COASTAL DYNAMIC FEATURES ALONG THE NORTHERN LIGURIAN SHELF (PORTOFINO CAPE) IN SUMMER 2004: ROLE OF THE METEOROLOGICAL AND THE TOPOGRAPHIC FORCINGS

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Abstract
A comprehensive analysis of hydrological, current-meter and meteorological data was performed in the northern Ligurian sea to describe the coastal dynamic near the Portofino cape and its relation with the general cyclonic circulation during summer 2004. Current-meter data was acquired in two coastal sites: the Portofino Cape and the marine area of Arenzano. The hydrological parameters around the cape suggested the presence of two different water masses. The first, located in the lee of the cape, is influenced by local effects, while the second, offshore the cape, is correlated to the general circulation of the Ligurian Sea. The prevalent southern direction of the current in Portofino indicates the presence of a local anticyclonic circulation, associated to the presence of the cape.
Keywords: Currents, Hydrology, Ligurian Sea

A current analysis has been performed in two coastal locations of the Northern Ligurian sea, situated respectively in the eastern and western side of the Gulf of Genova: the Portofino Cape, characterized by a unusual squared-shape of the coast, and the coastal area offshore Arenzano. A very narrow shelf with a very steep slope is typical of the Portofino location, while Arenzano presents a gently sloping bathymetry and a fairly straight coast.

Between July and August 2004, current-meter measures were acquired in the lee side of the cape on a bottom of 30 metres, using a new technology named SEPTR [1] . A hydrological survey was also conducted in the same area in August, using a CTD probe on 36 stations around the cape. In the maritime coastal area of Arenzano an ADCP mooring was placed at 30 m of depth, on a bottom of 50 m. Satellite wind data was acquired by QuikScat for the summer 2004, and compared with the local winds four stations along the Ligurian coast. The aim of this work is to provide a coastal dynamics circulation scheme around the Portofino cape, with particular attention to its interaction with the general cyclonic circulation, and to describe the role of the meteorological and the topographic forcings.

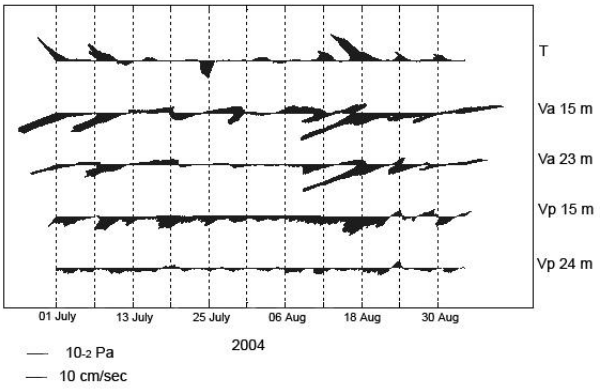

Fig. 1. Five time series are presented: (top) wind stress in Genova (unit 10^{-2} Pa); (second and third) Arenzano currents at 15 m and 23 m respectively; (forth and fifth) Portofino currents at 15 m and 23 m respectively (units: cm/s).

The direct current measures on the lee side of the cape suggest a local re-circulation with a prevalent southern current direction almost perpendicular to the coast. On the other hand the main local current direction in Arenzano is south-west, following the isobaths of the continental shelf [2]. The comparison between Arenzano and Portofino currents shows the maximum correlation of 0.53 for a time lag about 9-10 hours: the Portofino current anticipates the Arenzano one. The ADCP data shows shorter time scale phenomena (few days) in both locations, mainly forced by meteorological events. The study of the baroclinic component of the Portofino currents indicates an important role played by both the wind and the bottom stress. A preliminary meteorological analysis suggests to consider the wind at Genova location, which is prevalently directed towards north-west, with the main intensity-current picks well correlated to all the other wind locations. Comparing the low-frequency current fluctuations of Portofino (15-24 metres deep), of Arenzano (15-23 metres deep) and the Genova wind stress, it is possible to reveal a common time variability between July and August 2004 (Figure 1). The singular topography of the Portofino Cape plays a significant role in the response of the coastal waters to wind forcing and to the general circulation of the Ligurian Sea, determining a small-scale, anti-cyclonic eddy on the western side of the Portofino Cape, according to previous numerical study [3].

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