Some characteristics of the sea water transparency of the Adriatic Sea during the period from 1956 to 1990

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During the oceanographic cruises data on transparency were collected from all the stations in the Adriatic sea during the period from 1956 to 1990. Transparency was measured by Secchi disc (30 cm). The transparency of the Adriatic sea is taken only at stations on the open sea to avoied the irregular variations of the transparency of coastal and channel waters (Fig.1.).

Fig 1. Positions measurements by Secchi disc on the open Adriatic sea

Total data number was devided into two periods, earlier period (1956-1971) and recent period (1972-1990) in table 1.

Table 1. The average of the values of the transparency of the sea water is measured by Secchi disc (m). The figures in brackets denote the number of measurements

Open Adriatic sea areas	Period (1956 - 1971)		Period (1972 - 1990)	
North	19.4	(150)	13.9	(223)
Middle	26.3	(740)	22.7	(281)
South	27.4	(189)	22.0	(404)
Average	25.5	(1079)	20.2	(908)

Simple statistical data analysis (annual, seasons and monthly average measurement of the transparency values) showes us that for all open sea areas from the north to the south the transparency shows a decrease trend in the recent period (1972-1990) in comparison to earlier period (1956-1971). This trend of decreasing transparency values may be a good predictor for showing us the increasing pollution of the sea water. The increasing of pollution appeared with long and intesive appearance of "red tide" not only in the coastal area but also in the part of the open sea for the period of last few years.

Results of data analysis and comparisons of the both periods will be given in tables and figures.

Also, data analysis shows that average decreasing transparency values for all area on the open Adriatic sea is 5.3 m (20.3%). On the other hand, however, the changes are better pointed out at Fig 2.

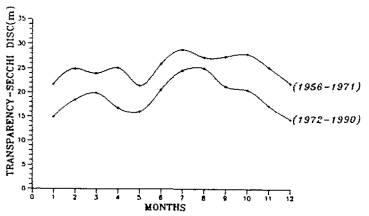

Fig 2. Transparency month-to-month variations at stations for the earlier period (1956-1971) as well as for the recent period (1972-1990)

It is quite obvious that transparency has been reduced for all 12 months for the recent period (1972-1990). Fig 2. also shows that transparency decreases at all stations in May and increase in July or August. The climate origin influences the showen decreasing and increasing of the transparency of the sea in the particular periods and given months is bigest cause of showen values, as well as, the constant seasonal variation of the sea water transparency.

Similar data analysis will be undertaken at the north part, as well as, at the middle and at the south part of the Adriatic sea.

The given statistical data analysis of the sea water transparency despite all the lack of numbers and dispersion can be used as a contribution for the further search of the optical properties of the Adriatic sea.

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***OPTICAL DATA BASE RDB/VMS - VAX 8350, HIRH,1990

Sea level response to atmospheric oscillations on climatic and synoptic periods

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Sea level rise is one of the most disturbing possible consequences of global "greenhouse" warming. On climatic time scale global sea level rise about 10-20 cm/century (BARNETT, 1984) and according to W.R. Peltier (MEIER, 1990) during the past 50 years, sea level has been rising at an average of 2.4 ± 0.9 mm yr^{-1}. On the climate time scale the sea level rises due to CO_2-induced warming, low frequency fluctuations such as ice age e.t.c. This CO_2 increasing might lead to a rise of air temperature and so to a global sea level rise. On the other hand, at shorter time scale (about several days and weeks) sea level variability has been explained in terms of atmospheric pressure forcing which is impossible on climate time scale.

The purpose of this work is to find out:

- how variability in air pressure affects the sea level on climatic time scale and
- what happens with these processes on shorter time scale.

For these purposes yearly values of mean sea level and air pressure for the avaiable period (1890-1987 for Trieste and 1955-1987 for Split) were analysed. Relative values of mean sea level together with seven-year filtered values (PUGH, 1987) are plotted in Fig.1. Trend is evident for station Trieste. Fitted linear model leads to a slope of 0.1376 cm/year which is according to BARNETT value, of 13.66 cm/century (BARNETT, 1984).

In order to study the mean sea level response to the air pressure on climatic time scale, annual mean air pressure for station Trieste was analyzed for the same period as the sea level. Regression analysis between seven-year filtered values of sea level and air pressure data gives regression line with corresponding correlation coefficients (r=-0.28).

Relatively low correlation coefficient in Trieste data can be explained by existing mean sea level increase trend incomparable to far less pressure decrease trend. For station Trieste a linear trend in mean sea level and air pressure was obtained:

$PRE = 1015.55 - 5.435\ 10^{-4}\ t$
$MSL = 150.36 + 0.1376\ t.$

Detrended series gives a correlation coefficients of r=-0.727.

On the time scale of several days the sea level response to atmospheric pressure forcing was analyzed based of hourly data for station Split. After applying symmetrical 24M214 filter, smoothed curves are obtained (Fig.2.) containing signals of few-day period. Maximum correlation (r=-0.46) was found for lag of 43 hours which is in accordance with the synoptic scale.

In conclusion it may be pointed out that the sea-level changes on climatic time scale are not induced by the atmospheric pressure forcing because the air pressure negative trend contributions can be neglected. On the time scale of several days atmospheric pressure forcing is better pronounced.

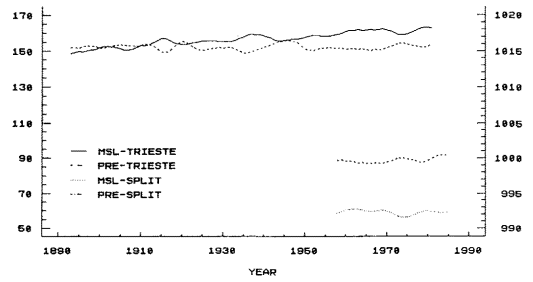

Figure 1. Filtered annual mean sea level and air pressure

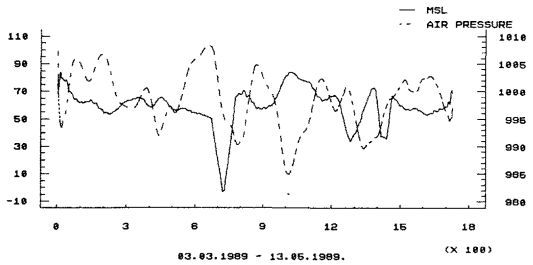

Figure 2. Filtered hourly values of mean sea level and air pressure for station Split

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