2.4 INVERSION

- Inversion is defined as increase in temperature with respect to altitude. It is also known as negative lapse rate.
- An inversion is an extreme sub-adiabatic condition, and thus the vertical air movement within the inversion is almost nil.
- The two most common kinds of inversion are subsidence inversion and radiation inversion.
- The base of the subsidence inversion lies some distance above the earth's surface.
- This type of inversion is formed due to adiabatic compression and warming of sinking air mass to a lower altitude in the region of a high pressure centre.
- In the case of radiation inversion, the surface layers of a atmosphere during the day receive heat by conduction, convection and radiation from the earth's surface and are warmed.
- This results in a temperature profile in the lower atmosphere, which is represented by a negative temperature gradient.
- On a clear night, the ground surface radiates heat and quickly cools.

Types of inversion:

1. Subsidence Inversion
2. Radiation Inversion
3. Combination of subsidence and radiation

1. Subsidence Inversion

- It occurs high above emission sources.
- Associated with high-pressure systems Inversion layer is formed aloft Covers hundreds of thousands of square kms contributes to long term air pollution problems.
- Persists for several days and greatly contribute to long term accumulation of pollutants.
- Gets broken by strong winds at that altitude.

- Elevation of base of inversion varies from about 200m to around 1000m.

2. Radiation Inversion

• Surface layers of the atmosphere during the day receive heat by conduction, convection and radiation from the earth's surface and are warmed.

• This results in temperature profile in the lower atmosphere that is represented by a negative lapse rate.

• These types of inversions are intensified in river valleys.

• Cause pollutants to be "trapped".

• Breakup after sunrise.

• Occurs in winter season in India.

• Most likely to occur during windless and cloudless nights.

3. Combination of radiation and Subsidence inversion

• It is possible for subsidence and radiation inversions to appear in the atmosphere at the same time.

• Joint occurrence of these two types of inversions leads to a special phenomena called 'Trapping of plume'.

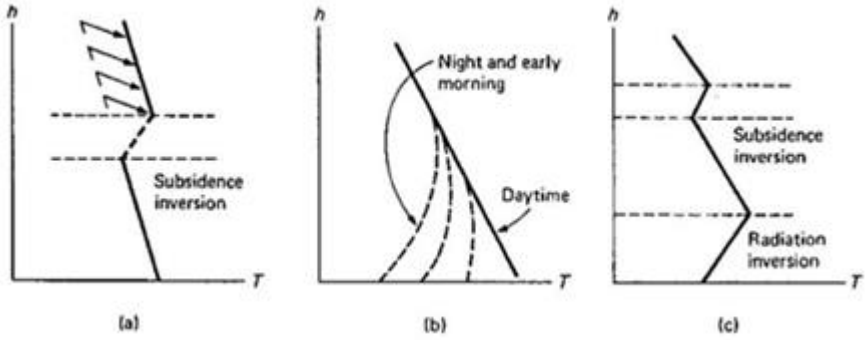

Figure 2.4.1 Illustrations of a) subsidence inversion, b)radiation inversion and c)combination of subsidence and radiation inversion

[Source:https://images.app.goo.gl/Tc18ZmMKU6yUj27d7]