



Spatial patterns of wind and favorable upwelling conditions along the Galician Coast (NW Spain)

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Wind field in the Galician coast is far from homogeneous due to the particular coastal geometry. Macroscopically, the Galician coast can be divided in three regions, the western coast, stretching from the Northern part of Portugal to Cape Finisterre, with an approximate angle of 90 degrees relative to the equator; the middle coast, from Cape Finisterre to Cape Ortegal, with an approximate angle of 55 degrees; and the northern coast, approximately parallel to the equator. Summer and winter wind fields have a small number of dominant patterns which are not necessarily representative because summer patterns may dominate in winter and vice versa depending on the coastal area. Therefore, wind observations at a single point, coastal or offshore, will not necessarily be representative of the wind conditions along the coast. Thus, it is necessary to have wind data able to characterize the different areas. These data can be provided by satellite scatterometry. Surface wind fields were obtained from the QuikSCAT satellite, available from July 1999. Wind data were retrieved from the Jet Propulsion Laboratory web site (http://podaac.jpl.nasa.gov/quikscat/qscat_data.html) as Level 3 Scientific product. The data set consists of global grid values of meridional and zonal components of wind twice daily measured on an approximately 0.25 x 0.25 degree grid with global coverage. Wind speed measurements range from 3 to 20 m/s, with an accuracy of 2 m/s and 20 degrees in direction. In addition, it is necessary to take into account that wind data close to coast (about 25 km) are not available due to the existence of a small coast mask. The reference height of wind data is also 10 m. QuikSCAT data are given in an ascending and descending pass. Data corresponding to one pass present numerous shadow areas, therefore, to increase the coverage, an average between both pass was considered. During winter wind blows from southwest along the coast with amplitude increasing from south to north. The summer season is clearly different with wind blowing from north all over the coast. Both situations point

out the weakening effect produced by the coast. In particular in the western coast during winter, south-westerly wind blows directly toward coast decreasing its magnitude in relation to the rest of the Galician coast. In contrast during summer, when the wind trend is from the north, wind blows almost parallel to the western coast reaching a high magnitude due to the absence of obstacles. The different orientation is responsible for the along shore variations in the prevalence of upwelling favorable conditions. Thus, in average, the most upwelling favorable conditions correspond to the western coast. Upwelling reaches a maximum probability of 60% at western coast during summer and a minimum probability of around 30% in December- January. The middle coast shows lower probabilities during summer (about 40%) and the northern coast presents the lowest probabilities of upwelling favorable conditions with two maxima in March and September and a minimum in December- January and July.