HIGH RESOLUTION MODELLING OF THE IMPACT OF A STORM ON THE COUPLING OF SEA STATE AND OCEANIC CIRCULATION IN THE GULF OF LION (NW MEDITERRANEAN SEA).

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Abstract
The Gulf of Lion (GoL, NW Mediterranean sea) is known to be the place of East-Southeastern winter storms. These extreme events induce energetic sea states, with significant wave height close to 5 m, and oceanic currents, which could reach 0.80 cm.s^{-1} at the surface.These conditions are at the origin of large amounts of sediment resuspension and transport. Data obtained during a winter storm in March 2013 have been used to validate a coupled wave-current model. This high spatial resolution model permitted to study the impact of the storm on sea state and oceanic currents.

Keywords: Circulation models, Gulf of Lyon, Coastal processes, Waves, Continental shelf

The residual cyclonic circulation in the Gulf of Lion (GoL) is mainly induced by the Northern Current which is part of the Western Mediterranean circulation [1]. A study has shown that GoL sea state is generally quiet with significant wave height lower than 1.5 m [2]. This study also highlighted a specific period, from October to March, during which short events with more than 5 m wave height can be related to the passage of winter storms.

In the past ten years, the NW Mediterranean sea has been the place of several of these East-Southeastern (E-SE) storms. In the Gulf of Aigues-Mortes (NW GoL), waves with significant height greater than 5 m have been seen during the winter storm of 18 February 2007 [3]. The same study noticed strong surface currents that reached 0.8 m.s^{-1} while near bottom current presented maximum value of 0.5 m.s^{-1} close to 30 m depth. Similar observations have been made during 2011 winter storms offshore the Cap de Creus (SW GoL) [4]. Significant wave heights higher than 4 m have been observed and at the same time, maximum current speed of 0.55 cm.s^{-1} have been measured.

Since the 2011 winter events, a major E-SE sea storm has been detected during the month of March 2013. Waves characteristics and currents have been measured off the coast of Sète (France) at the BESsète station (position : 43°20,035' N, 3°38,377'E).
These in situ observations have been used to validate a numerical model based on the coupling of the three dimensional ocean circulation model SYMPHONIE [5] and the generation and propagation wave model WAVEWATCH III [6]. To reproduce the effect of the storms on the circulation and the sea level on the Gulf of Lion continental shelf including the vicinity of the coastline, a bipolar numerical grid with a spatial resolution lower than 300 m along the coast has been used. The impact of the storm on the intensity of currents and turbulence on the whole continental shelf is discussed .

The energetics inputs in the water column induced by storms increases sediment resuspension. Consequently, the better the storms are simulated, the better the estimation of sediment transport will be reproduced. This work is therefore the first step in order to well represent the erosion and dispersal of sediment.

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