot (see also Giorgi 2006), where the intensity and frequency of climatic extremes are projected to increase over the next decades (Kovats et al. 2014). Knowledge from past climates can help understand climate variability and change by weighting natural versus external climatic forcing, thus improving future projections. Furthermore, the availability of longer climatic series contributes to a greater understanding of anthropogenic forcing, particularly at regional scales (Zorita et al. 2010, Masson-Delmotte et al. 2013), where additional processes may modulate climate responses under external forcing (Gómez-Navarro et al. 2014).

*Corresponding author: mfragoso@campus.ul.pt