ANALYSIS OF THE LOCATION OF UPPER BOUNDARY OF THE H2S-ZONE FROM MULTIANNUAL DATA

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The problem of the hydrogen sulphide contamination of the Black sea is in the focus of attention of oceanologists and ecologists in view of the existing assumptions and some data on the rise of the anoxic water boundary to the sea surface and on possible catastrophic effect of hydrogen sulphide on human activity in the coastal zone. The estimates of dynamic of the upper boundary on the H_2S zone (UB of the H_2S zone) obtained up to present were based on the limited data array which did cover the whole population of measuring results accumulated. The work on mobilization and rescue of all accessible data has been done by us.

The correlation between the location of the UB of the H_2S zone and some physical surfaces in the Black sea was noted in a series of papers published in recent years. According to the opinions of many researchers (BEZBORODOV, 1989; VINOGRADOV, 1991) the correspondence of the UB of the H_2S zone to the certain, rather narrow isopycnic layer ($\sigma_{s,\,t,\,o}$ -16.20) is most demonstrative. However such a correspondence was observed, as a rule, within rather short time interval, most often during one voyage and over the limited areas. Research carried out by academic institutions of the Ukraine showed that in the Black sea there exists a relationship between the location of the definite isopycnic surface and the UB of the H_2S zone not only on meso-scales but also on climatic scales when computation is done using the multiannual averaged data. In computations averaged data over the period 1921-1993 years was used.

The coefficent of correlation between the location of the UB of the H_2S zone and the depth of the 16.2 isopycnal has been computed from the averaged data. The value of this coefficent was obtained to be equal to 0.71. It is noteworthy that the best correspondence between the location of the UB of the H_2S zone and the depth of the isopycnal is observed in the deep-sea region where the correlation coefficient reaches 0.88.

Thus the results obtained permit a conclusion that an interplay between location of the UB of the H_2S zone and the depth of isopycnal 16.20 can be traced not only witihin rather short time intervals (as noted previously) but also on the climatic time scales when using the averaged observation data for the entire basin.

On the basis of the studies implemented, the linear regression equations was deduced relating the location of the UB of the H_2S zone with the depth of the 16.20 isopycnal, which allows us to specify the depth of the upper bounday of the hydrogen sulphide zone in the squares in poor data coverage or in the periods when observations of the hydrogen sulphide concentration vertical distribution was absent.

Figure 1 shows the multiannual average variability of the depths of the UB of the H_2S zone (solid line) and of isopycnal with conventional density 6-16.2 (dashed line) for the Black sea basin. One can assume that these curves describe some global climatic process which has no constant trend. Apparently, the UB of the H_2S zone produces oscillatory movements in time with approximately century period. Comparing curves, one can conclude that the diagrams showing the location of the UB of the H_2S zone and the depth of the isopycnal agree well, which supports a corollary about the oscillatory character of variability of the UB of the H_2S zone.

The high correlation level between the location of the H_2S zone boundary and the elements of the density structure od seawater points to the dominant role of hydrophysical and hydrological factors in a totality of processes which govern its multiannual variability.

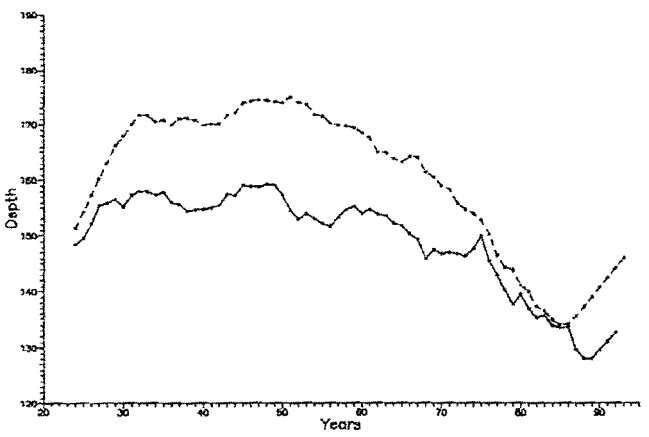

Figure 1. The multiannual average variability of the depths of the UB of the H23-zone (solid line) and of isopycnal 16,20 (dashed line).