

## Temperature Inversion – UPSC Notes

A temperature inversion is a layer in the atmosphere in which air temperature increases with height. An inversion is present in the lower part of a cap. Temperature Inversion is also known as thermal inversion.

The cap is a layer of relatively warm air aloft (above the inversion). Air parcels rising into this layer become cooler than the surrounding environment, which inhibits their ability to ascend.

### Temperature Inversion

- The reversal of the normal behaviour of temperature in the troposphere is known as temperature inversion.
- The troposphere is the lowest region of the atmosphere, extending from the earth's surface to a height of about 6–10 km.
- Inversions play an important role in determining visibility, precipitation, and cloud forms.
- There will be limited diffusion of air pollutants, smoke and dust.
- During the day time, the radiation from the sun heats up the land surface and the air gets mainly heated up when this air gets in touch with the heated land surface.
- Diurnal variations in air temperature also affect inversion.
- Convective clouds cannot grow high enough to produce showers in regions where a pronounced low-level inversion is present. This happens due to the accumulation of smoke and dust particles.
- Even in the absence of clouds, visibility may be greatly reduced below the inversion.
- Fog is frequently present there, as the air near the base of an inversion tends to be cool.
- Through convection and conduction, the heat from the ground gets transferred to the air.
- The magnitude of ground inversions is greatly affected by the topography.
- Temperature inversion is quite common, but it happens for a short duration.
- An ideal situation for inversion is still air, long winter nights with clear skies.
- It is a normal phenomenon throughout the year over the polar areas.

### Inversion - Frontal Inversion and Subsidence Inversion

- When a cold air mass undercuts a warm air mass and lifts it aloft, a frontal inversion occurs.

- When other inversions are horizontal, this kind of inversion has a considerable slope.
- Clouds may be present immediately above it, in addition, humidity may be high.
- Subtropical oceans and northern continents are the areas where subsidence inversions are common.
- As these areas are under large high-pressure centres, subsiding air is generally found in these regions.

### Inversion - Subsidence Inversion

- When a widespread layer of air starts descending, it leads to subsidence inversion.
- The resulting increase in atmospheric pressure leads to heating and compression of atmospheric pressure. This leads to a reduction in the lapse rate of temperature.
- Temperature inversion is produced when the air at higher altitudes becomes warmer than lower altitudes, this happens when the air mass sinks low enough.

## Frequently Asked Questions on Temperature Inversion

### What is an example of temperature inversion?

Freezing rain is an example of temperature inversion. This phenomenon develops with a temperature inversion in a cold area because snow melts as it moves through the warm inversion layer.

### What are the types of temperature inversion?

Frontal Inversion, Subsidence Inversion, Ground Inversion, Temperature Inversion in Intermontane Valley are the different types of temperature inversion.