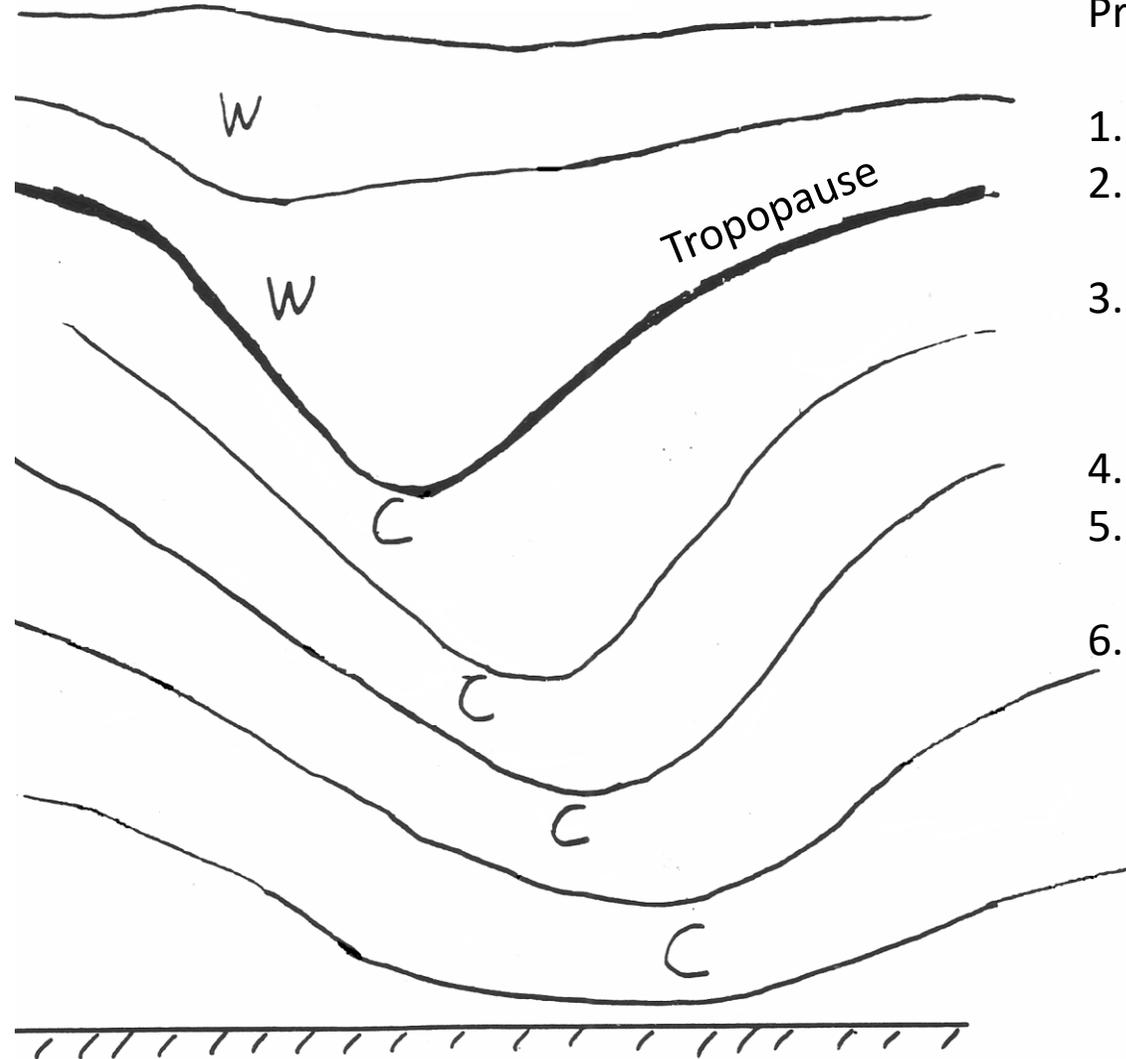


# Cold-core mid-latitude cyclones

How can a cold-core cyclone have low surface pressure?

1. In stratosphere, it is "warm-core."
2. Since the stratosphere is stable, a little subsidence warms the air a lot
3. Also recall that  $dp = -\frac{RT}{g} \frac{dp}{p}$ . The temperature impact is proportional to  $\frac{dp}{p}$ . Hence, temperature perturbations in the stratosphere have major impact on surface pressure



Properties

1. Concave upwards in troposphere
2. Becomes more cyclonic with height in troposphere
3. This is because thickness is proportional to mean temperature in layer
4. Tilt with height
5. Coldest temperatures are northwest of system
6. Upper-level low or trough is displaced northwest of surface low

# Warm-core cyclones

1. Tropical cyclones
2. Thermal lows
  - a. A warm, shallow, non-frontal depression which forms above continental regions, mostly in the subtropics, but also in the lower mid-latitudes
  - b. Form mostly during summer months because of the intense surface heating over land. The main areas of occurrence are regions with arid or semi-arid surfaces where there is little surface evaporation.
  - c. Some remain quasi-stationary above the regions of origin, reaching their maximum intensity during the afternoon followed by a substantial weakening during the night. Others, for example in West Australian, may become mobile during the day and the intensity does not diminish overnight
  - d. Generally “fair weather” systems, but can influence large-scale patterns and monsoons
  - e. Intense heating lowers the air density over an area wide enough for a synoptic-scale low to form
  - f. Occur in northeast India and Pakistan; west Australia; Arabia; Qinghai-Xizang plateau in China; north Africa; Tasmania; and southwest United States

# Warm-core anticyclones

- a. Consist of extensive areas of subsiding warm, dry air
- b. Circulation extends from surface to tropopause
- c. One set of examples are the semi-permanent subtropical highs, such as the Bermuda-Azores High
- d. Also form over continents during the summer, associated with surface temperatures above normal and air pollution
- e. If stationary, can be associated with droughts

# Cold-core anticyclones

- a. Shallow, wintertime system
- b. Can produce surface pressure as high as 1050 mb, as the cold air is relatively dense
- c. Source is from continental poleward or arctic regions, can bring frigid temperatures
- d. Susceptible to mixed precipitation (sleet, freezing rain), especially in the southern US
- e. Associated with air pollution events