RESUSPENSION EVENTS AND SEDIMENT FLUXES ACROSS BARCELONA CONTINENTAL SHELF

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Abstract
Near-bottom sediment fluxes were measured at several locations across the Barcelona continental shelf (NW Mediterranean) during the SEDMET Study. Current meters equipped with turbidimeters were installed on instrumented tripods deployed at 20, 30 and 40 m water depth. Measurements of near bottom currents and water turbidity, from October 2007 to June 2008, in combination with wave data provided information about the physical forcing and resulting resuspension and sediment fluxes on this Mediterranean continental shelf. This contribution analyses the results obtained during the first recording period (September – December, 2007) characterized by a high wave-energy regime. During this period, six moderate storms occurred, being identified as the main contributors to the sediment resuspension events recorded between 20 and 40 m depth.
Keywords: Sediment Transport, Continental Shelf, Western Mediterranean

Sediment resuspension in the Western Mediterranean Sea is caused primarily by the wave-storm activity when wave periods increase significantly. Some authors showed that sediment resuspension in response to storm waves on the Ebro Margin (NW Mediterranean) is mainly effective on the inner-shelf region [1] [2]. The present project involves studying resuspension and sediment transport events in a littoral system affected by industrial and urban activities, Barcelona (NW Mediterranean) (Figure 1).

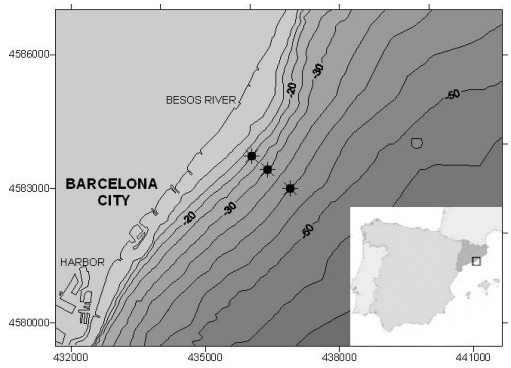

Fig. 1. Map of the Barcelona continental shelf showing the three tripods locations. Depth contours and UTM units are in meters.

During the SEDMET Project, three benthic tripods were deployed in the northern Barcelona continental shelf at 20, 30 and 40 m water depth (Figure 1). Each tripod was equipped with an Aanderaa Doppler current meter (RCM9) coupled with a pressure sensor, a temperature sensor, and 2 Aanderaa turbidimeters of different ranges. These sensors were measuring at 0.6 meters above bottom (mab). In addition, an NKE ALTUS 2 Hz altimeter and a sediment trap were incorporated to the tripods structures. For this study, the current meter recording intervals were set at 20 minutes, and the observational period lasted in total 8 months in 3 deployments of 2-3 months, beginning 28 September 2007 and ending 19 June 2008.

The meteorological and the waves conditions were obtained from "Puertos del Estado" WANA model calibrated with data obtained from the Llobregat buoy of the XIOM ("Generalitat de Catalunya"). In addition, vertical hydrographic profiles were made monthly using a SBE 25 CTD, coupled with a Seapoint turbidimeter. Water samples were collected during each cast near the bottom and at the surface. To obtain time series of suspended sediment concentration (SSC), turbidity sensors were calibrated with estimations of SSC measured from filtered water samples.

This paper analyses the data recorded during the high-energy season, from the 28th of September to the 29th of November 2007, at the three tripod locations (20 m, 30 m and 40 m). During this first deployment, there were six moderate storms with significant wave height (Hs) of about 2-3 m and peak wave period (Tp) around 10 s, increasing during the strongest storm to Hs up to 3 m and a Tp of 12 s (Figure 2).

The highest near-bottom current speed at the three locations were associated with storms events, reaching maximum values up to 25 cm/s. During those events, the mean component of the near-bottom currents was 1-2 orders of magnitude higher alongshelf than across-shelf with a resultant flow predominantly directed towards the SW.

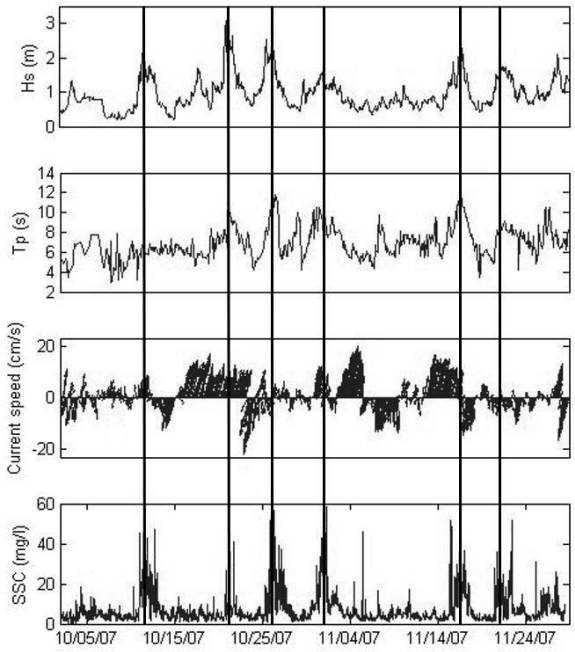

Fig. 2. Time series of significant wave height (Hs), peak wave period (Tp), near-bottom current vectors and SSC (0.6 mab) at 20 m depth during the high wave-energy period. Vertical lines identify the six resuspension events.

The near-bottom SSC during the recorded period showed a high temporal and spatial variability, and mean values decreased offshore. At 20 m depth, the SSC was less than 0.5 mg/l during fair-weather conditions and increased up to 50 mg/l during storms (Figure 2). Finally, regarding to the sediment flux, the mean alongshelf sediment fluxes at all the recording sites were higher than the across-shelf component and decreased with increasing depth.

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References
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