

Inversion (Special case-Met)

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Inverted Lapse Rates (Strongly Stable)

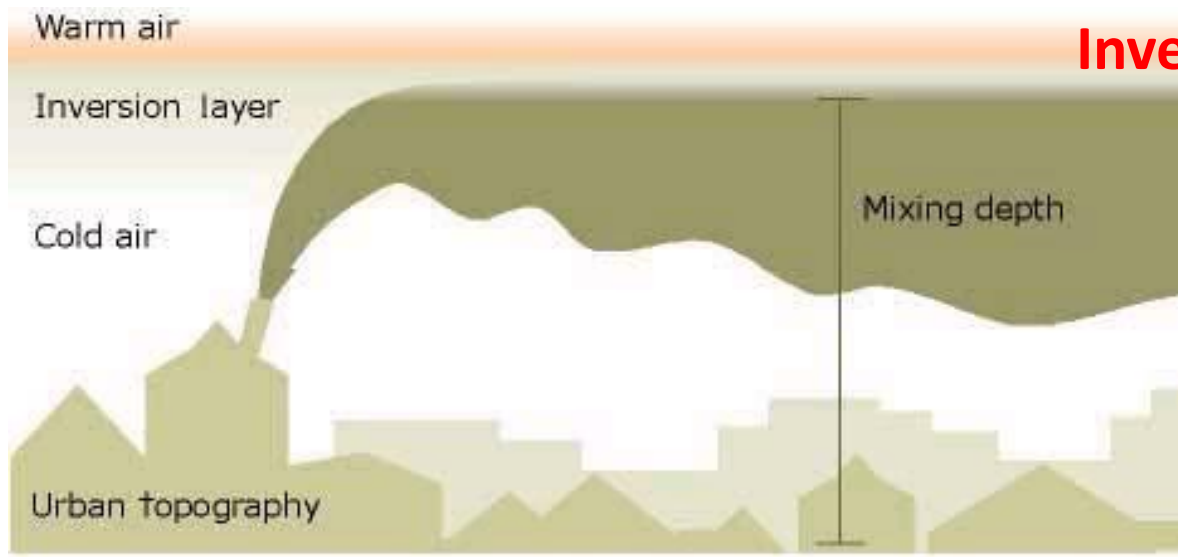
- Characterized by increasing temperature with height



Does it occur during the day or at night?

Is it associated with high or low pressure systems?

Does it improve or deteriorate air quality?



Winter inversion layer trapping smoke from home fires

www.co.mendocino.ca.us/aqmd/Inversions.htm

www.ew.govt.nz/enviroinfo/air/weather.htm

Inversion

- Definition: temperature increases with altitude

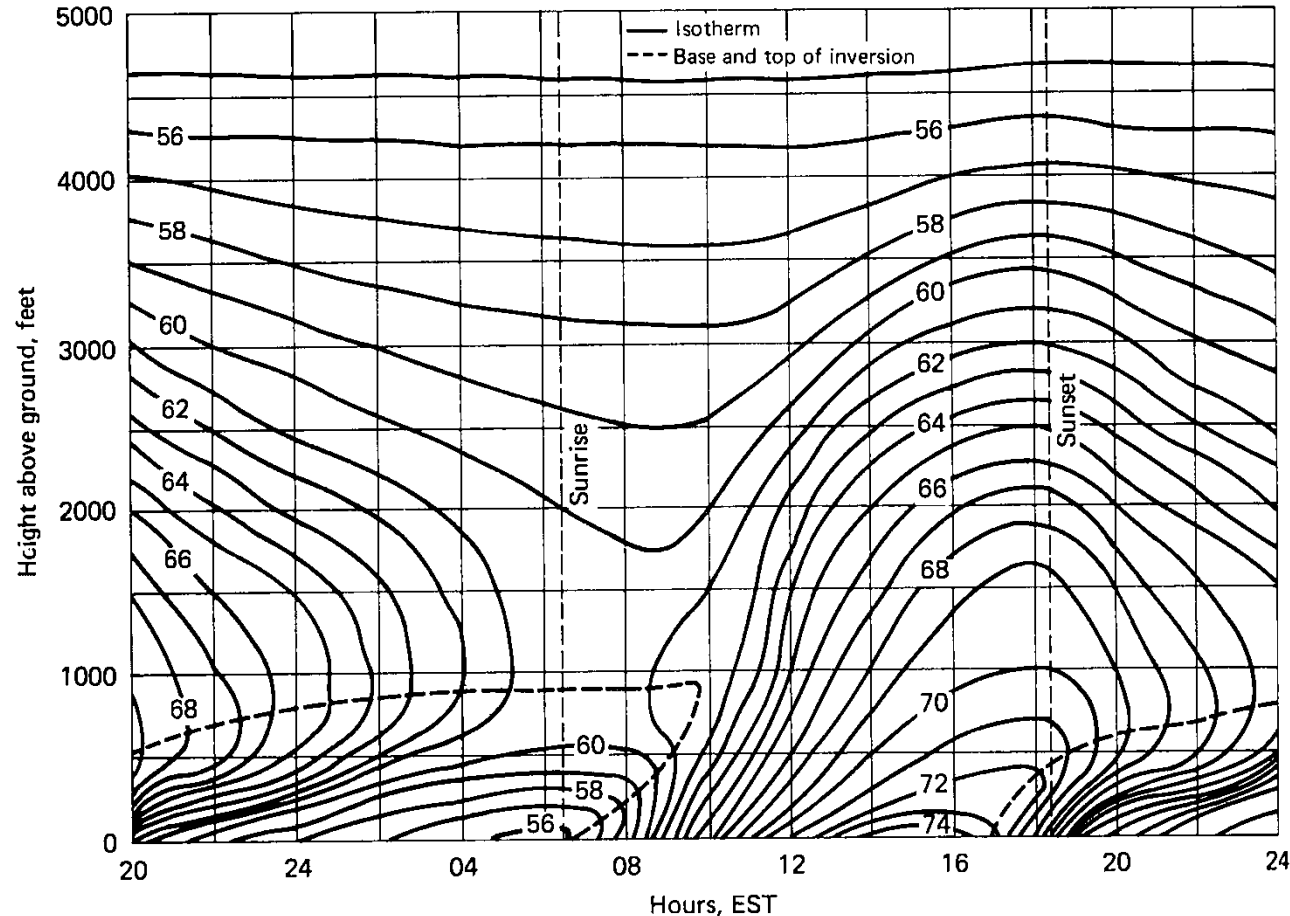


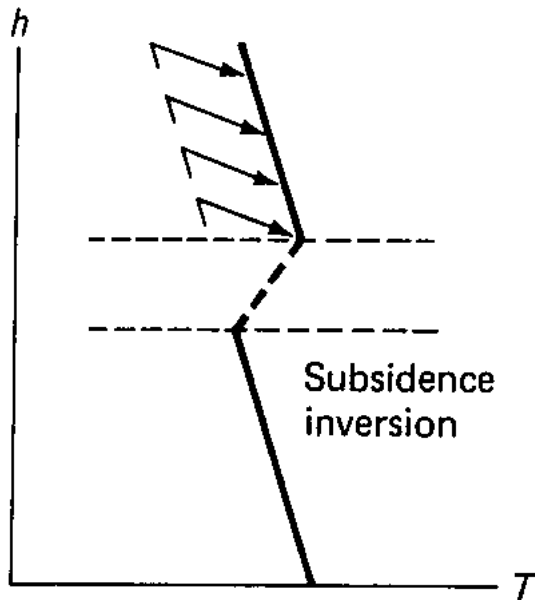
Figure 3-11 Time cross section of average temperature ($^{\circ}\text{F}$) up to 5000-ft altitude, September, October, 1950, Oak Ridge, Tenn. (SOURCE: U.S. Weather Bureau, *Meteorological Survey of the Oak Ridge Area*. Report ORO-99. Oak Ridge, Tenn.: AEC, 1953.)

Inversion

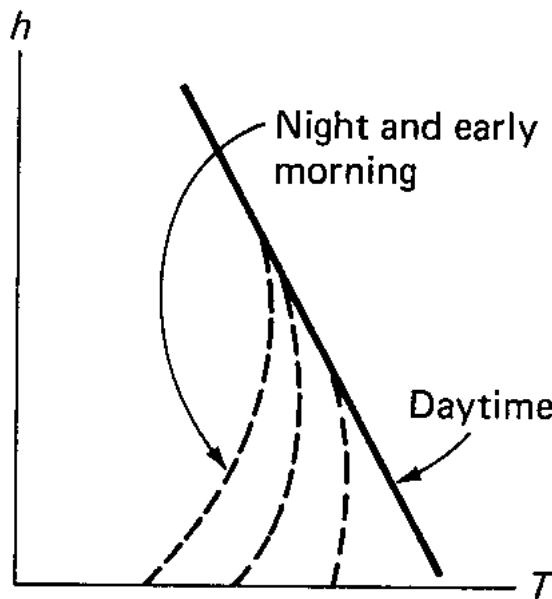


Inversion

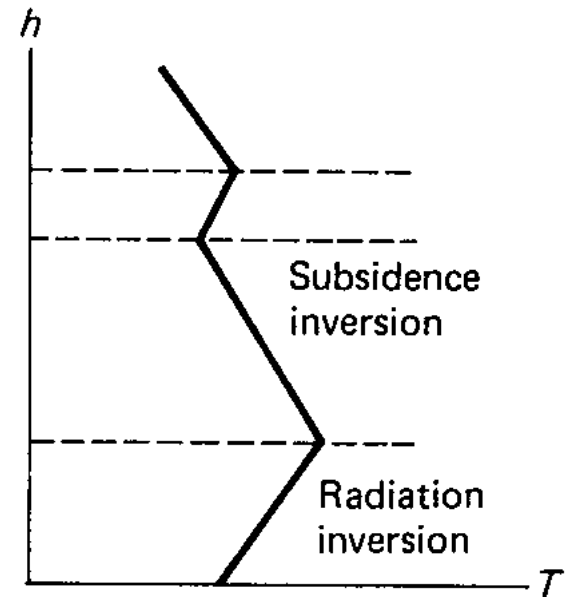
- Two major types of inversion:
 - **Subsidence Inversion**: descent of a layer of air within a high pressure air mass
 - **Radiational Inversion**: radiation at night from the earth's surface into the local atmosphere



(a)



(b)



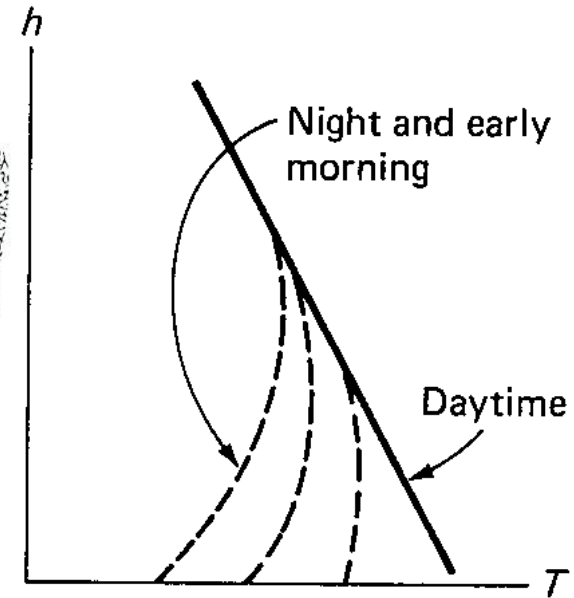
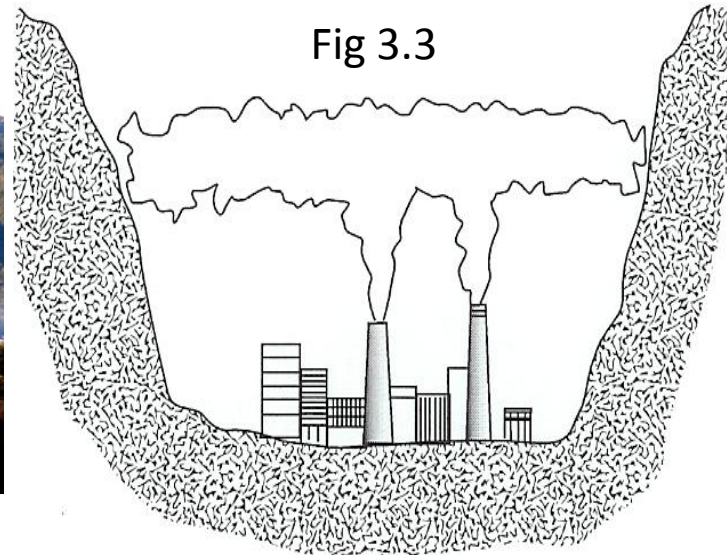
(c)

Radiational Inversions

- Result from radiational cooling of the ground
- Occur on cloudless nights – nocturnal
- Typically surface based
- Are intensified in river valleys
- Cause pollutants to be “trapped”



www.co.mendocino.ca.us/aqmd/Inversions.htm



What happens to inversion when sun rises?

Radiational Inversions

- Breakup after sunrise
- Breakup results in elevated ground level concentrations
- Breakup described as a fumigation



de.wikipedia.org/wiki/Smog

Radiational Inversions

- Elevated inversions are formed over urban areas
 - Due to heat island effect
 - Due to dust dome

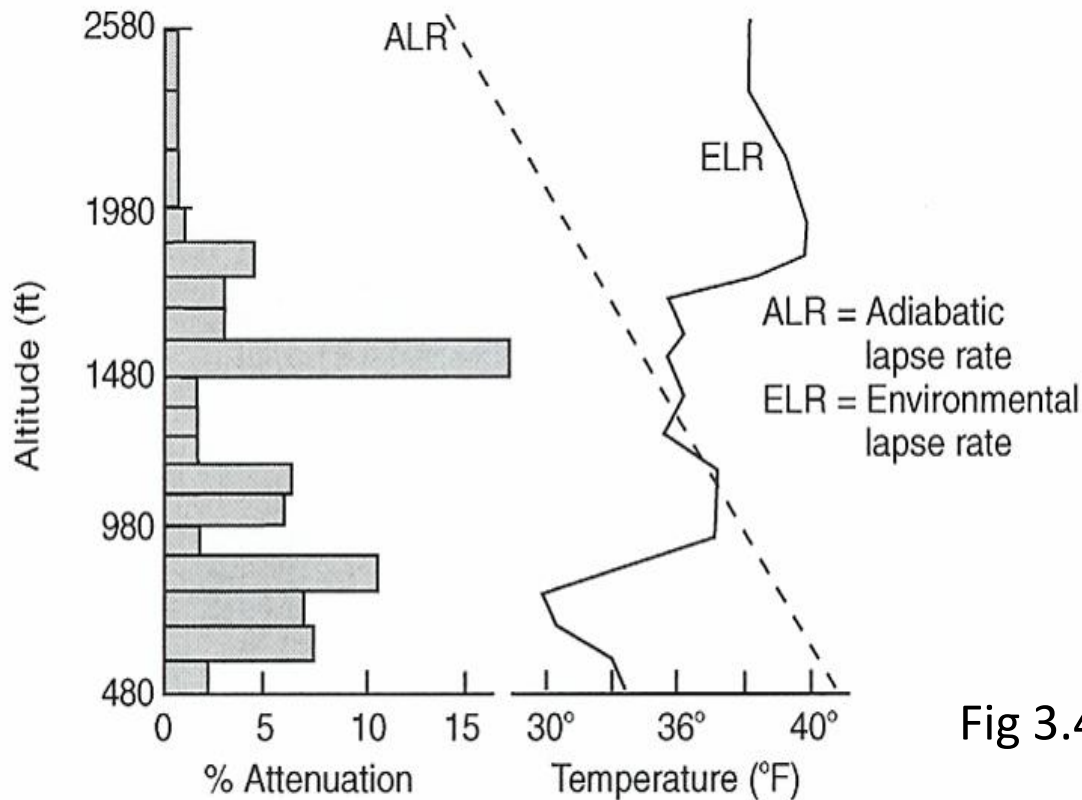
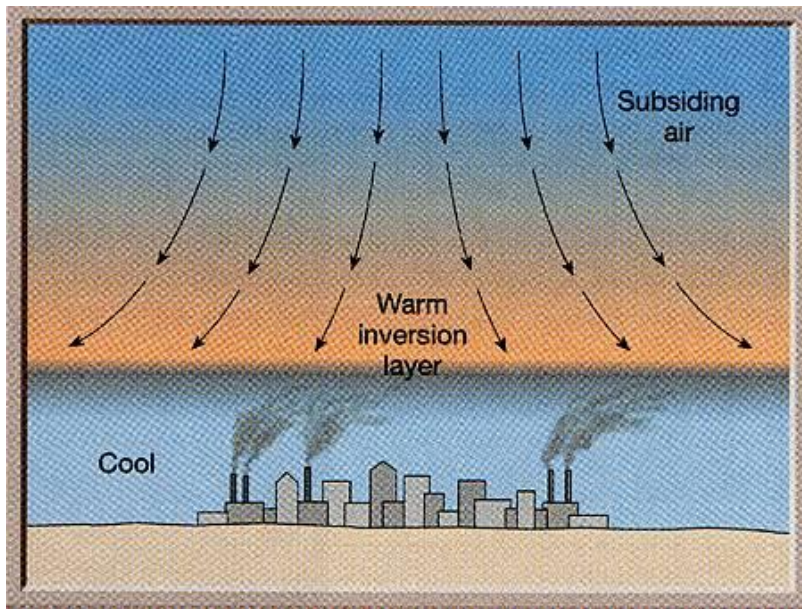


Fig 3.4

Subsidence Inversion

- Associated with high-pressure systems
- Inversion layer is formed aloft
- Covers hundreds of thousands of square kms
- Persists for days



apollo.lsc.vsc.edu/.../smog_var_geo.html

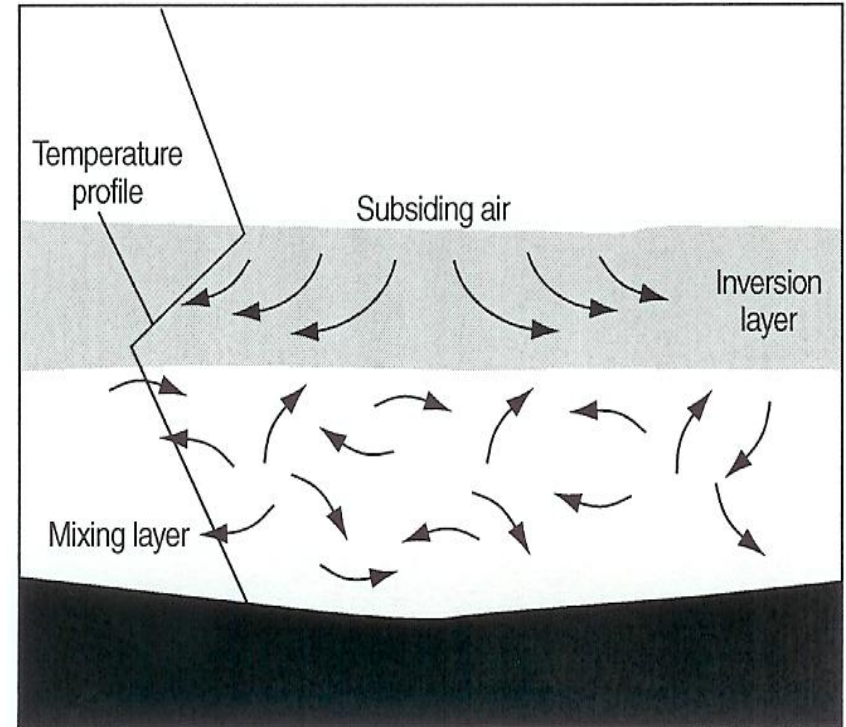


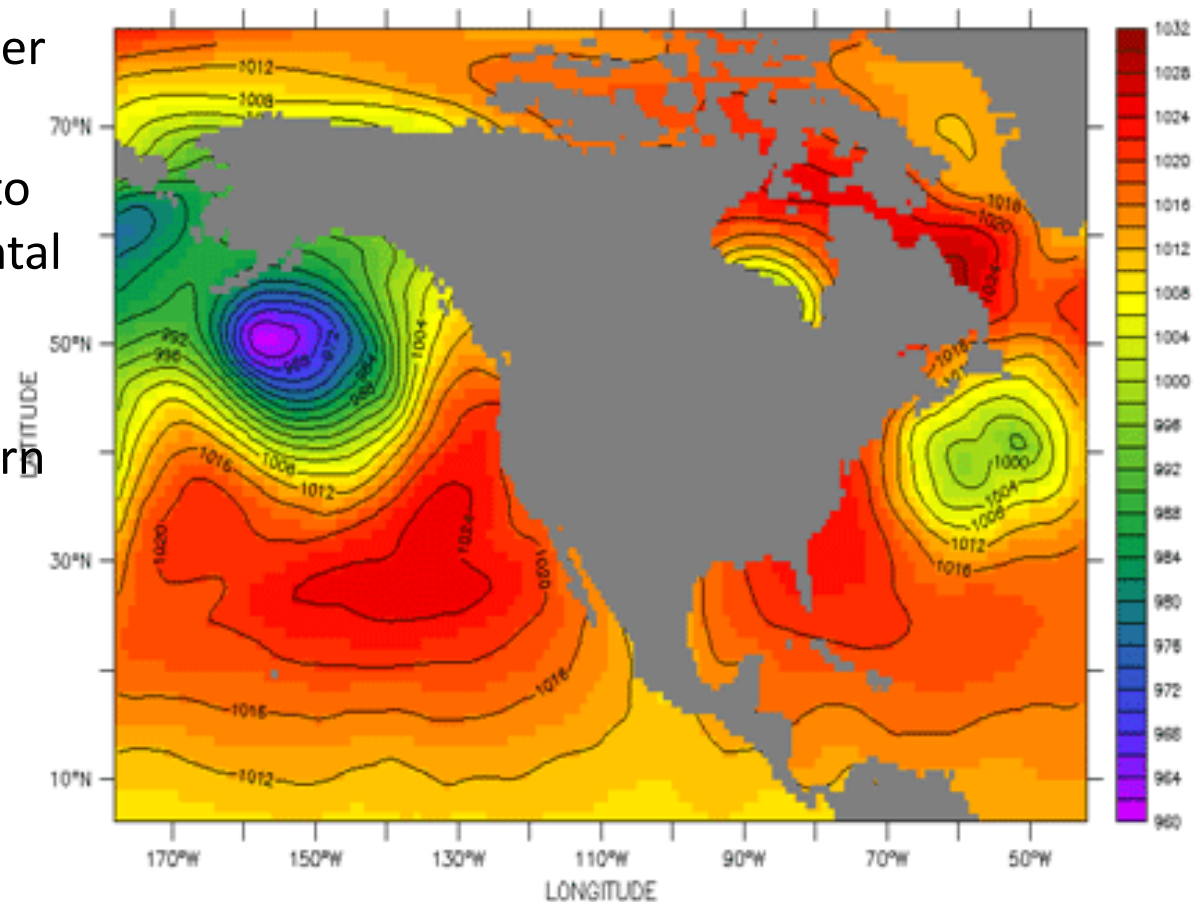
Fig 3.5

Subsidence Inversion

- Migrating high-pressure systems: contribute to the hazy summer conditions in Midwest, SE and NE
- Semi-permanent marine high-pressure systems
 - Results in a large number of sunny calm days
 - Inversion layer closest to the ground on continental side
 - Responsible for air stagnation over Southern California

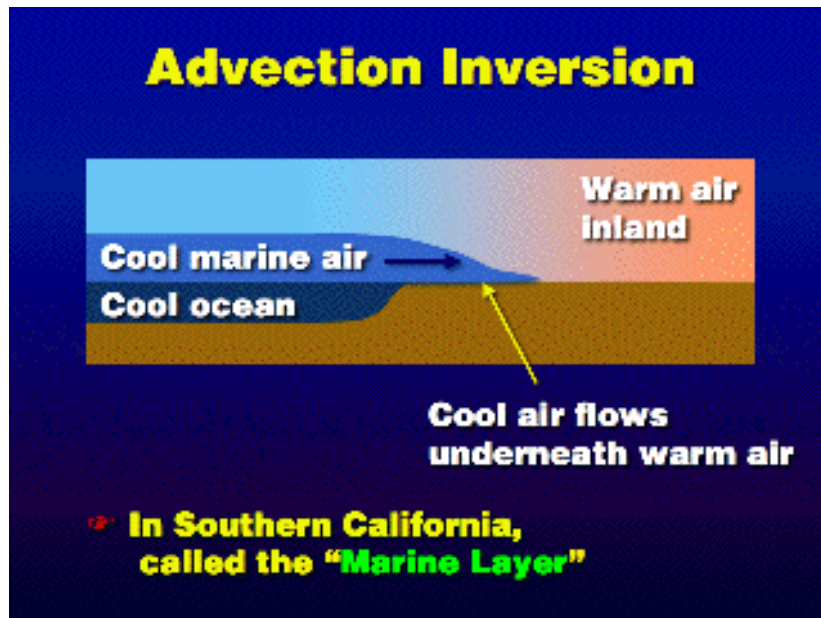


Where else on earth would have similar phenomenon?



Inversions

- **Frontal** - warm air overrides cooler air
- **Advection** - warm air flows over a cold surface or cold air



www.atmos.ucla.edu/.../inversions/Note03.html