



Characterization of upwelling phenomenon along the Italian coasts

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In order to investigate wind-driven upwelling along the Italian coasts, preliminary wind data provided by the ISPRA Italian Tide Gauge Measurement Network (RMN) have been analyzed. In a further step, MyOcean Sea Surface Temperature (SST) data have been analyzed in order to define an SST index for wind-driven coastal upwelling assessment.

At first, hourly wind data for the period 2009 - 2011 have been used in order to provide the statistical distribution and the wind rose plots at each RMN station. In particular, wind direction and speed have been selected in order to find upwelling-favorable areas and periods of time. E.g. wind directions in the sector between North and West in the Tyrrhenian Sea and between South and East in the Adriatic Sea have been defined as upwelling favorable, the wind sector being defined as the $\pm 30^\circ$ arc around the direction parallel to the coast. Moreover only wind speeds greater than 3.0 m/s have been considered as significant for upwelling. For each location, the number of selected data has been divided by the total number of recorded wind data, thus obtaining a sort of upwelling frequency, which allows to define areas mostly exposed to upwelling. Once these areas were defined, satellite SST data have been used as a proxy to study the changes in upwelling intensity, since upwelling waters are colder than surrounding waters. So, in a given satellite SST image the upwelling event is identifiable through SST minima along the coasts.

Finally, the SST upwelling index has been defined; also, this index has been “weighted” with wind intensity and direction indicating upwelling conditions obtained from the RMN wind dataset, to better distinguish between upwelling-favorable and downwelling-favorable conditions at each RMN site.