



Coastal storms in northern spain: assessment of relationships between natural forcing mechanisms and spatio-temporal distribution of damages

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Storms are one of the most significant natural hazards for coastal regions in terms of damaged properties. Concerns over the increase in damages generated by coastal storms has spread among the population and authorities in northern Spain, specially after the winter of 2013-2014. Such winter represented the most energetic coastal storm period since the beginning of the 20th century. As a result, beaches and coastal infrastructures were severely damaged. The objective of this contribution is to approximate to the spatial and temporal variability of the economic impacts of coastal storms and link their impacts to main meteorological and oceanographic forcing mechanisms in that area of the Iberian Peninsula.

The economic impacts of storms has been analyzed using the value of the compensations (euros) paid by the Spanish Consorcio de Seguros between 1996 and 2015. This is a Spanish public entity with activity in the insurance sector, linked to the coverage for extraordinay damages in Spain, excluding human losses and those due to business interruption.

Storms producing those events were identified and their main features extracted. Meteorological data from NCEP Reanalysis have been used, as well as wave (significant wave height and period) and sea level data from Puertos del Estado. First of all, maximum total water level associated with each events were calculated in several points along the northern coast of Spain, and compared with the value of the compensations. Long term trends of those features were analyzed in order to highlight the recent storm evolucion.

For the studied period almost two hundred storm events were identified, with a total direct cost higher than 64 million euros. Most of them occurred in January and February. The bulk of the damages can be attributed to a reduced number of storms which combine high but not necessary exceptional waves and high spring tides. By contrary, storm surges only play a secundary role. Spatially, most of the damages were concentrated in the eastern cantabrian coast, the Basque Country. This is consequence of a NW swell forcing induced by a storm track which enabled waves to propagate up this coastal sector unimpeded, and also due to a greater exposure in terms of human occupation and concentration of facilities. The western coast (Galicia) only suffered significative damages when storms follow a southern track and waves attack the coast with a more zonal component. Consequently, this research highlights the role of specific storms tracks on the magnitude and timing of episodes of coastal damages.

A long-term analysis of both the atmospheric and oceanographic mechanisms only shows a significant trend for the sea level. Storms and waves show remarkable interannual variations but not definded trends.