Adriatic thermal front Statistics

Mira MOROVIC

Institute of Oceanography and Fisheries, SPLIT (**Croatia**)

The images from bulletin SATMER published as thermal structures for months were the source of the data. Data set extends from September 1980 to January 1987.

There are some typical position for thermal front. They usually occur parallel to the coast but some transversal transects occasionaly show thermal front. The length of the thermal front extends from one hundred km to 1500 km along Italian coast. To be abble to distinguish the length of frontal zone it is imagined that the front consists of small front increments whose positions were named by the nearest point on the coast. The length of front increments ranged from 50 to 150 km. Fig. 1. shows the positions of fronts.

All front events were counted from every monthly image for each position. There are two types of fronts along the coast : there can be either a positive or a negative temperature gradient towards the coast so they are separately counted while transversal fronts are considered negative if there is a negative gradient towards north.

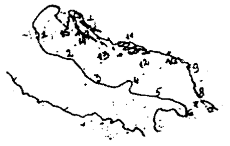

Fig. 1.- Front positions

The frequencies of the occurence of fronts in every season were presented by histograms in fig. 2.

The highest number of fronts recorded within observed period was 18 negative fronts at positions 3, 4, 5 and 6. Fronts were also frequent at positions 1 and 2 so that in winter it usually had long extension along Italian side.

In the spring their occurence was smaller but still much higher than the occurence of other fronts. In spring also more often than in winter occured fronts of positive gradients at the Italian side of coast. The phenomenon of positive fronts is for Italian side especially characteristic for the summer time while in the same time very few negative fronts occur.

Correlation between all fronts was calculated in order to get more informations about silmutaneous occurence of fronts at different positions.

Different seasonal rhythm was found for fronts along Italian and Albanian side of the coast in some seasons.

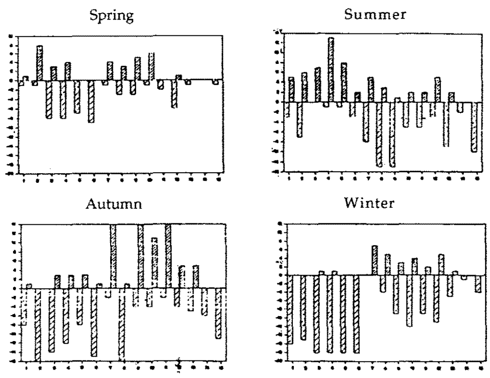

Fig. 2.- Frequencies of fronts

Global climatic fluctuations reflected in the Mediterranean Sea

Miroslava PASARIC and Mirko ORLIC

Andrija Mohorovicic Geophysical Institute, Faculty of Science, University of ZAGREB (**Croatia**)

Response of the Mediterranean Sea to slow air-pressure changes, especially those caused by planetary atmospheric waves, is being the subject of extensive studies. Here we examine low-frequency variability of the Adriatic Sea, due to long-lasting pulse of high air pressure that was recorded in the Mediterranean area in winter 1988/89.

Persistent, exceptionally low sea levels were registered in winter 1988/89 all along the east Adriatic coast (PASARIC and ORLIC, 1992), as well as in other parts of the Mediterranean Sea (e.g. ANGRISANO, 1989). These low sea levels corresponded with an anticyclonic disturbance over Europe. Monthly mean values of sea level at Bakar and air pressure at Mali Losinj, together with the 30-year monthly averages and standard deviations, are shown in Figure 1. During four months, from November 1988 until February 1989, sea level and air pressure departed significantly from their long-term averages. In January, at the peak of the event, mean air pressure was higher than the January average by more than three standard deviations, and sea level was lower than its average by more than two standard deviations. The ratio of January anomaly of sea level to that of air pressure was close to 1.6 cm/mbar; it suggests that the inverse-barometer overshoot, observed in the frequency range dominated by planetary atmospheric waves, characterizes the longer-term variability as well. The anticyclonic disturbance was of great spatial scale. Monthly charts of anomalies of sea-surface air pressure and geopotential height of the 500-mbar surface show that the high-pressure field spread in winter 1988/89 over the whole of Europe and extended to the higher levels of the troposphere.

Climatic fluctuations over Europe, similar to the one of winter 1988/89, occur from time to time, and have been analysed in a number of empirical and modelling studies. Results show that the European climate is influenced by sea surface temperature anomalies in the northwest Atlantic and equatorial Pacific. Persistent anticyclonic disturbance over Europe can be associated with the colder-than-usual surface water occurring in winter off the coast of Newfoundland (PALMER, 1986). In years when abnormally cold water appears in the equatorial Pacific (the event called La Nina), there are more anticyclonic and less cyclonic situations over Europe; these Pacific cold events peak in December, and the response of atmosphere above Europe is largest the following January and February (FRAEDRICH 1990). It seems that a dual cold event has taken place in winter 1988/89: appearence of abnormally cold surface waters has been registered in both the northwest Atlantic and equatorial Pacific (ARKIN, 1989). This implied strong anticyclonic disturbance over Europe, which in turn caused exceptionally low sea levels.

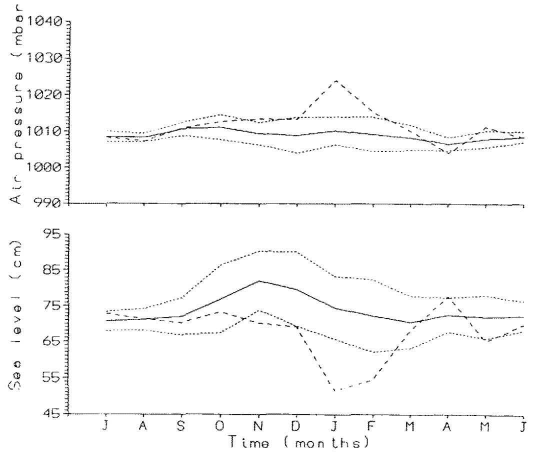

Figure 1. Monthly means of air pressure registered at Mali Losinj, and sea level recorded at Bakar. Full and dotted lines denote the 1956/85 averages and standard deviations, respectively, whereas dashed lines mark the values measured in winter 1988/89.

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