



A methodological approach to rapid assessment of a river flood in coastal waters. First test in the Po River delta

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As part of the actions of the flagship project RITMARE (Ricerca ITaliana per il MARE) a daily oceanographic survey was performed on 29th November 2013 in front of the Po River delta (Northern Adriatic Sea). The Po river affects a large part of the Northern Adriatic Sea with strong implications on the circulation and functionality of the basin. Physical-chemical and biological properties of coastal waters were investigated after a moderate flood occurred around 25th-27th November. The cruise activities, carried out using a small research boat, were mainly focused on the test of a methodological approach to investigate the environment variability after a flood event in the framework of rapid assessment. The effects of the flood on the coastal waters, have been evaluated in the field using operational forecasts and real-time satellite imagery to assist field measurements and samplings.

Surface satellite chlorophyll maps and surface salinity and current maps obtained from a numerical model forced by meteorological forecast and river data were analyzed to better identify the Po plume dispersion during and after the event in order to better locate offshore monitoring stations at the sea.

Profiles of Temperature, Salinity, Turbidity, Fluorescence and Colored Dissolved Organic Matter (CDOM) throughout the water column were collected at 7 stations in front of the Po River delta. Sea surface water samples were also collected for the analysis of nutrients, Dissolved Organic Carbon (DOC) and CDOM (surface and bottom). The CDOM regulates the penetration of UV light throughout the water column and mediates photochemical reactions, playing an important role in many marine biogeochemical processes.

Satellite images showed a strong color front that separates the higher-chlorophyll coastal water from the more oligotrophic mid-basin and eastern boundary Adriatic waters. In front of the river mouth, the surface layer was characterized by low salinity (14-15), high turbidity (8-11 NTU) and high CDOM (20-22 ppb) values. These parameters showed a strong gradient from coast to offshore and from surface to the bottom. The fluorescence values were more variable since the phytoplankton growth is not quickly correlated with the load of riverborne materials. The higher fluorescence values ($1.8-2 \mu\text{g l}^{-1}$) were, in fact, detected offshore and at bottom. A good correlation between salinity versus CDOM ($R^2=0.84$) and salinity versus Spectral slope (SCDOM275-295; $R^2=0.86$) were found. These features reveal the role of CDOM as tracer of the freshwater inputs.

Chemical analysis of waters affected by the river plume display high concentration of organic carbon ($100-160 \mu\text{mol l}^{-1}$) and nutrients strengthening this zone as one of the most eutrophic area of the Mediterranean Sea (Campanelli et al. 2011, Marini et al. 2008).

The synergy of actions applied in the test has proved useful to better analyze the variability of coastal water characteristics after a river flood. However, a similar methodological approach could be reasonably applied to the rapid assessment of different events (i.e. harmful phytoplankton growth, chemical spills) which can occur in the area or in areas with similar features. The definition of methodologies for rapid assessment of marine processes can be a useful tool for the future integrated management of coastal zone.

References

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