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Seasonal reconstruction of extreme events for central Spain from rogation ceremonies and historical floods.

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This work shows the evolution from 1500 to 1900 of two kinds of extreme climatic events very common in theIberian Peninsula: floods and droughts. The study was carried out in the southern Central Spanish Plateau on the basis of two documentary series: 1) The pro-pluvia rogations ceremonies (ceremonies to ask God for rain) celebrated inToledo. We analyze the duration of periods with continuous/overlapping ceremonies (Pro-pluvia Periods) to estimate the significance of the drought. This methodology gives an objective criterion for the analysis of the drought periods, and the possibility of working at seasonal scale. 2) The documented historic floods of the Tagus River at Aranjuez, Toledo and Talavera. The combination of these three locations provides a complete record of historical floods into the study area. These floods are classified, on the basis of the flooded area and damages, as a) ordinary b) extraordinary and c) catastrophic.Despite it is uncommon that both phenomena took place during the same year, they use to alternate during periods of high frequency of events. Accordingly to the annual frequency and the magnitude of events, we differentiate six periods: 1500-1556. Few extreme events, droughts in spring and floods in winter (their usual season). 1557-1623. It is the period with the highest abundance of events. We identify two subperiods: 1557-1590, events took place in their usual season, and 1591-1623, events in all the seasons. 1624-1716. Events are more frequent than in the first period but less frequent than in the second. Droughts and floods appear in all the seasons but floods only appear with severity during the second half of the period, especially between 1700 and 1715. 1717-1793. Increased frequency of events. Droughts were concentrated in spring and fall but their length decreased. Floods were more frequent in winter. This period shows the highest number of years (7) with both drought and flood. 1794-1850. The number of droughts and floods decreased drastically for all the seasons. 1850-1900. This period is characterized by social changes, that led to the progressive abandonment of the rogation ceremonies, and an increased anthropic pressure on the thalweg. As consequence only some spring droughts are recorded up to 1875, when their record ceases, but the flood record spreads to all the seasons. Thus, seasonal comparison of the frequency of events allows a better characterization of the annual series. On this basis, we can argue that the 1550 to 1800 episode was a period of high frequency of events during the Little Ice Age. Acknowledgements: This research is supported by the Spanish Ministry of Science and Education (MEC) projects REN2002-04433-CO2 and CGL2005-06458-CO2-01/HID. Fernando Domnguez-Castro work is supported by a MEC research grant (BES-2003-0482).