Synoptic situations associated with principal wave patterns in Galicia (NW of Spain)

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Galicia is located in the Northwest of the Iberian Peninsula at mid-latitudes. This region has 1700km of coastal zones bathed by the Cantabrian Sea and the Atlantic Ocean. Through the year the waves that affect these coasts can be higher than 4 meters, because of the situation of low and high pressure centres in the Atlantic Ocean and the North of Europe.

The objective of this study is to obtain a classification of the synoptic situations associated with different wave patterns in Galicia.

Data used included 3-hourly wave buoy observations since 1998 to 2004. The variables that are included in this study are: mean direction of the wave (Dmd, in degrees), mean spectral period (Tm, s) and the mean height of the wave (Hm, m). The buoys are situated in three characteristic zones along the coast: Cabo Villano (43º3.6'N, 9º12.6'W), Estaca de Bares (44º3.6'N, 7º37.2'W) and Cabo de Peñas (43º 43.8'N, 6º10.2'W).

First, a sine-cosine transformation was used to convert the mean wave direction (in degrees) into two variables U-Dmd and V-Dmd. Then, the 3-hourly observations were averaged from 9:00UTC to 18:00UTC. So, four variables were considered in each buoy and then the total number of variables was twelve.

Second, a principal component analysis (PCA) was performed over the twelve variables. The correlation matrix was calculated and the principal components were rotated using a Varimax procedure. The principal components retained were five, which explained 94.5% of the variance. The component loadings represent the correlations

between each variable and each principal component, so the principal components were characterized according to the loading values.

Last, a k-means clustering analysis was applied to the principal component scores to identify the most common combinations of them. Then, eight clusters were obtained representing the principal situations that generate characteristic wave patterns in Galicia.