(II) Atmospheric Heat Balance :

Energy received	Energy lost
(i) 14% through absorption of incoming solar radiation	
(ii) 6% through effective radiation from the earth	48% through radiation into the space
(iii) 9% through convection and turbulence from the earth	
(iv) 19% through evaporation	
Total 48%	

Distribution of Temperature

The spatial and temporal distribution of temperature is very significant because different types of weather, climate, vegetation zones, animals and human life depends on the distribution of temperature, whether horizontal or vertical. The study of distribution of temperature can be done in two ways :

(i) Temporal Distribution

(ii) Spatial distribution

Spatial distribution is studied in two ways :

(a) Vertical distribution

(b) Horizontal distribution

Factors Controlling the Distribution of Temperature

(i) **Latitudes**—The temperature of the atmosphere of a particular place near the ground surface depends on the amount of insolation received at that place and the amount of insolation decreases from low latitudes towards high latitudes because the sun's rays become more and more oblique poleward and hence air temperature also decreases poleward.

(ii) **Altitude**—The temperature decreases with the increase in height from the earth's surface at an average rate of 6·5°C per kilometre due to following two reasons :

(a) The major source of atmospheric heat is the earth's surface from where heat is transferred to the atmosphere through the processes of conduction, radiation and convection. Thus the lower portion gets more heated than the above lying ones.

(b) The layers of air are denser near the earth's surface and become lighter with increasing altitudes. The lower layer of air contains more water vapour and dust particles than the layers above and hence it absorbs larger amount of heat radiated from the earth's surface than the upper air layers.

(iii) **Distance from the Coast**—The marine environment moderates the weather conditions to the coastal areas due to daily rhythems of land and sea breezes. Thus daily range of temperature near the coastal environment is minimum but it increases as the distance from the sea coast increases.

(iv) **Nature of Land and Water**—Land becomes warm and cold more quickly than the water body. So if equal amount of insolation is received the temperature of land becomes more than the temperature of the water body. It is due to the fact that Sun's rays penetrate more in the water than in the land which is opaque. But in case of water since it is transparent if has to warm more volume of waters.

Also a large amount of heat is lost in evaporation in case of seas and ocean. But in case of land very less amount of heat is lost in the name of evaporation. Also the specific heat (*i.e.*, the amount of heat needed to raise the temperature of one gram of a substance by 1°C) of water is much greater than the land because the relative density of water is much lower than the land surface. Reflection from sea surface is also more than the land surface and thus water receives less insolation than the land.

(v) **Nature of Ground Surface**—The snow covered surfaces receive very low amount of insolation because they reflect 70–90% of incoming short wave solar radiations and thus polar and arctic areas are characterised by extremely low temperature throughout the year. On the other hand sandy surfaces record high temperature during the day time in tropical and subtropical areas because they absorb most of the solar radiations and reflect only 20–30% of Solar radiation.

(vi) **Nature of Ground Slope**—The ground slope facing the Sun receives more insolation because the Sun's rays reach the surface more or less straight and hence sun facing ground surfaces record higher temperature than the leeward slopes where sun's rays reach more obliquely. In the northern hemisphere the southward facing slopes

of east-west stretching mountains receive greater amount of insolation than the northward facing slopes because of their exposure to the sun for longer duration.

(vii) **Prevailing Wind**—The winds blowing from the low latitudes to the high latitudes raise the temperature of the regions where they blow while winds blowing from high latitudes to low latitudes lower the temperature. Also the wind blowing from oceans to coastal areas bring in marine effects and lower the daily range of temperature. The winds coming from higher parts of the mountains lower the temperature in the valleys.

(viii) **Ocean Currents**—The warm ocean currents flowing from tropical areas to temperate and cold zones raise the average temperature in the affected areas. For example : Gulf stream raises the average temperature of the coastal areas of north western Europe.

Vertical distribution of temperature—Temperature decreases with increasing height in the troposphere but the rate of decrease varies according to seasons, duration of sunshine and location. On an average, the rate of decrease of temperature with increasing altitude in 6·5°C per 1000 metres. This decrease of temperature is called **vertical temperature gradient** or **normal lapse rate**. But this phenomena is limited up to troposphere only. The upper limit of troposphere is called tropopause. The temperature at tropopause increases from over the equator towards the poles because the height of tropopause decreases from over the equator towards the poles. Upward from tropopause the temperature is reported to increase with increase in height in the stratosphere wherein it becomes 0°C or 32°F at the height of 50 km from sea level. This is the upper limit of the stratosphere and is called stratopause.

Temperature again decreases with increasing height in the mesosphere which is found between 50–80 km. The temperature becomes –80°C at mesopause, the upper limit of the mesosphere. Beyond mesopause temperature again increases with increasing height in the thermosphere. It is estimated that temperature at its upper limit becomes around 1700°C.

Inversion of Temperature