SEA WATER TEMPERATURE REGIME IN THE ROMANIAN BLACK SEA COAST AREA

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ABSTRACT

The thermal analysis of marine waters in the Black Sea coastal area refers to the multi-annual average temperature values, maximum and minimum, both vertically and by comparing the area of shore and offshore waters. Aspects of daily and seasonal variations of seawater temperature are detected by analyzing a series of parameters such as: vertical and horizontal thermal gradients, temperature variation, thermal jump layer, thermal stratification and charts available for specific periods of day or year.

Keywords: *temperature variation, coastal waters, isotherm.*

Romanian coastal waters are characterized by multi-annual average surface temperature of about 12.6 ° C to 13 ° C shore and offshore. Since the average air temperature in the coastal area is 10.7 ° C, it can be said that the mass of sea water is a heat reservoir which significantly affect coastal climate by moderating the extremes during the winter.

Concerning the maximum temperature of sea water, the surface is reached in August.

Minimum temperature, the value recorded in February, it falls below the freezing point of salted water to a salinity of 18 per thousand.

Vertical temperature variation in the coastal highlights the existence of two water masses. The first is between surface and deep horizons of 70 meters and the second between 70-100 meters deep and up to the edge of the marine shelf that is 180-200 meters. The first horizon temperature varies greatly, here registering thermoclina. Vertical thermal gradient varies between 2° C and 20° C depending on the season. In the second horizon of water, extended to the shelf edge, the water temperature variations are small, the vertical thermal gradient between 1° C and 2° C.

In the cold months of the year (December, January, February) temperature variation shows some characteristics: water temperature increases with depth, increases are more pronounced during the cold, the variation is between 0.5° C and 2° C , the average water temperature at 50 m depth were averaged from 6° C to 7.5 ° C Celsius degrees. Between late March and early April there is the phenomenon of equalization of vertical water temperature (homothermy) in stratum between the surface and a depth of 40 meters, then, as warming surface layers of water, sense of variation of temperature change, the temperature started to rise toward the surface.

During homothermy phenomenon, the temperature of water ranges from 5° C to 6° C. The warm period from May to September, the sea water temperature decreases with increasing depth, water mass until 20-25 m is strongly heated, the variation being from 12° C to 24° C (the thermocline). Under the horizon to 25 meters deep and up to 75 meters depth, sea temperature drops to an average of 7.3° C.

For the cold period of the year, in November sees the second equalizing the mass of water surface temperature to a depth of 35 meters. Homothermy in autumn is characterized by temperatures between 10° C and 12° C.

Vertical distribution of isotherms show that after the heating period from August to November by 7.5° C isotherm appears twice in the vertical stratification, namely: once at the bottom of the layer under heating, and again in layer 100 meters deep layer is not subjected to intense mixing of water masses.

The water between depths of 70 and 100 meters store thermal characteristics of water masses bottom of the mass surface layer phenomenon which is subject to heating and, after cooling period (February-March), has a temperature of 7.5 ° C.

Arguably, the Isotherm of 7.5 ° C separating the upper body of water of the sea (seasonal thermocline subject to periodic heating and cooling) to deep water (the permanent thermocline, no changes in water temperature over time)

Changes in water mass temperature of Romanian coastal area between surface and depth is 70 meters depending on the periods of heating and cooling of atmospheric air. Thus, the mass of water heat and cool properly. This water feature has a decisive influence on the climate of the Romanian Black Sea coast.

The presence of a layer of water with temperature below the ambient air during heating makes sea water mass occur vertical gradients of temperature, whose value varies depending on local currents and the heating stage phenomenon.

Vertical gradients of temperature values change depending on time of year. During heating months (April-May), values of vertical temperature gradients are small, averaging 0.3 ° C / m. In the months from June to July, with warm air from the water table depth of 10...25 m, the gradient of temperature reaches 2 ° C / m. This value of thermal gradient that is related to the vertical distance between the upper limit of deep cold layer and the lower layer of atmosphere above the heated shrink greatly as the warm water masses acquire depth. In this way are recorded high values of temperature gradient.

This lasts until November and in cooling water temperature gradients at very small decrease (0.15 ° C / m).

Heat jump in the warm year (from July until September) is usually located between depths of -15 and -30 m, being limited to the top of the isotherm of 21 °C and at the bottom of the 10° C isotherm. Heat jump in October is at a depth of -35 m and thermal gradients are - 0.5 ° C / m.

Position of the thermocline in the coastal area is influenced by currents and wind regime.

If the wind blows from the north-eastern sector, it creates a strong flow south, creating a push to shore shallow warm waters, through the accumulation ashore, causing the descent of thermocline. Sometimes it happens that this phenomenon may be accentuated more and this time thermocline position changes, reaching larger depths (-180 m).

When the wind blows from the southeast, significant influence thermocline: offshore, at a distance of 18 km ... 22 km, masses of water down there where there is thermocline and, in the shore area, thermocline is at a shallow.

If the wind blows for several days in southern sector, is a phenomenon called upwelling or halodonic - as fishermen call it, which cause an elevation of water masses (with a temperature of 9 ... 10 ° C) from depth to surface.

Atmospheric air temperature influences the underlying water mass temperature to a depth of -75 m. At depths below, until the shelf edge (-180 ...- 200 m) water mass temperature remains constant, the variation being in the range value of 7 ° C - 8 ° C. The existence of these two features of water is related mixture of deep sea water, which is why the temperature increases with depth, is limited. Mass of water is warming up to a depth of - 40 m in coastal waters and - 60 m in the shelf waters. The mass of seawater warms harder and harder gives this accumulated heat, influencing thus the seasonal variation of water mass temperature. Water layer up to 10 meters deep register a variation of temperature similar to ambient air temperature. Surface water temperature maxima meet in July-August (25° C), in August at a depth of 10 m water temperature is 24 ° C, in September to 20 m depth is 9.18 ° C, in October at a depth of 30 meters is 18 ° C and in November it marks a significant increase of water temperature from 6 ° C to 9.5 ° C in shelf waters. Daily variation of seawater temperature recorded a magnitude ranging from 0.6 ° C in December and 1.9 ° C in July and August. Maximum amount of sea water daily thermal amplitude ranges from 2 ° C in December and 9 ° C during the months from May to August. Minimum value of daily amplitude of water temperature varies around 0 ° C.

During a day, minimum temperature of sea water is recorded in the morning around 5 ... 6 hours and maximum value is recorded in the afternoon between the hours of 15 ... 17. Water heating is most intense in the morning between 7 am to 10 am. This particularity of the daily variation of sea water temperature has a more pronounced in the offshore waters compared to coastal or shelf waters. Seawater temperature variations are also related by the currents and wind regime.

Sudden changes in temperature occur mainly in changing the currents along the Romanian Black Sea Coast. Northern flow (north-south currents) generated during the summer sudden drops in water temperatures and, during cold season, water temperature increases. For example, in July, temperatures can drop shore waters where there is a south wind from a value of 24 ° C to a value of 7°C ... 8 °C. In winter, under the same wind regime, shore water temperature increases by 1°C to 6°C…7°C.

Besides water temperature variation vertical space Romanian Black Sea coast, the sea water has a temperature variation in the horizontal plane. This horizontal variation has a character of heterogeneity in offshore and coastal waters and a weaker variation at greater depths in shelf waters.

Isotherms shape located along hydrological profiles perpendicular to the coast (deep ashore and built in shelf waters) show that the processes of heating and cooling water range from shore to sea. Depending on the ambient air temperature regime over large vertical temperature gradients both appear and horizontal gradients due to complex phenomena that occur in sea water interface - atmosphere by energy changes that occur.

Phenomena occurring in atmospheric air - the sea surface interface have an important role in explaining the physical, chemical and dynamic processes. Also, should not be neglected influence they have on the system interface phenomena of wind and wind potential default on the influence of which is materialized by the existence of different roughness coefficients depending on the specifics of these interactions.

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