CHLOROPHYLL CONCENTRATION ALGORITHMS IN APULIAN COASTAL AREAS

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Monitoring and managing small coastal ecosystems requires a considerable understanding of the temporal dynamics of biophysical factors describing the coastal water systems. For this reason, daily observation from space could be a very efficient tool. For this purpose, high resolution, multispectral satellite data have been successfully applied in the detection of chemical, biological and physical processes developing in coastal waters. However, the monitoring of coastal waters using the existing satellite instruments, is a challenging task which requires certain special procedures. In fact, we know that in open oceans, case 1 waters, phytoplankton is the principal agent responsible for the optical properties of waters. Instead, the optical properties of shallow and coastal waters, case 2 waters, are influenced not only by phytoplankton, but also by other substances, generally classified as suspended inorganic particles and yellow substance[1].

In the framework of IMCA project (Integrated Monitoring of Coastal Area) an important set of in situ measurements has been done. Beside the laboratory measurements of water quality parameters and their inherent optical properties, a set of radiometric measurements have been performed. This measurements consist of in downwelling irradiance above water, and in water profiles of downwelling irradiance, upwelling radiance, fluorimetric chlorophyll-a concentration, temperature and other ancillary quantity. These measurements are performed using a Satlantic Profile II, free fall profiler at which the OCR- 507 I and OCR-507 R radiometers are connected. The areas of interest are located in the south-east of Italy in the region of Apulia. In this region, three sites have been selected: 1) Taranto seas on the Ionian Sea. This site is characterized by a strong human activity for the presence of important industrial settlements with an high traffic commercial port and a base of Italian Military Marine; 2) Manfredonia and estuarine of Ofanto river on the Adriatic sea. The waters of this area are very turbid due to the presence of the river and for some industrial settlements near Manfredonia; 3) Tremiti islands on the Adriatic sea. This area is an important marine protected area characterized by clear waters conditions. In these areas a total of 25 stations located within 3 km from the shore have been selected, and the measurements have been performed almost 2 times per month, according on the cloud free satellite overpasses from Spring 2006 to Spring 2008. Moreover in the Manfredonia and Taranto sites a buoy in each site has been deployed in 2006 and a two-years long series of chlorophyll concentration measurements and some other ancillary parameter data has been collected.

The aim of this paper is the validation of some bio-optical algorithms for the retrieval of chlorophyll-a concentration. The remote sensing reflectance derived from field measurements has been used as input for the algorithms, and the resulting chlorophyll concentration has been compared to the one measured by the fluorimeter and with the one derived by the water samples using the HPLC technique. Three algorithms have been selected. The first one is the OC4v4, an empirical algorithm[2]. It has been selected to test the hypothesis that the Tremiti site could be considered as case 1 area. The other two algorithms are semi-analytical ones: the GSM algorithm [3] and Carder algorithm[4].

The results shows a good agreement between the output of the empirical model and the in situ measurements in the case of Tremiti site and the surrounded area. These results confirms that the latter site could be considered as a case 1 water area. As expected, the OC4v4 fails when it is applied to the Manfredonia and Taranto site. In these areas the two semi-analytical models performs well than the OC4v4.

The temporal series of the two buoys measurements has been compared with the MODIS level 2 products. The results of this comparison will be shown in the final revision of the paper.

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