OCEAN COLOUR AND OTHER OPTICAL SATELLITE DATA VERSUS IN-SITU DATA

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Abstract

Different optical data are available at JRC database, covering partly the same time period. The idea of this paper was to extract monthly mean data from the geoportal from different satellites for the same location in the open middle Adriatic Sea and compare them with each other and with the in-situ optically weighted monthly chlorophyll pigments. The correlation coefficients were calculated between various optical data retrieved from the satellites like Chlorophyll data from SeaWiFS, MODIS and MERIS diffuse attenuation coefficient, absorption coefficient, particulate backscattering coefficient and euphotic zone depth with the monthly in-situ chlorophyll and Secchi disk transparency.

Keywords: Remote sensing, North-Central Mediterranean

The data series of the Institute of Oceanography (Split, Croatia) especially in the Middle Adriatic has long tradition of almost monthly oceanographic measurements. Among these data we used transparency and in-situ chlorophyll from the station located at 43N; 16.33E for the period 1997-2007 (Fig 1).

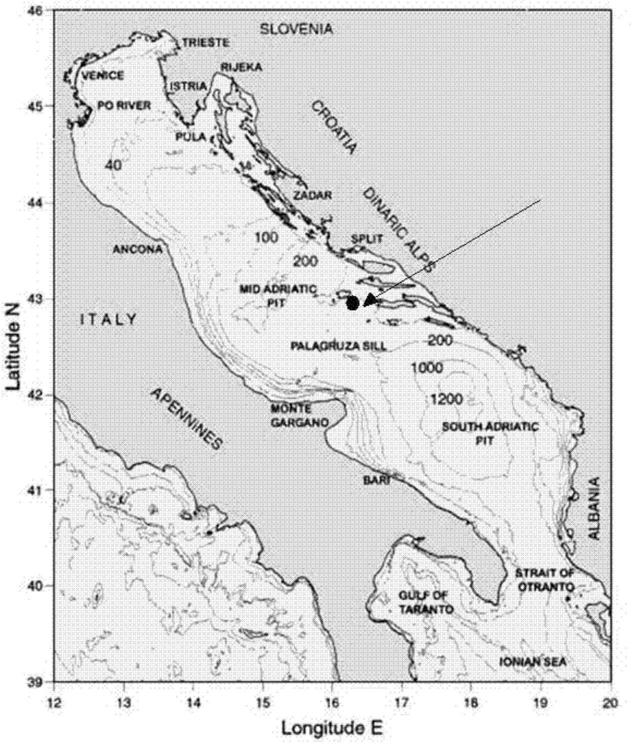

Fig. 1. Investigated location.

From the same point all the available satellite optical data were retrieved form www.jrc.it geoportal.

Recent comparison of in-situ to satellite colour data from the same area at the monthly scale has shown rather high differences, especially in summer when satellites often show higher values (1). In some earlier analysis high seasonal differences were also found (2). Daily pixel values also show in some periods large differences relative to the same day and location in-situ data (3). The question is how to handle these differences, if we wish to complement one data type with the other?

Besides anylsing the annual course of the differences, the correlation analysis was performed to see to what extent the data from different sources, the satellite and the in-situ, correspond and also to what additional parameters, retrieved from the satellites, are they best related.

In spite of the differences, high correlation coefficients were obtained between in-situ optically weighted chlorophyll (OPW) with chlorophyll values from satellite sensor MODIS and somewhat less with the data from MERIS (Table 1).

Also high correlation was obtained between OPW and diffuse attenuation coefficient Kd490 (MODIS). The correlation coefficients, although significant, are lowest with the Secchi disk depth, which is understandable due to their dependence not only on water properties.

Euphotic zone depth is highly correlated to absorption coefficient and both euphotic zone depth and absorption coefficients are highly correlated (0.96) to MERIS Kd490, while correlation of these with particulate backscattering coefficient is somewhat lower (0.7).

The correlation coefficients between the chlorophyll satellite data from the three satellites are very high while correlations among Kd490 from the three satellite sources are little lower.

Although the analysis of long-term series of both in-situ and satellite data often lead to similar and comprehensive results, the differences in data require particular attention in order to take the advantage of frequent optical satellite data measurements.

Tab. 1. Correlation coefficients between diffuse attenuation coefficient Kd_{490}, Chlorophyll pigments from different sensors (MERIS, MODIS and SW-SeaWiFS), transparency (SD), optical data from MERIS: euphotic zone depth (Z_{eu}), absorption coefficient at 443 nm (a_{443}), particulate backscattering coefficient at 443 nm (bb_{443}) and optically weighted in-situ chlorophyll pigments (OPW). N-data number, p-significance level <0.01 for all unmarked coefficients, and p<0.045 for coefficient marked with *. Only the significant correlation coefficients are shown.

	K_{490} (m-1)		(m)	Chl (mg dm-3)				(m)	(m-1)	
	SW	MODIS	SD	MERIS	SW	MODIS	OPW	Zeu	a_{443}	bb_{443}
K_{490} MERIS	0.78 N=30	0.85 N=85	-0.42 N=74	0.98 N=113	0.85 N=30	0.85 N=85	0.63 N=46	-0.98 N=109	0.92 N=113	0.68 N=113
K_{490} SW		0.88 N=27	-0.38 N=54	0.80 N=30	0.97 N=86	0.86 N=27		-0.78 N=30	0.82 N=30	0.55 N=30
K_{490} MODIS			-0.47 N=57	0.87 N=85	0.90 N=27	0.97 N=85	0.81 N=40	-0.82 N=85	0.89 N=85	0.41 N=85
SD				-0.46 N=74	-0.37 N=54	-0.48 N=57		0.43 N=74	-0.44 N=74	-0.32 N=74
Chl MERIS					0.87 N=30	0.89 N=85	0.65 N=46	-0.96 N=109	0.96 N=113	0.70 N=113
Chl SW						0.90 N=27		-0.86 N=30	0.88 N=30	0.64 N=30
Chl MODIS							0.80 N=40	-0.81 N=85	0.90 N=85	0.50 N=85
Chl OPW								-0.59 N=46	0.66 N=46	0.30* N=46
Zeu									-0.91 N=109	-0.69 N=109
a_{443}										0.57 N=113

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