people and the ENVIRONMENT

Atmospheric Stability and Air Pollution

Air quality is closely linked to the atmosphere's ability to scatter pollutants. Perhaps you've heard "Dilution is the solution to pollution." To a large degree, this is true. If the air into which pollution is released is not dispersed, the air will become more toxic. Two of the most important atmospheric conditions affecting the distribution of pollutants are wind strength and air stability.

When winds are weak or calm, the concentration of pollutants is higher than when winds are strong. High wind speeds mix polluted air into a larger volume of surrounding air, causing the pollution to be more diluted. When winds are light, there is less turbulence and mixing, so the concentration of pollutants is higher.

Atmospheric stability affects vertical movements of air. In general, the larger the extent of vertical mixing, the better the air quality is. During a temperature inversion, the atmosphere is very stable and it does not move much vertically. Warm air overlying cooler air acts as a lid and prevents upward movement, which leaves pollutants trapped near the ground, as shown in Figure 16.

Some inversions form near the ground, while others form higher above the ground. A surface inversion develops close to the ground on clear and relatively calm nights because the ground is a better radiator of heat than the air above it. Radiation from the ground to the clear night sky causes more rapid cooling at the surface than higher in the atmosphere. The result is that the air close to the ground is cooled more than the air above, yielding a temperature profile similar to the one shown in Figure 17. After sunrise, the ground is heated and the inversion disappears.

Although surface inversions usually are shallow, they may be thick in regions where the land surface is uneven. Because cold air is denser than warm air, the chilled air near the surface gradually drains from slopes into adjacent lowlands and valleys. As might be expected, these thicker surface inversions will not spread out as quickly after sunrise.

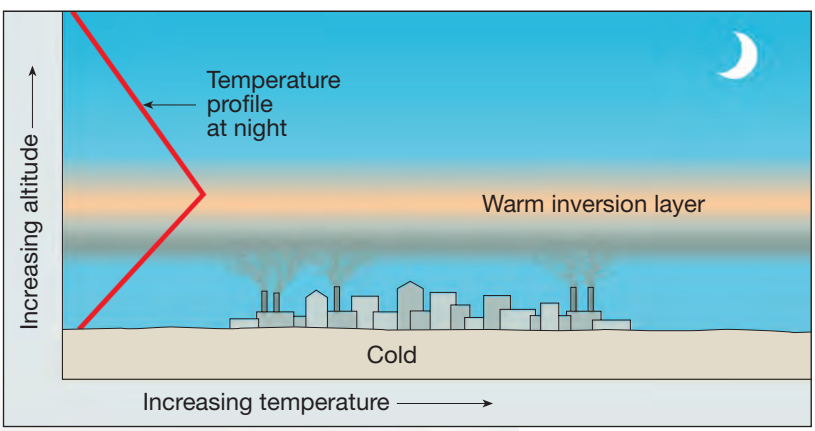

Figure 17 General Temperature Profile for a Surface Inversion

Figure 16 Air Pollution in Downtown Los Angeles
Temperatures inversions act as lids to trap pollutants below.

Gary Gray/DRG Photo

Ted Spiegel/Black Star