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Description and distribution of atmospheric-related extreme events in sea level around Spain

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Sudden changes in physical magnitudes may cause severe damage to human beings and man-made structures. This changes are often called extreme events if the variatios are high enough, in such cases the proporcionality between the input and the ouput is broken involving non-linear events. In the case of sea level, this changes are often related to storminess. The aim of this work is to characterize extreme events, from the statistical point of view, using a bayesian approach based in the Generalized Pareto Distribution.

Temporal series from the REDMAR network from Puertos del Estado have been used. This series are measured in different spanish harbours covering the period between 1992 to 2003 and a sampling rate of five minutes. As a first approach, to determine the impact of the atmospheric-related sea level signal, the total sea level (SLtotal) is decomposed as follows:

SLtotal = MSL + SLLF + SLA + SLHF

where MSL corresponds to Mean Sea Level, SLLF is the low frequency signal in SL mostly related to the thermo-steric cycle associated with the expansion and contraction of sea water, SLA is related to the atmospheric-related changes in SL, SLHF corresponds to changes in sea level in a period of a day. It includes tides and noise wich can be viewed as posible measurement errors. A study of different aspects of the decomposition and statistical analysis regarding SLA which results in return period and the probability of occurrency of extreme events is carried out. Some results are presented grouped in different regions due to the different nature of the spanish coasts.