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SOME FEATURES OF THE EARLY AND LATE PHASE OF THE DEEP WATER FORMATION IN THE ADRIATIC SEA

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With respect to topographic characteristics Adriatic Sea can be divided into three distinst regions: North, Middle and South Adriatic. Each of these areas are sites of deep water formation. Deep water formation processes take place during the cold part of the year. Favourable conditions are present during the cold air outbreaks connected with bura wind.

North Adriatic is the shallowest part (maximum depth 70 m) and it is the area of the formation of the densest Adriatic water. High density is mostly due to the low winter temperature of the area. It was observed that the important sinking and mixing of water take place in the North Adriatic frontal zone whose position depends on the bura wind frequency. The densest North Adriatic water spreads southward by advection in the bottom layer and replenishes the Jabuka Pit. Only occasionally this water spreads over the Palagruže Sill into the South Adriatic Pit.

Another important area for the formation of deep water is the South Adriatic Pit. This water is formed in the center of the South Adriatic cyclonic gyre and it spreads into the Eastern Mediterranean.

In the early phase of the dense water formation process when the stratification is still present, the dense water does not reach the bottom but it is advected in the layer below the thermocline by the mean current. The seasonal cooling starts in the coastal area of the Adriatic where the salinity is generally lower than at the open sea and consequently the presence of this water below the thermocline can be observed from the secondary subsurface salinity minimum.

The subsurface salinity minimum was observed in the Middle Adriatic from the POEM data collected in October 1985.(Fig.1). The thickness of the layer was about 10 m and salinity was about 38.3 while the sea water on both sides of that layer had salinity of about 38.6. The subsurface salinity minimum was explained in terms of the surface cooling caused by the bura wind in the period prior to the cruise. It was shown from the wind data for the period of about ten days before the cruise that bura was the prevalent wind. This salinity minimum is short-lived phenomenon and can be detected only in situations after the bura events when the stratification is still present. Under homogeneous conditions this salinity minimum is destroyed by the vertical mixing.

Consequently this phenomenon is also present during the spring when the stratification develops and bura forcing is still strong. The subsurface salinity minimum is documented also from the salinity data for April/May 1975 in the area of North and Middle Adriatic which is also discussed with respect to meteorological conditions. The salinity minimum was observed also in the Otranto at the end of February 1972 where colder and fresher water of the South Adriatic origin sank while it met the Yonian Sea water. The Yonian water was more saline but warmer and advected in the surface layer northward. This subsurface salinity minimum has no connection with the Atlantic water as suggested by Ovchinikov (1975).

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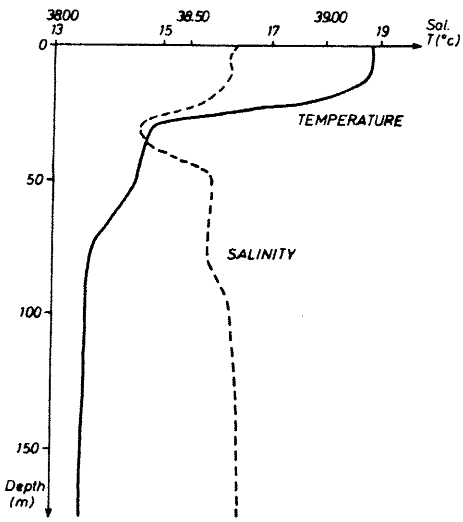

Fig. 1. Vertical distribution of temperature and salinity for one station in the South Adriatic near the Yugoslav coast in October 1985. Well pronounced salinity minimum is present below the thermocline layer.

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SOME OBSERVATIONS ON THE RELATIONSHIP BETWEEN WIND AND CURRENTS IN THE NORTH ADRIATIC

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In the period 1978-1982 winds and currents were measured in the North Adriatic from the platform "Panon".

The platform changed position several times in that period so that the depth over which it was placed differed from 40 to 70 m. Residual flow shows clearly that the wind has much stronger influence on current field during the winter than during the summer.

Signal in current field induced by the bura wind is the most prominent. Along the north coast of the basin and at the southern boundery bura induced flow is in a downwind direction. The vertical shear is small.During summer large part of the wind energy is transferred to inertial oscillations which show two-layer vertical structure. Generally speaking summer is characterized by the weak bura-wind forcing and consequently residual currents induced by the wind are poor. Therefore for the analysis of the relationship between wind and currents, data from the winter period when the platform was located in the northernmost part of the north Adriatic have been chosen. Some previous analyses showed that the wind induced signal in current field became stronger than the background noise for the wind speeds over 5 ms^{-1}.

For the analysis of wind-current relationship only wind events with the wind speed over 5 ms^{-1} have been chosen. For these situations linear correlation coefficient between the wind speed and surface current is very high. The ratio wind speed to current is in good agreement with the values found in some other areas. Between the surface and middepth the shear is much greater than the shear between the middepth and bottom layer.

The duration of bura wind is several days, however it changes speed rapidly because it is typical gusty wind. During the wind spead increase the current speed increases linearly as a function of wind speed for the interval from 5 to 11 ms^{-1} (Fig. 1). During the wind speed decrease the change in the current speed is not proportional to the wind speed changes. Some of the energy left in current field is probably associated with the geostrophic motion in balance with the sea surface slope.

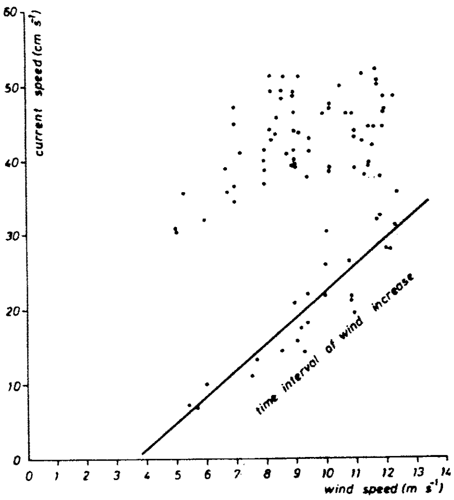

Fig. 1. Mean hourly values of the current speed at the surface as a function of wind speed for the bura event (December 4 - 7,1978) at the station located near the North Adriatic coast (distance from the coast 15 nM).