THE POTENTIAL OF COLORED DISSOLVED ORGANIC MATTER AS WATER MASS TRACER. COMPARISON BETWEEN CENTRAL AND SOUTHERN ADRIATIC SEA

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Abstract
This work investigates the role of CDOM as a potential tracer of water masses, by comparing two different areas of the Adriatic Sea, Senigallia and Gulf of Manfredonia, based on two sampling campaigns conducted in October 2014 (Autumn) and May 2015 (Spring). The results showed that the CDOM is a good tracer for the Senigallia area while the Gulf of Manfredonia presents as a more complex biogeochemical system.

Keywords: Organic matter, Central Adriatic Sea, Chlorophyll-A

Introduction
The paper reports the hydrological (Temperature, Salinity) and the biogeochemical (Colored Dissolved Organic Matter-CDOM; Chlorophyll *a*-Chl*a*) data gathered along two cross-shore transects located in front of Senigallia (Midwestern Adriatic Sea) and in the Gulf of Manfredonia (Southwestern Adriatic Sea) during two oceanographic surveys dating back to October 2014 (autumn) and May 2015 (spring), respectively (Fig. 1). Both surveys are included in the framework of two Italian projects, (i.e. Ritmare and DSS-Pesca).

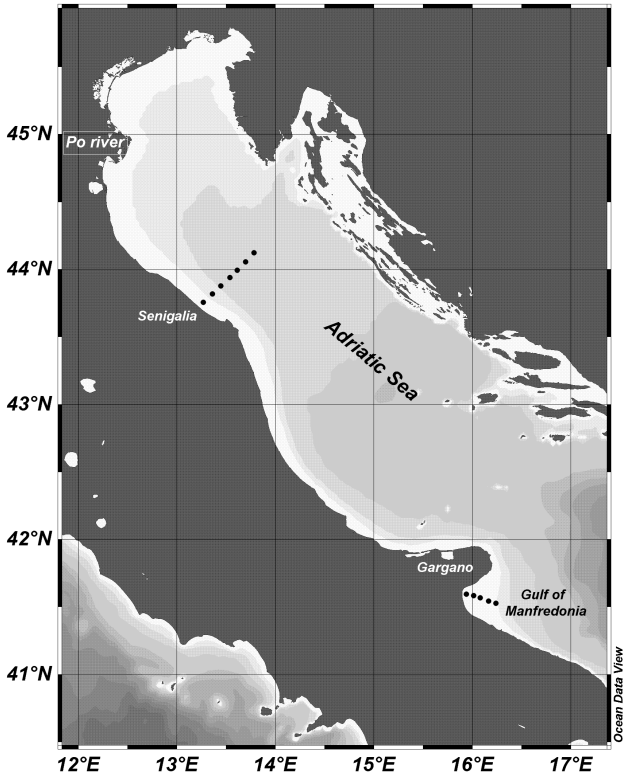

Fig. 1. Map of all sampling stations in the italian waters of the Ariatic Sea

The Western Adriatic Current (WAC) flows south-eastwards along the Italian coast, transporting the freshwaters of the main Italian river, the Po, affecting mainly the Senigallia area and the offshore zone of the Gulf of Manfredonia (in winter). Here in the nearshore area, the physical forcings able to affect the biogeochemical variability are represented by minor local rivers (i.e the Calendaro and the Ofanto), that play a similar role to the Po in the North Adriatic Sea. In addition the timing of the survey allowed evaluation of the effects of the exceptional river floods occurred in the Gargano Promontory area in September 2014. CDOM plays an important role in many marine biogeochemical processes, regulating the penetration of UV light throughout the water column and mediating photochemical reactions [1]. Moreover it can be a useful tracer for carbon and also a proxy for mixing in a wide variety of environments. The aim of the study is to investigate the potential of CDOM as tracer of water masses comparing two coastal zones of the Adriatic Sea with a different hydrological asset.

Methods
Profiles of Temperature and Salinity were performed at 7 stations along the Senigallia Transect (ST) and at 5 stations along the Gulf of Manfredonia Transect (MT). Sea surface and bottom water samples were also collected for the analyses of CDOM ($a_{CDOM}355$ and Spectral Slope $S_{275-295}$) and Chl*a*.

Results and Discussions
Temperature, salinity and CDOM showed gradients offshorewards and from surface to the bottom along the ST. In both periods the ST was characterised by a wider salinity range (autumn 2014: 32-38.5; spring 2015: 35-38), especially at the surface, than the MT (autumn 2014: 35-37; spring 2015: 36.5-38). Similar patterns were detected for temperature and organic matter. The $a_{CDOM}355$ showed more variability along the ST (autumn 2014: 0.16-0.81 m^{-1};$a_{CDOM}355$ spring 2015:0.18-0.45 m^{-1}) than along the MT (autumn 2014: 0.25-0.49 m^{-1}; spring: 0.26-0.55 m^{-1}), especially in autumn, despite the alluvium. In autumn, along the MT, a weak gradient is observed, with fresher coastal waters rich in organic matter, while in spring this feature is almost absent. ST shows a significant negative correlation ($p<0.01$) between salinity and $a_{CDOM}355$ both at the surface and at the bottom in both periods. The analyses of $S_{275-295}$ [2] and Chl*a* revealed that CDOM was mainly of terrestrial origin (humic substance with high molecular weight) in spring (surface and bottom) and of marine origin (i.e. substance with low molecular weight) in autumn (surface).
In autumn, the MT shows a significant negative correlation ($p<0.05$) between $a_{CDOM}355$ and S both at the surface and on the bottom while in spring the correlation ($p<0.01$) is limited to the surface. Furthermore, the analyses of $S_{275-295}$ and Chl*a* show that, in autumn the chemical nature of surface CDOM is mainly of marine origin and in spring it is of terrestrial origin.
These patterns reveal that the CDOM (and thus salinity) is a good tracer of water masses along the ST during the investigated periods. In fact ,this transect intercept different water masses that are carried by the WAC and that seem to be detectable using CDOM ($a_{CDOM}355$ and $S_{275-295}$). The MT shows a more complex pattern with abundance and distribution of organic matter of different origin (rivers runoff, decomposition of terrestrial organic matter, phytoplankton etc.). This is due to the strong influence of instantaneous local river organic inputs or possibly of different origin. The CDOM measured in the MT seems a rather ambiguous tracer during the studied periods.
Further investigations are needed to better understand the role of CDOM as tracer in these areas and assess its seasonal and annual variability.

References
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