

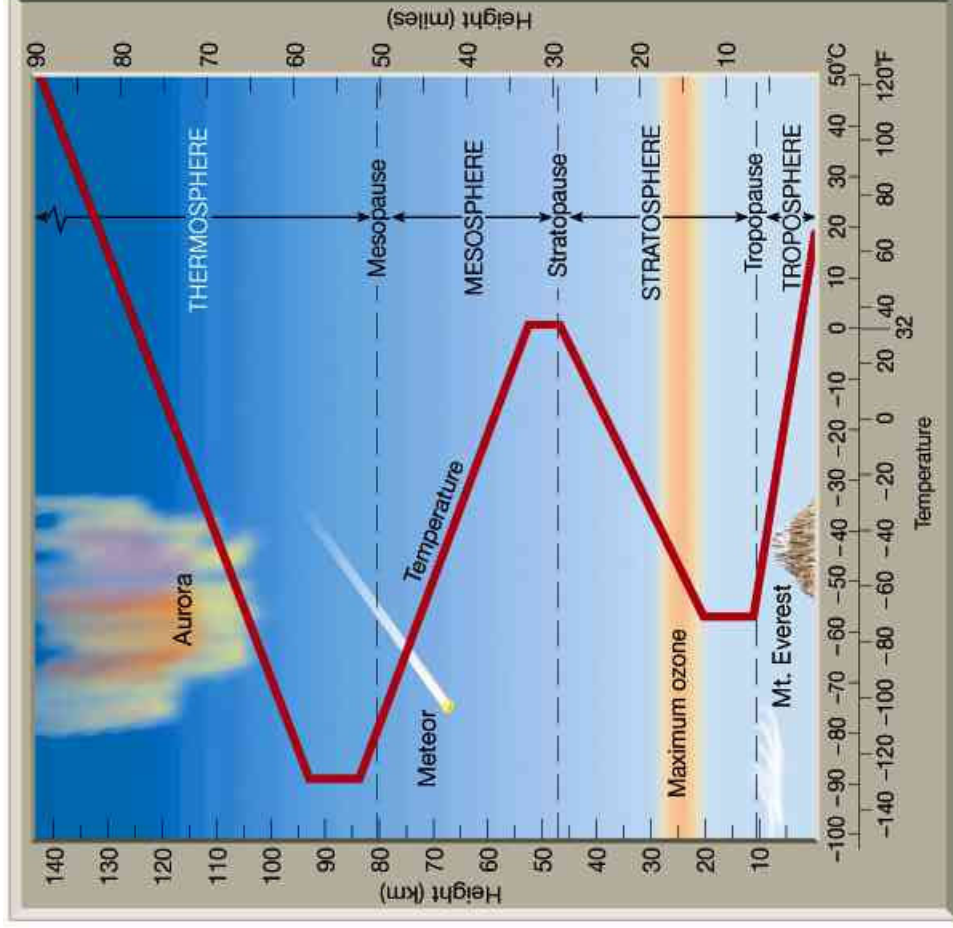
Utah Temperature Inversions

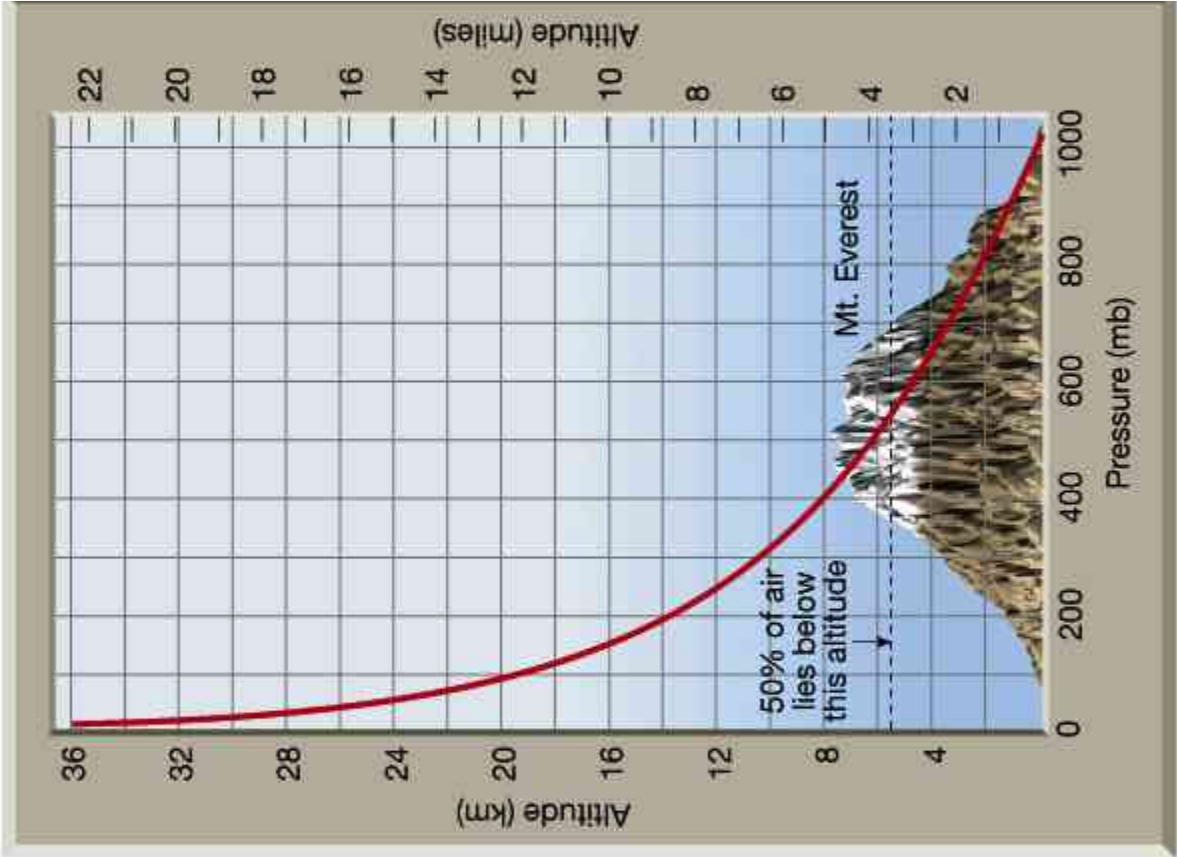
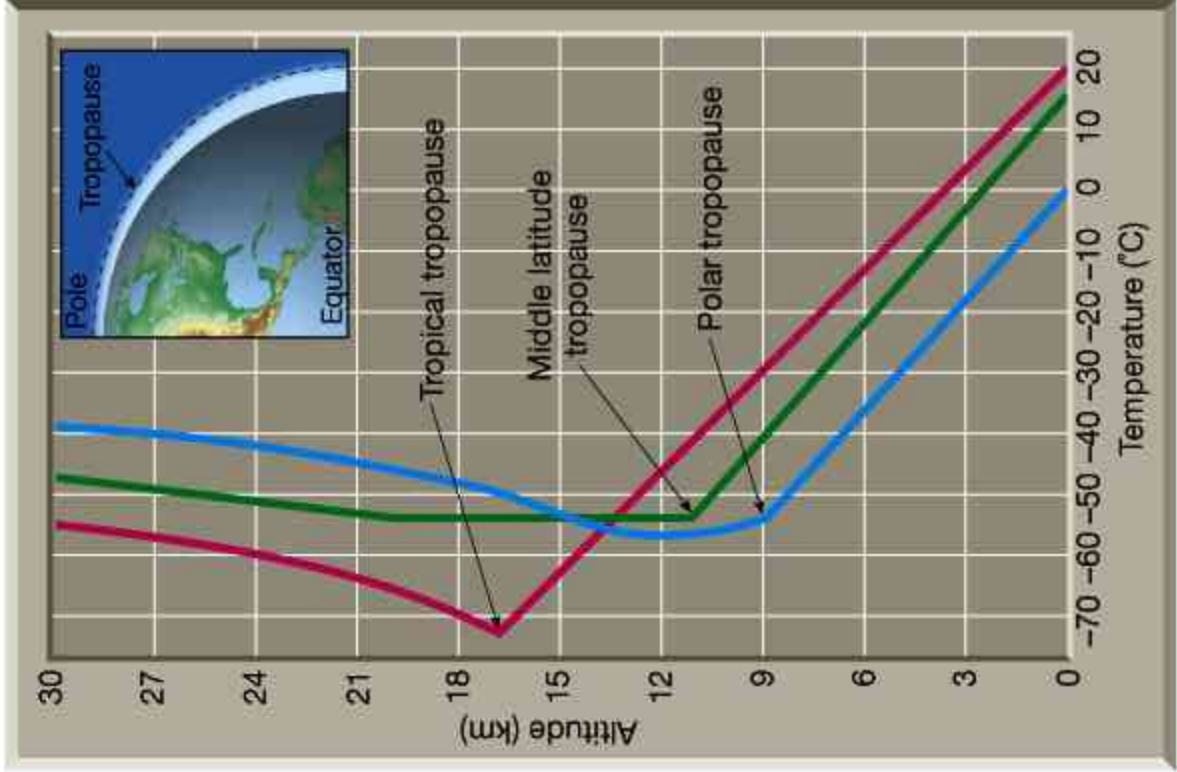
- 1. What is an inversion?
- 2. How does it get set up?
- 3. Why does it happen in the winter?
- 4. What does it take for it to go away?
- 5. Is there anything we can do to make it go away?

Atmospheric Vertical Structure

Photo Credit: Bob Rohli

(b)





Set up

- High pressure
 - Sunshine
 - High in the winter, the high doesn't have clouds, subsiding motion
 - Light winds
 - Light winds let the cold air pool
 - Night lots of nighttime cooling
 - Less wind and no clouds to trap the heat
- Cold air pool could form at night from drainage winds
- Cold front can come in and leave cold air in the valley

Mountain

- Drainage flows
- Mountains help to trap the air in our valley
 - Can make them more persistent
 - Counter example: An open area will get more winds
 - Amount of sunshine can be reduced by shadows
 - Pool won't be as windy due to mountains

How to get rid of it?

- Precipitation will reduce the pollution, but may not get rid of the temperature inversion
- New weather to come in
 - Cool the air above
 - Warm the air on the ground
 - A really strong wind event

Why in winter?

- At night we almost always have an inversion, but it is removed by the heating of the ground by the sun.
- Sometimes the sun can't effectively heat the ground because the particles that reflect the sunlight
- Sun is at a low angle and there is less direct sunshine
- Snow on the ground reflects sunlight

Air pollution

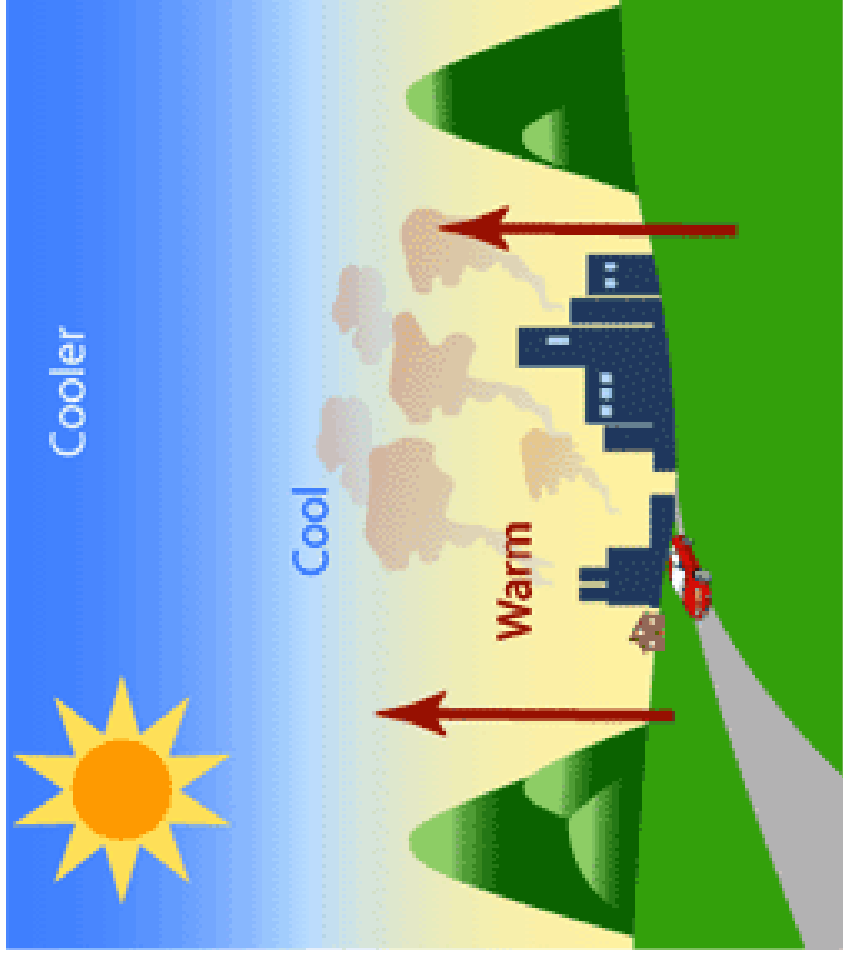
- Pollution that is emitted at the ground, stays at the ground, meanders around
- Morning vs. nighttime pollution
 - Morning it shines on the east facing hillsides
 - Layer drifts to the coachers in the morning and moves towards the wasatch in the afternoon.
 - Run up the valley in the day and down towards the city and lake at night.

Why in winter?

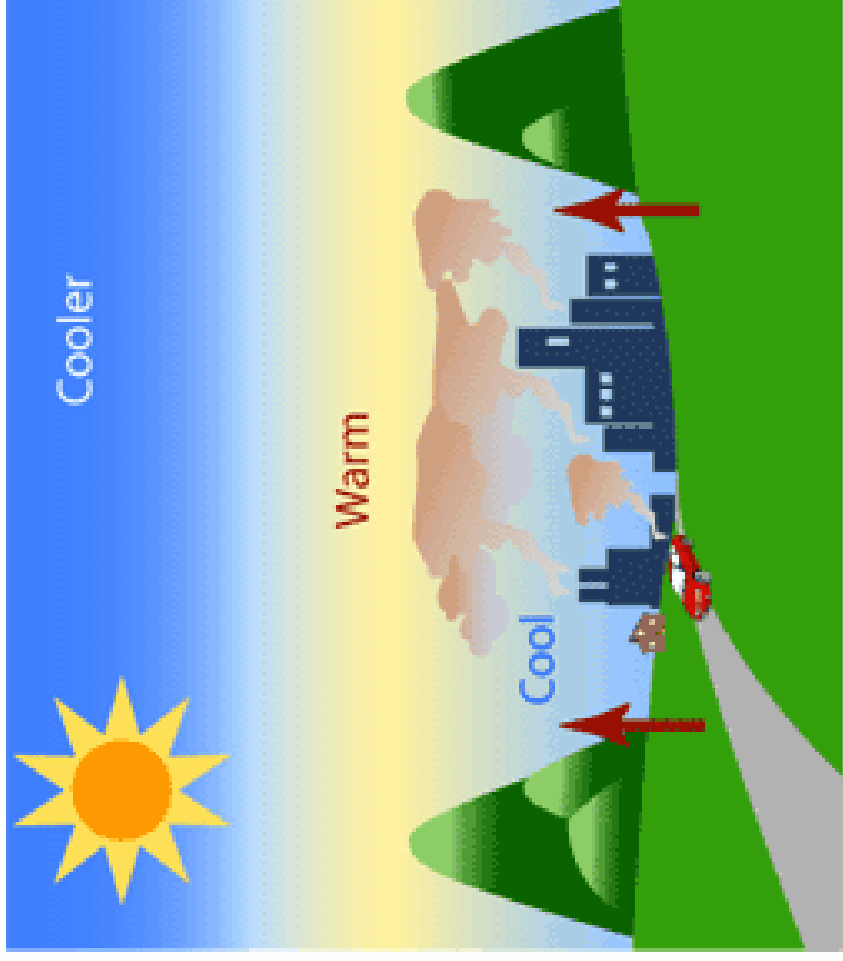
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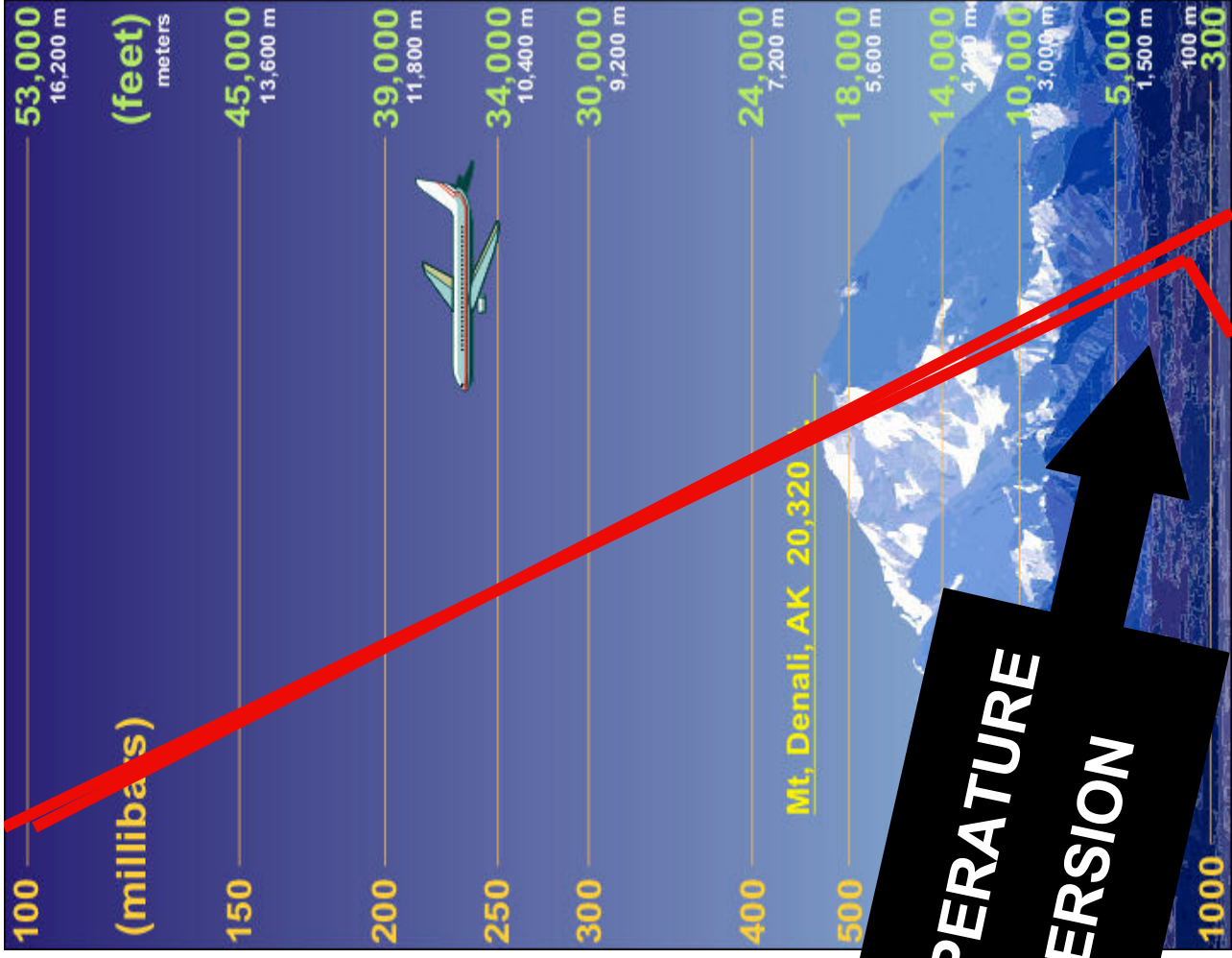


Warm Air Rising



Rising Warm Air Inhibited
by Inversion

Will the
temperature
profile still look
like this at
night?

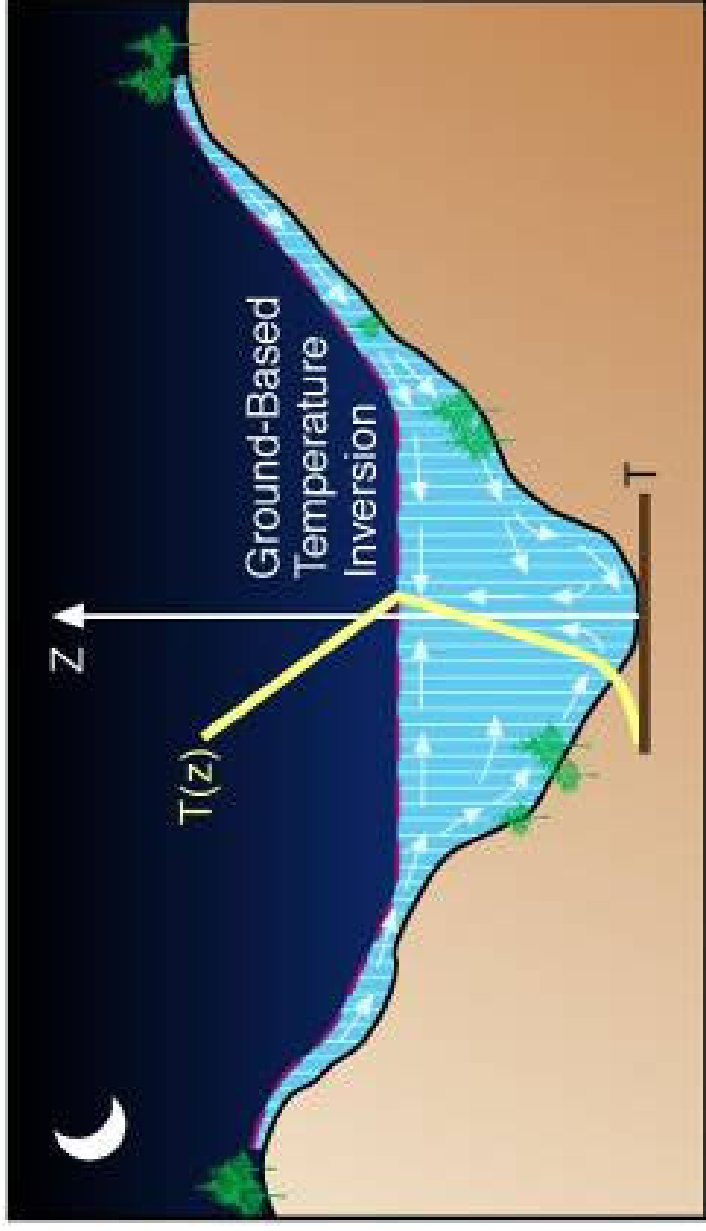


**TEMPERATURE
INVERSION**

Temperature ↑

Temperature Inversion

- Winter temperature inversions can persist for many days since the sun's heat is not as strong and the pollutants block some of the sunlight. These inversions are usually removed by fronts that come through.



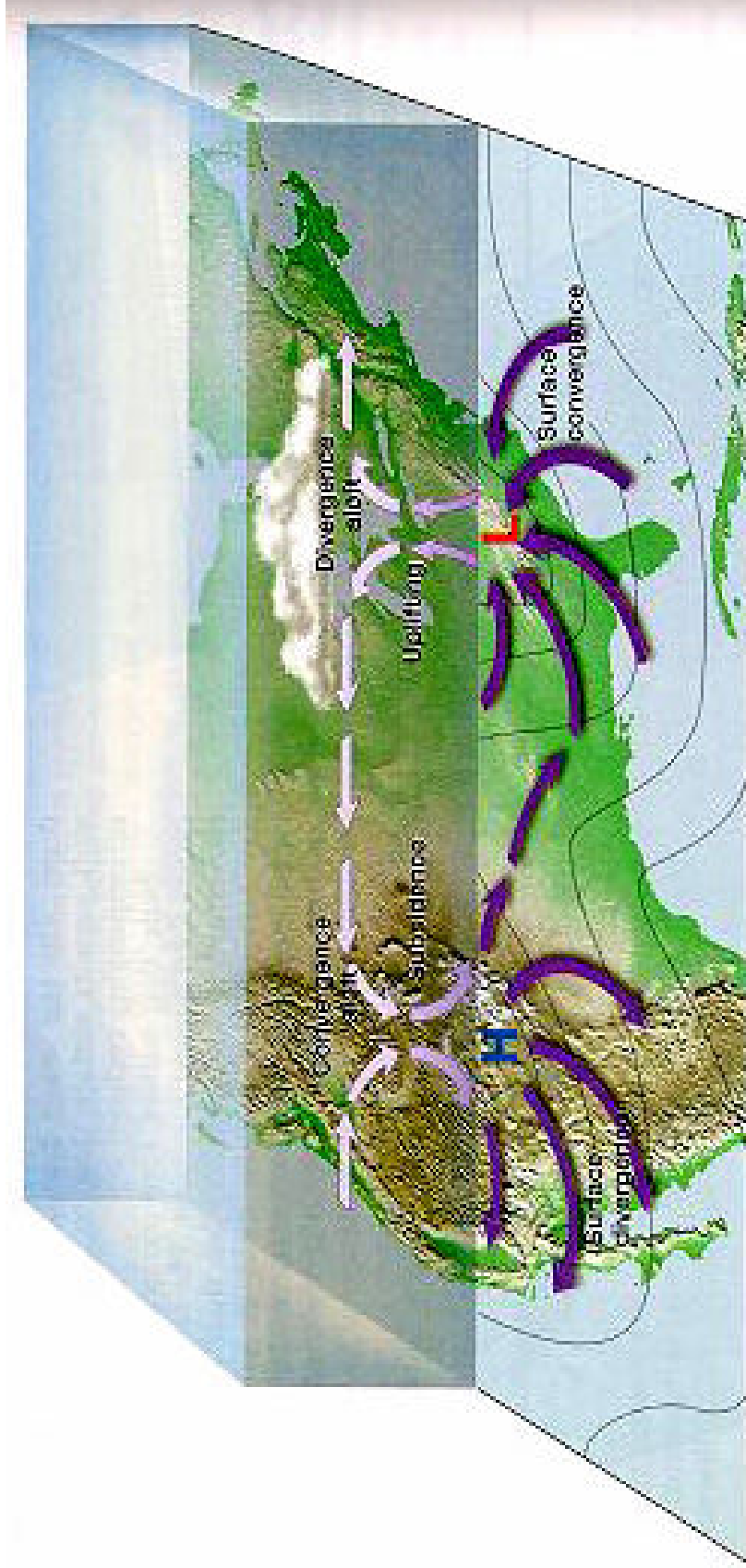


Figure 6-19 Airflow associated with surface cyclones and anticyclones. A low, or cyclone, has converging surface winds and rising air causing cloudy conditions. A high, or anticyclone, has diverging surface winds and descending air, which leads to clear skies and fair weather.