

Geophysical Research Abstracts
Vol. 20, EGU2018-10444, 2018
EGU General Assembly 2018
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Megadroughts in Iberia. A case study of the event 1812-1824. Atmospheric processes and socio-environmental impacts

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Drought events are a recurrent phenomenon on Mediterranean Regions. Present context of global environmental change has drawn more attention to the study of climatic variability related to extreme patterns. Here, we investigate the so called megadroughts, which are long duration droughts with complex and diverse atmospheric-hydrological processes and severe socioeconomic and environmental impacts.

The analysis of megadroughts as low frequency events, requires a multi-proxy approach. In this case, we focus on the Mediterranean fringe of the Iberian Peninsula and study the drought phase between AD1812 and 1824 including different data sources: i) old instrumental series of Barcelona and different barometric records for Western Europe to characterize the atmospheric patterns, ii) dendroclimatic data, and iii) documentary sources to analyze pluviometric anomalies and socio-environmental impacts.

First results show pluviometric deficits in Barcelona between 1812 and 1824 with more than 75% of the months under dry conditions, including yearly values unrecorded up to present (less than 200 mm). Most important cities of Catalonia (NE Spain) recorded strongest level of rogation ceremonies by drought during this event. In addition, low growth rates are found in the trees limited by precipitation, suggesting that the long water stress period is also noticeable in biological records available from mountain systems of Ebro Valley. The impacts of the megadrought are also identified and evaluated. On the one hand, different indicators of direct impacts, such as agricultural affectations, lower water supply for urban concentrations, or reduced hydraulic power production, are analyzed to determine the severity of the event. On the other hand, we explore the indirect impacts caused by the studied megadrought, such as social riots, changes in water governance, or opportunistic epidemics.

Finally, we examine possible forcing factors, with special interest on the impacts of volcanic explosive eruptions already known for this period (Unknown, 1808/1809, VEI-6/7. Tambora, 1815, VEI-7. Galunggung, 1822, VEI-5). The study and understanding of long periods of drought in the past in complex Mediterranean socio-ecological systems, can contribute to better adapt our societies in the context of climate change.