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A Coastal Storms Intensity Scale for the Catalan Sea

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The impact of storms on the coastal zone produces a series of high-intensity processes such as beach erosion, overwash and inundation, usually considered as coastal hazards. When these coastal hazards verify along developed/urbanized areas, could produce large damages in existing infrastructures, affect coastal uses and disturb coastal ecosystem services. The importance of these storms and induced hazards is explicit in the Protocol on ICZM in the Mediterranean signed in 2008 by the EU and the Mediterranean countries. This Protocol includes a specific chapter on natural hazards, where the parties are advised to undertake vulnerability and hazard assessments of coastal zones and take prevention, mitigation and adaptation measures to address the effects of natural disasters.

Within this context, the main aim of this work is to present an intensity scale for coastal storms developed for typical conditions of the Catalan Shelf. This follows the classic works of the hurricane (Saffir-Simpson, 1971) and the Atlantic Northeast storms (Dolan-Davis, 1992) scales although adapting them to the characteristics of Mediterranean coastal wave storms.

To develop such scale, wave data recorded along the Catalan coast in 5 locations covering a coastline of about 400 km have been used. Recorded wave time series cover a total time frame of about 25 years (1984-2008).

The first task was to identify storms in time series, which here were defined as those events during which the significant wave height exceeded a minimum value (threshold) of 2 m during a minimum period of 6 hours. Because our interest is to use this information to help managers to deal with coastal hazards, this definition was based not just in statistical properties of time series but on physical ones, i.e. this is the minimum event producing a significant coastal response in terms of beach erosion (estimated by means of numerical modelling of beach response to storm impacts).

With this, a complete storm data set for the Catalan coast was built by identifying all events in recorded time series. Each one is defined in terms of wave height –*Hs*-, period –*Tp*-, direction –θ-, duration –$D-$ and wave power –$P-$ (integrated along the storm duration). This storm data set is then analysed by means of a clustering technique resulting in a 5-categories scale using the wave power as classification parameter. This 5-level scale was selected to maintain the capacity to compare it to original ones developed for the Atlantic.

Once all the storms were associated to a given class, the next step was to assign them the order of magnitude of the expected induced coastal hazards along the Catalan coast. This was done by obtaining for each storm a measure of the intensity of the main induced hazards (beach profile erosion, sediment transport and inundation). Thus, each storm category is finally defined in terms of wave properties (*Hs*, *Tp*, θ, D, P) and, in terms of the magnitude of expected coastal hazards (which are defined by a mean, maximum and standard deviation of estimated values).

The final paper will show the obtained values and proposed classification and it will compare with storm classification developed for the Atlantic coast.

References

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