



Upwelling conditions along the Galician Coast (NW Spain) during the last six years (2000-2005)

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Macroscopically, the Galician shore line 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° relative to the equator; the middle coast, from Cape Finisterre to Cape Ortegal, with an approximate angle of 55°; and the northern coast, approximately parallel to the equator. The Galician western coast is part of the so called NW Iberian Upwelling System and it has attracted the interest of oceanographers since the seventies. In fact, this system is the northernmost limit of the Eastern North Atlantic Upwelling System. Coastal upwelling is basically a spring-summer process in the Galician coast, characterized by favourable southward winds along the coast, although it has also been observed in winter under some special conditions. Summer upwelling pumps into the estuaries colder nutrient-rich deeper water known as Eastern North Atlantic Central Water (ENACW). Upwelling is also present north of Cape Finisterre although is not a common event in the northern coast. In fact, some papers describing the presence of upwelling along the Galician coast point the existence of important differences in thermohaline variables, in the concentration of opal and silicate or in the abundance of cephalopods between this part of the Galician coast and the rest. To analyze the upwelling conditions along the Galician coast, surface wind fields were obtained from the QuikSCAT satellite (http://podaac.jpl.nasa.gov/quikscat/quikscat_data.html). 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° in direction. 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. The Upwelling Index (UI) can be calculated by means of the Ekman transport components and used to analyze the upwelling conditions along the Galician coast. The mean value of UI for the period under study shows prevalence (in average) of upwelling favorable conditions at the western coast. At the middle coast it is possible to observe positive UI values although with a lower magnitude and at the northern coast there are upwelling unfavorable conditions. The different orientation and amplitude of Ekman transport is responsible for the along shore variations in the prevalence of upwelling favourable conditions. Thus, in average, the most upwelling favourable conditions correspond to the western coast.