Atmospheric Inversion Layers Encyclopedia Article

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Atmospheric Inversion Layers

Whenever an anomaly exists in the atmosphere in which an increase in **temperature**, **humidity**, or **precipitation** occurs where a decrease would be expected, there is an inversion, or reversal. An atmospheric inversion most commonly refers to temperature inversion where the temperature increases rather than decreases with increasing altitude.

Normally air temperature decreases with altitude at a rate of about 33.8°F (1°C) per 59 feet (180 m) because since the Sun's heating effect is greatest at the Earth's surface. There are three factors that alter this rate, causing the temperature to rise within the first few hundred meters of the ground. Inversions can occur as a result of radiative, or direct, cooling from the earth's surface. This occurs at night when the ground cools more rapidly than the air above it. The effects of an inversion are thus greatest during early morning, usually the coolest part of the day. Inversions also occur as a result of subsidence (sinking) of air in an anticyclone, or high pressure system, where the descending air warms adiabatically, that is,

Denver's "brown cloud," the haze of air pollution that hangs over the city, is kept in place by atmospheric inversion layers.

within itself, while the ground remains cool. High pressure systems have the stability that inversion layers require. Finally, movement of air can create an advective inversion. For instance, if a warm air mass moves over a body of **water** or over snow cover, an inversion will occur.

Inversion layers block the upward movement of air, trapping moisture and natural and man-made pollutants near the ground. The result is **fog** and **smog**. The lower the inversion ceiling, the more concentrated the accumulation of moisture and particulates. Some of the most serious episodes of smog or fog occur in mountainous areas, especially where a city (e.g., Denver, Colorado) or industrial site is located. In places in the San Fernando Valley in California, the polluted air is trapped both vertically and horizontally.

The mere presence of a city or factory often creates a microclimate of its own, creating a pocket of warm air within the cool ground layer. Smoke from a stack, instead of escaping upward or laterally, will descend to the ground, delivering a direct dose of pollution to residents of the **area**.

See Also

Atmospheric Composition and Structure; Atmospheric Lapse Rate; Atmospheric Pollution; Environmental Pollution; Greenhouse Gases and Greenhouse Effect; Meteorology; Troposphere and Tropopause