TEMPERATURE OF OCEAN WATER WITH PARTICULAR REFERENCE TO ATLANTIC AND PACIFIC OCEAN

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Temperature is a physical property of matter that quantitatively expresses whether it is hot or cold. Temperature of oceans is of importance as it determines the movement of ocean currents, the type and distribution of marine organisms at various depths of oceans, the climate of coastal lands etc.

The sun is the principal source of energy for oceans. Ocean is also heated by the inner heat of the ocean itself. The ocean water is heated by three processes- Absorption of radiation from the sun, the convectional currents, kinetic energy produced by the surface wind and tidal currents which increase stress on the waterbody and heats it up. Ocean water is cooled by back radiation from the sea surface, exchange of heat between the sea and atmosphere and evaporation.

Temperature distribution in ocean waters is controlled by the following factors:

1) The average daily duration of insolation and its intensity
2) The depletion of energy by insolation, reflection, scattering and absorption
3) The albedo of the sea surface and its varying nature depending on the angle of sun rays
4) The physical characteristics of the sea surface
5) Prevailing winds
6) Local weather conditions such as cyclones, storms and hurricanes
7) Presence of submarine ridge
8) Shape of the ocean

The oceans are heated and cooled slower than the land surfaces. The average daily range of temperature is barely one degree in seas and oceans. The highest temperature in surface water is recorded at 2p.m. and the lowest temperature is recorded at 5a.m. The daily range of

temperature is highest in oceans if sky is free of clouds and the atmosphere is calm. The annual range of temperature is influenced by the annual variation of insolation, the nature of ocean currents and the prevailing winds. The maximum temperature is recorded in the month of August and minimum temperature is recorded in the month of February.

HORIZONTAL DISTRIBUTION OF TEMPERATURE

Horizontal distribution of temperature is shown by isotherms. The sea-surface isotherms in February for **Atlantic Ocean** reveal that the isothermal lines are closely spaced in the south of Newfoundland near the west coast of Europe and North Sea and then the isotherms widen out to make a bulge towards north near the coast of Norway. The cause of this phenomenon lies in the cold Labrador Current flowing southward along the North American coast which reduces the temperature of the region more sharply than in other places in the same latitude; at the same time the warm Gulf Stream proceeds towards the western coast of Europe and raises the temperature of the west coast of Europe. In the south western part of the Atlantic, isotherms bulge towards south-west due to warm Brazil Current but in the eastern part of south Atlantic isotherms bend towards north-west due to cold Benguela Current. Further south isotherms are parallel owing to constant prevailing west wind drift. The distribution of temperature in the north and the south Atlantic is not symmetrical. In north Atlantic, 5°C isotherm touches 70° north latitude whereas in the southern half of the Atlantic it never crosses 50°south latitude because the warm Gulf Stream is more powerful and it reaches to much higher latitude than the cold Brazil Current. Moreover, there is a considerable difference between the eastern and western parts of the Atlantic. In the western part near Labrador coast, 0° Celsius temperature is recorded but 9°C to 13°C is found on the west coast of Europe.

The August condition is markedly different from that of February isothermal conditions. In Atlantic the ice in the Arctic melts away resulting in northward loop of all the isotherms in the Davis Strait. The sharp northward bends of isotherms on the Norwegian coast are absent

in August. On an average the isotherms in the north Atlantic shift northward in August.

In February in the northern half of the **Pacific** isotherms and latitudes are almost parallel but on the coast of North America isotherms bend slightly northward under the influence of the warm Kuroshio Current and along the coast of Japan isotherms are closely spaced due to the cold Oyashio Current. In the equatorial region of the western part of the Pacific, high temperatures are recorded as the warm equatorial current flows towards south. In the eastern part of the Pacific, low temperatures prevail due to the influence of cold Peru Current. In the south Pacific, isotherms make minor loops due to the warm Peru or Humboldt current.

In August the southern Pacific shows isothermal lines and latitudes placed parallelly. Towards west the adjacent ocean of Australia-Asia region witnesses temperature as high as 28°C as the westerly flowing equatorial current draws warm water towards west Pacific.

VERTICAL DISTRIBUTION OF TEMPERATURE

There is a gradual decrease of temperature with increasing descent. Normally 90 per cent of the solar heat is absorbed in the topmost 15.6 m of water. The sea water temperature corresponds to the surface temperature only up to a depth of about 100m and with further descent temperature generally decreases. As temperature decreases with increasing depth the oceans can be divided into 2 broad zones:-

1) **Photic or euphotic zone** extends from the upper surface to 200m and receives adequate solar insolation
2) **Aphotic zone** extends from 200m to the ocean bottom and does not receive adequate sunrays