Student Notes:

1. Insolation

The earth's atmosphere is very much a **dynamic** entity. Large volumes of air are continually being moved both up and down and across the face of the Earth. As a proof, we feel air when it is in motion. There must be some energy involved here. It needs to be understood that the atmosphere is not a closed system. It is in contact with both the earth and with space, and receives energy from both directions. However, Earth itself directly contributes only a negligible amount of energy to the atmosphere, and its main role is to reflect energy from elsewhere. The ultimate sole source of atmospheric energy is in fact **heat and light received through space from the Sun**. This energy is known as **solar insolation.**

The Earth receives only a tiny fraction of the total amount of Sun's radiations. Only **two billionths** or two units of energy out of 1,00,00,00,000 units of energy radiated by the sun reaches the earth's surface due to its small size and great distance from the Sun. The unit of measurements of this energy is **Langley** (Ly). On an average the earth receives 1.94 calories per sq. cm per minute (2 Langley) at the top of its atmosphere.

1.1. Factors Influencing Insolation

The insolation received on earth is not same everywhere. The amount and the intensity of insolation vary from place to place, during a day, in a season and in a year. The factors that cause these variations in insolation are:

1. **Revolution of earth around sun:** earth revolves in an elliptical orbit around the sun. Thus, distance between the Sun and the earth vary. The earth is farthest from the sun on 4th July. This position of the earth is called **aphelion**. On 3rd January, the earth is the nearest to the sun. This position is called **perihelion**. Therefore, the annual insolation received by the earth at perihelion is slightly more than the amount received at aphelion. However, the effect of this variation in the solar output is masked by other factors like the distribution of land and sea and the atmospheric circulation. Hence, this variation in the insolation does not have great effect on daily weather changes on the surface of the earth.
2. **The rotation of earth on its axis:** earth rotates around its axis and makes an **angle of 66½** with the plane of its orbit round the sun. This particular characteristic of earth **has great amount of influence** on the amount of insolation received at different latitudes. The seasons in each hemisphere are dictated not by the closeness to the sun but by the axial tilt of the earth.
3. **The angle of inclination of the sun's rays:** Since the earth is round, the sun's rays strike the surface at different angles at different places. The angle formed by the sun's ray with the tangent of the earth's circle at a point is called **angle of incidence**. It influences the insolation in two ways as follows:
    - When the sun is almost overhead, the rays of the sun are vertical. The **angle of incidence** is large. Hence, they are concentrated in a smaller area, giving more amount of insolation at that place. If the sun's rays are oblique, angle of incidence is small and sun's rays have to heat up a greater area, resulting in less amount of insolation received there.

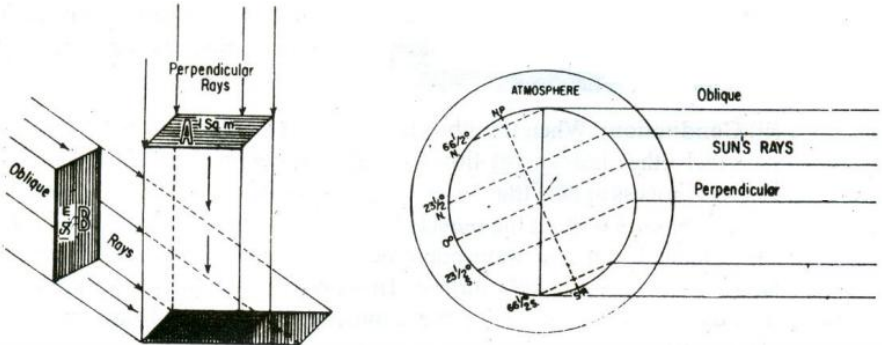

Figure 1 – effect of angle of inclination on Insolation