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A long-term perspective on flood response to climatic variability and human impact: Evidence from Spanish palaeoflood records

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The assessment of the response of hydrological extremes to anthropogenic global change is one of the main future uncertainties according to the IPCC (2007) report. With respect to understanding spatial and temporal patterns of extreme flood response to global change, a major limitation is the short length of instrumental records. This paper presents a review of recent and ongoing palaeoflood research in Spain that provides data on flood magnitude and frequency over long-term centennial timescales. The palaeoflood evidence collated to date provides valuable information for: a) understanding flood response to centennial scale climatic variability; and b) addressing the impact of global change (e.g. land-use) on modifying basin-scale flood hydrology. Evidence from the Guadalentín basin (ca. 350 km^2) in SE Spain indicates three main periods of increased flood magnitude and frequency, namely 900-1200 AD, 1450-1650 AD and 18-19^{th} centuries (the chronology of the last two phases corroborated by documentary evidence). The first two periods primarily indicate the influence of climatic variability (including the Little Ice Age), whilst the latter period reflects major global change (both climate and land-use change) in the basin, indicated by a shift in the sedimentology of the flood deposits that provide evidence of changing flood hydraulics and sediment loads. The largest recorded flood (2500 m^3s^{-1}) of the Llo-

bregat River (ca. 3370 km^2) in NE Spain was exceeded on at least 5 occasions during the last 3000 years. The textural change in the sedimentology of palaeoflood deposits reflects the deforestation in the basin that occurred before the 15^{th} Century. The largest flood, likely to be the 1617 event on account of radiocarbon dating and documentary evidence, reached a minimum peak discharge of 4600 m^3s^{-1} according to hydraulic modelling results. The implications of these results for the response of Mediterranean floods to future global change will be discussed.