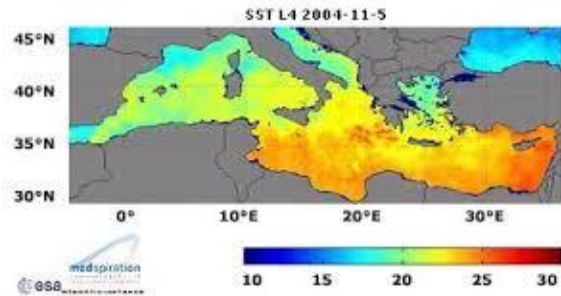
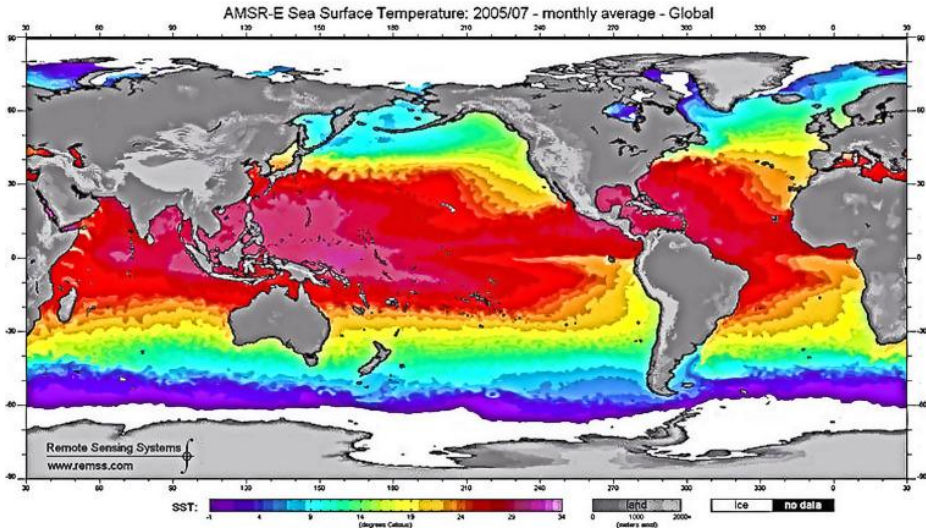


# Temperature and it's distribution(ocean)

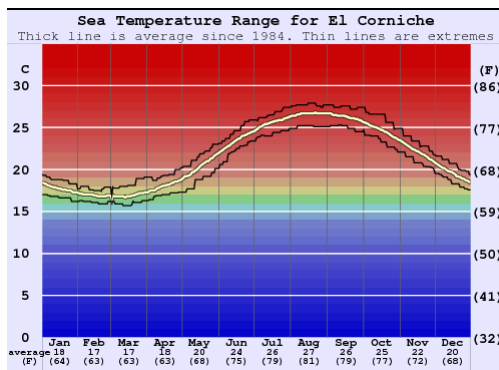
## Lecture 2

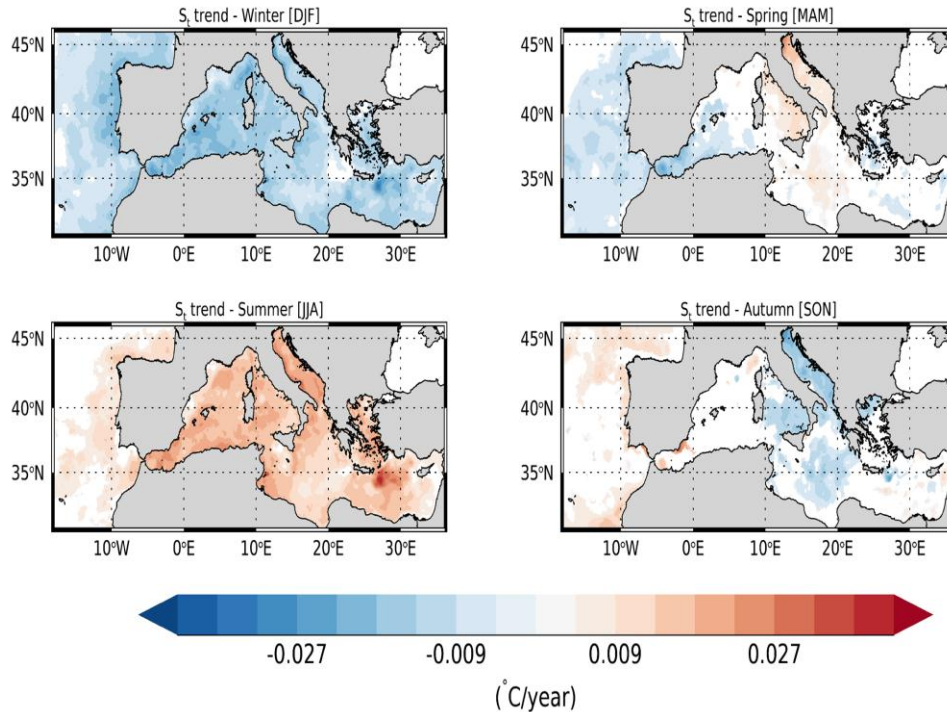
### **A- Horizontal Distribution Of oceanic Temperature**

- On an average the temperature of surface of the ocean is 26.7 degree Celsius and the temperature gradually decreases from equator to pole.
- The ocean in the northern hemisphere records relatively higher order temperature than in southern hemisphere. The variation of temperature in the southern and northern hemisphere because of unequal distribution of land and water.



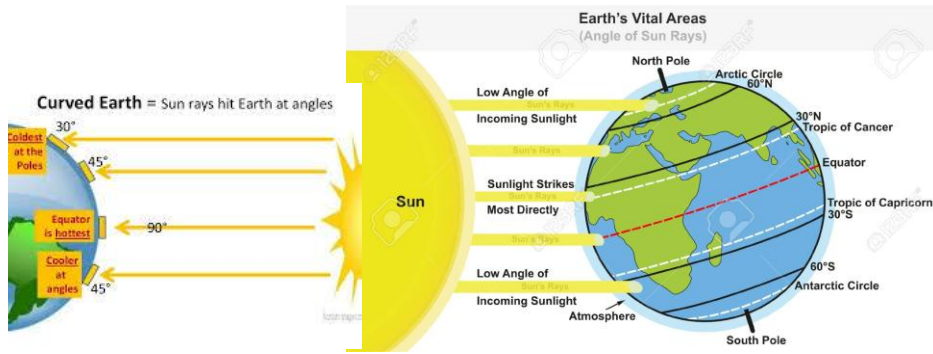
**Egyptian Coastal Mediterranean**





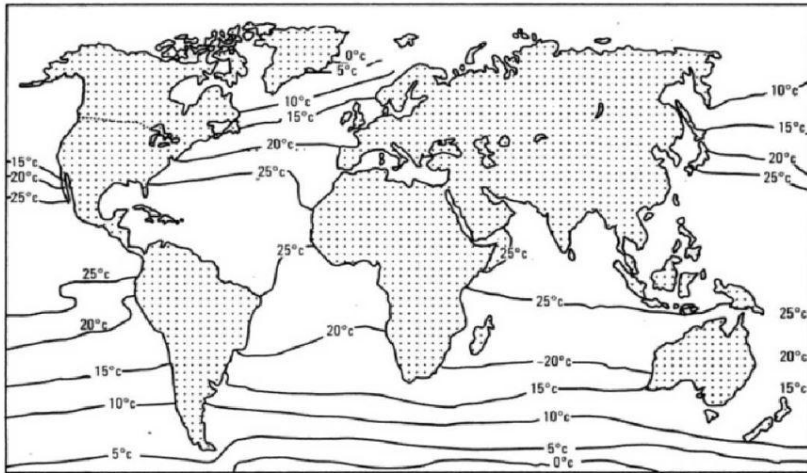
## Factors affecting horizontal distribution of temperature

- The surface water temperature of the Oceans is controlled by various factors. However, only the major factors have been discussed here.
- **(1) Latitude**
- The ocean water gets heated by the absorption of solar radiation. The sun's rays are always vertical at the equator, but because of the spherical shape of the earth, with increasing distance from the equator the rays become more and more slanting (angling).



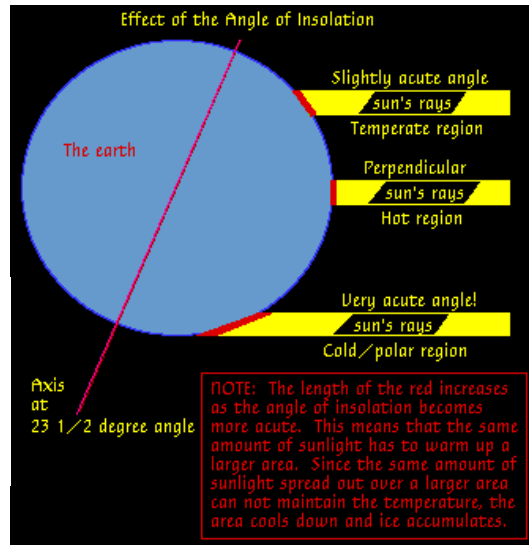
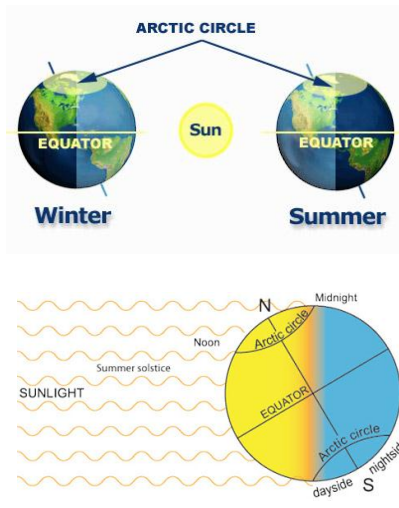
- As we know, the vertical rays are capable of giving more heat than the oblique rays. Because of this very fact, with increasing distance from the equator the amount of solar energy received by the oceans goes on decreasing.
- Since oblique rays have to cover greater distance in the atmosphere than the vertical rays before reaching the surface of the earth, certain amount of solar energy is lost through the processes of scattering, diffusion, reflection, and absorption.

## Horizontal distribution of temperature over world (ocean)

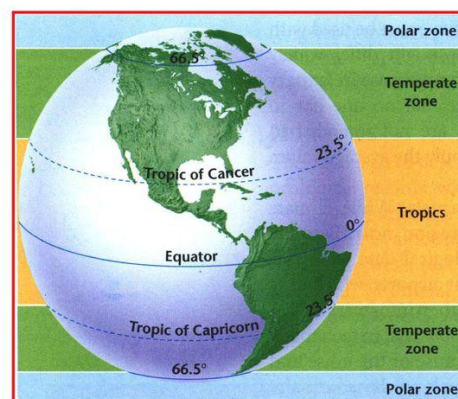


- Besides, the vertical rays falling on the earth have to heat up relatively smaller area than the oblique rays which are spread over a larger area. This results in more heat from the vertical rays than from the oblique or slanting rays of the sun. It is, therefore, quite clear that away from the equator the intensity of the solar radiation is reduced.
- In each hemisphere during the summer months the length of days goes on increasing from the equator towards the poles. In other words, the period of the duration of sunshine becomes longer towards the poles.

- It is very interesting to note that despite the fact that the two poles of the earth have the longest days during their respective summers; the polar areas are permanently under the snow cover.  
*The answer to this anomalous situation is not far to seek.*
  - Even though the outer limit of the atmosphere receives the maximum amount of solar energy in the polar areas, the solar rays touching the surface of the earth are very slanting, and a larger part of the incident solar radiation is reflected back from the snowbound surface.  
*That is why the Polar Regions are the coldest parts of the earth.*
- 
- During winter months the period of sunshine is negligible in the Polar Regions with the poles in complete darkness. Thus, it is obvious that during winter the minimum amount of solar energy is available to heat up the surface in these regions.
  - That is why the average surface temperature of the ocean water in the polar regions is  $-1.8^{\circ}\text{C}$ , this being the freezing point of water, whereas the equatorial regions record an average of  $32^{\circ}\text{C}$  for the surface temperature of ocean water.



3. The **tropics** receive the most solar radiation because the sun's rays strike almost **directly**. Temperatures in the tropics are **warm** year-round.
4. The **temperate zones** have **moderate** conditions.
5. The **polar zones** receive the least radiation because the sun's rays strike at a very **low** angle. Temperatures in polar regions are usually **cold**.

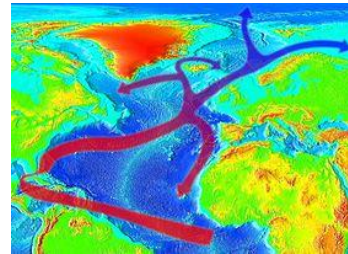
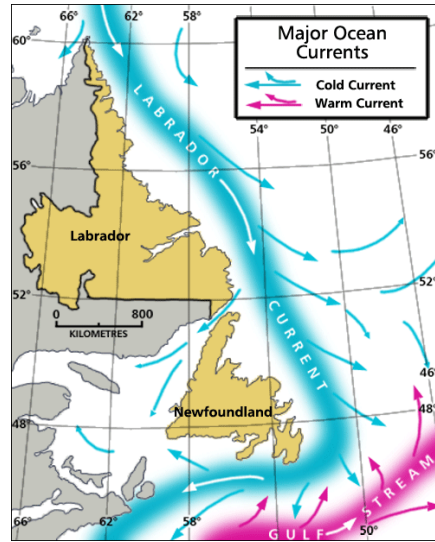


- **(2) Ocean Currents**
- The ocean currents also exercise dominant control over the temperature of the ocean water.
- All the warm ocean currents originate in the tropical oceans. When they reach the higher latitude oceans, temperature of the surface water registers an increase of several degrees.
- The Gulf Stream offers a typical example of the effect of oceans currents on temperature.
- It is because of the North Atlantic Drift, a branch of the Gulf Stream system, that the port of Arkhangle situated in the north polar sea does not freeze even during the winter months.

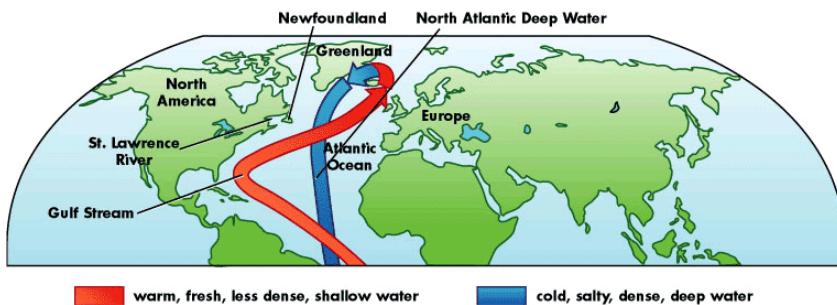


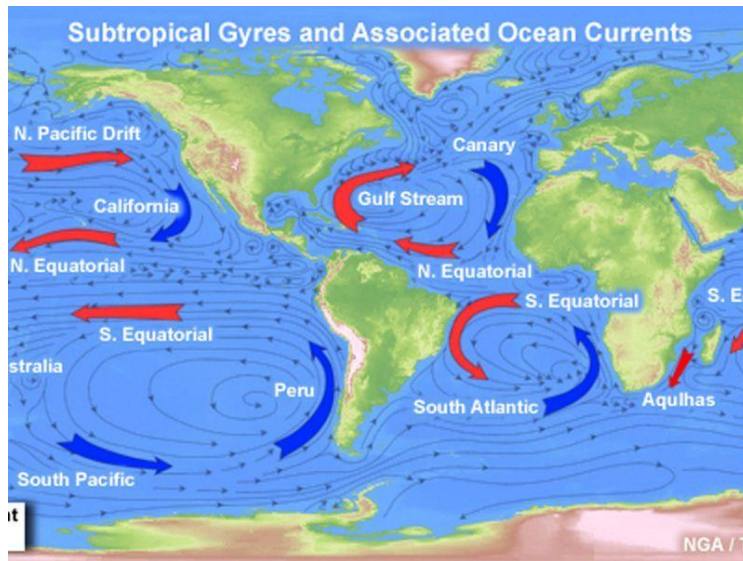


- On the other hand, cold ocean currents flowing from the higher latitudes towards the tropical regions lower the surface temperature of the ocean water there. The cold currents of Labrador in the North Atlantic and Kurile current in the North Pacific lower the temperatures in the coastal areas of eastern Canada and eastern Siberia.



**North Atlantic Ocean Circulation System**

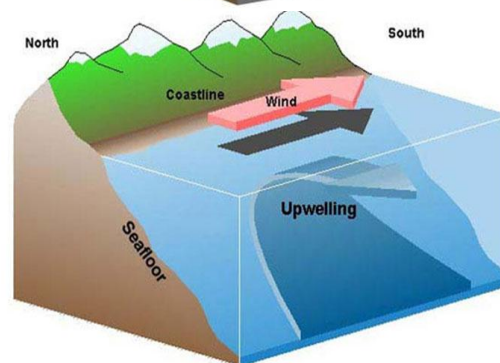
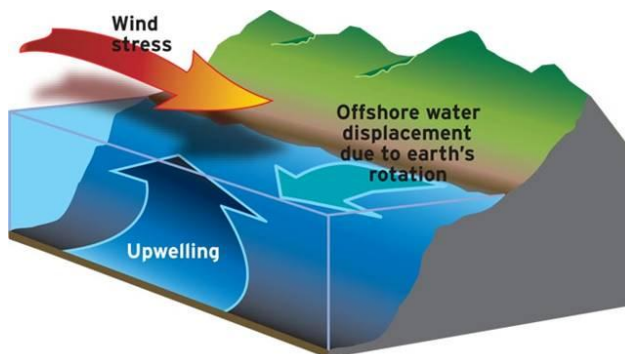




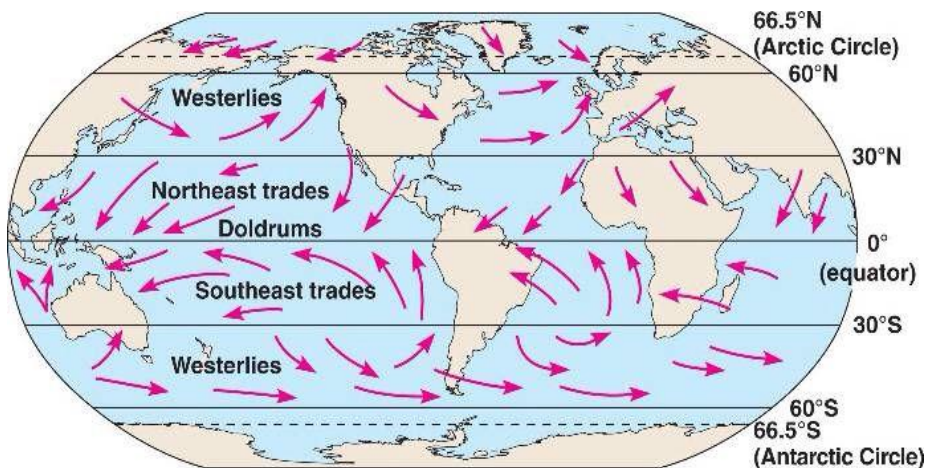
In oceanography, a subtropical gyre is a ring-like system of ocean currents rotating clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere caused by the Coriolis Effect. They generally form in large open ocean areas that lie between land masses.

- **(3) Prevailing Winds**
- Temperature of the surface water of the oceans and seas is also affected by the prevailing winds.
- When the warm air masses from over the heated land areas in the tropical regions move over the oceans, their surface temperatures are immediately raised.
- The effect of such winds is especially marked on the landlocked or partially enclosed seas. The direct effect of such winds blowing from the nearby tropical regions can be seen in the Gulf of Mexico, the Mediterranean Sea and the Red Sea. Temperatures of such local winds are much higher than that of these water bodies.

- On the contrary, cold and dry winds blowing out from the snow covered regions during winter lower the surface temperature of the oceans and seas that they visit. Temperatures in the North Sea or the Baltic Sea are reduced to a considerable degree under the influence of such cold and dry winds.
- When the direction of the prevailing winds happens to be from the land to the sea, the warm coastal waters under their influence move along with them. These offshore winds initiate upwelling of cooler water from depth to compensate for the loss of water as stated above.

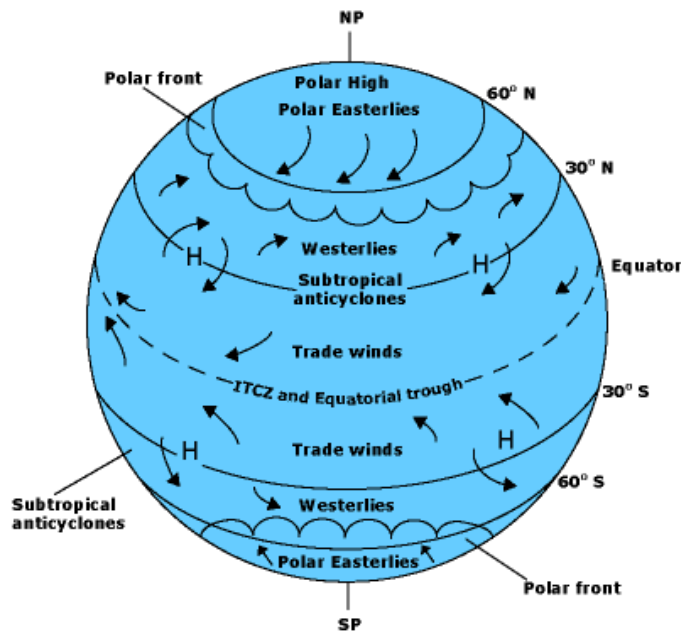


- The cold water naturally lowers the surface water temperature. When the prevailing winds are onshore, the warm sea water amassed up near the coasts raises the temperature to a certain extent. Thus, in the trade wind belts the surface temperatures in the eastern parts of the oceans are relatively lower than those in the western parts.
- For example, the coastal areas of Peru in South America are relatively cooler under the influence of offshore winds. On the contrary, the coastal waters of eastern Brazil are always warm and record relatively higher temperatures because of the piling up of warm tropical water near the coast by the northeast trade winds.

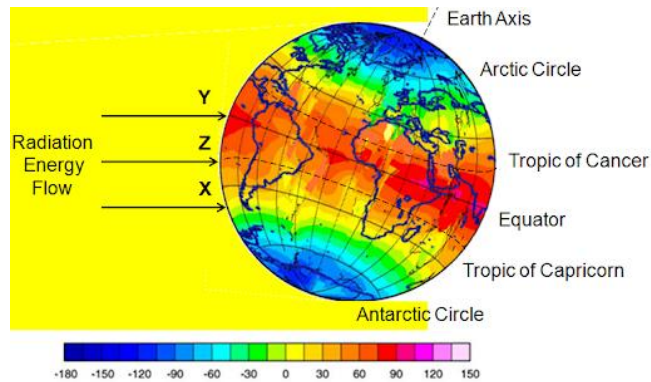
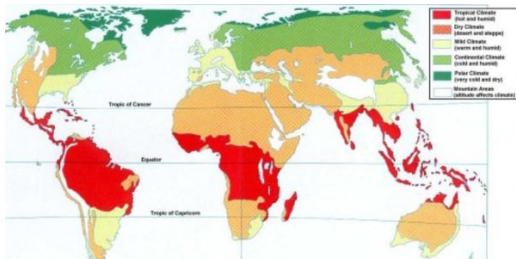


The westerlies, anti-trades, or prevailing westerlies, are prevailing winds from the west toward the east in the middle latitudes between 30 and 60 degrees latitude. They originate from the high-pressure areas in the horse latitudes and trend towards the poles and steer extratropical cyclones in this general manner.

The **horse latitudes** are subtropical regions known for calm winds and little precipitation. The **horse latitudes** are regions located at about 30 degrees north and south of the equator.



- **4. Local Weather**
- Local weather comprises different types of storms, cloudiness, precipitation and other weather conditions. In the equatorial regions, despite the vertical rays of the sun, large amount of cloudiness obstructs the solar radiation from reaching the earth surface.
- It is due to the clear sky that near the Tropic of Cancer and the Tropic of Capricorn the amount of solar radiation incident (happen) on the earth exceeds that reaching the equatorial regions.
- Besides, the incidence of daily afternoon rains in the equatorial regions does not allow the temperatures to rise further, whereas the extremely dry weather and cloudless skies prove helpful in raising the temperatures in the subtropical regions. In the same way in regions of stormy weather, the ocean water temperatures are relatively lower.



- In addition to the above stated factors there are other minor factors which also control the sea surface temperatures.
- Location of the seas and their shapes, submarine ridges, the rates of evaporation and condensation etc. are some such minor factors which also exert important influence on the surface temperatures of the ocean water.
- Range of Sea Surface Temperature The diurnal as well as annual range of oceanic temperature is much less than that of the land. As we will discuss later, the specific heat of water being more than that of land water takes longer time in both heating and cooling.
- It is due to this characteristic of water that the difference between the daily maxima and minima or between the winter and summer months temperatures are not as great as on land.