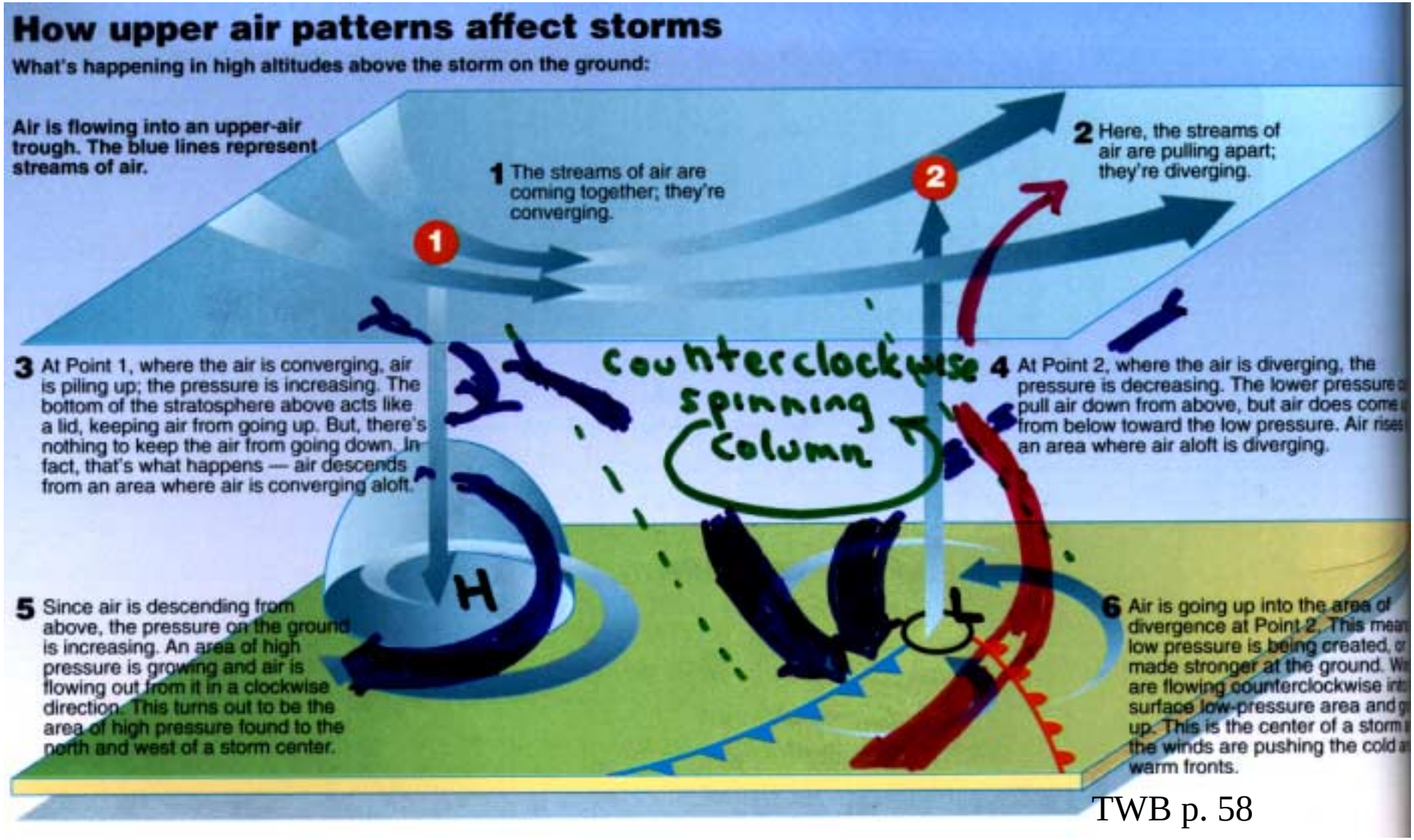
Lecture 16. Upper Atmospheric Cyclone Structure



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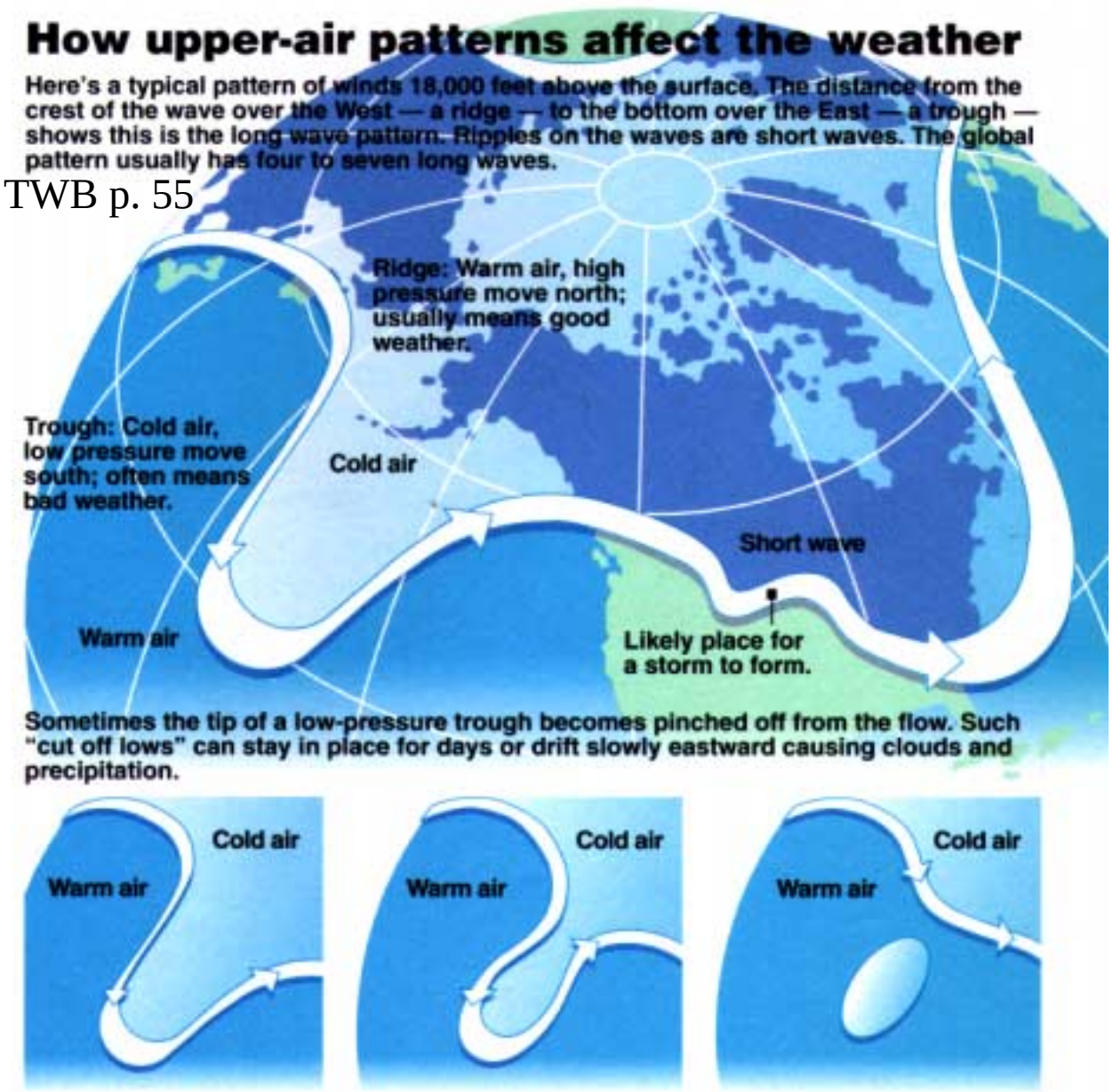
ET Cyclone mainly draws warm air up/poleward, cold air down/equatorward. Core of cyclone rotates counterclockwise, tilts westward with height.

Long and Short Waves



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Long waves - 3000-5000 km ridge to trough, nearly stationary.

Short waves: 1000-2000 km ridge to trough, move with 500 mb winds. ...not always easily distinguishable.

Troughs: 'cyclonic' (counterclockwise - NH) spin of winds

Ridges: 'anticyclonic' (clockwise - NH) spin

Movement of Short Waves Through Long Waves

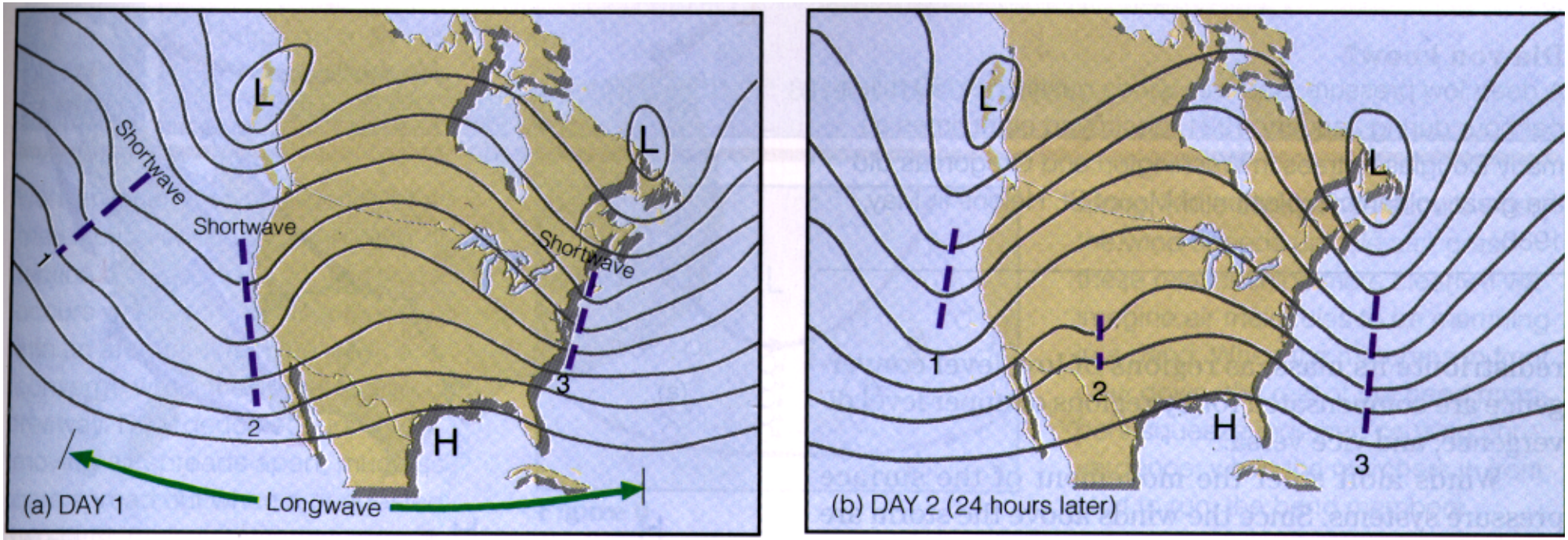


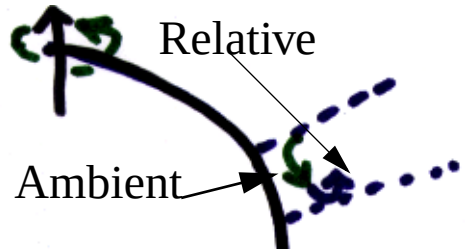
Figure 8.22
(a) Upper-air chart showing a longwave with three shortwaves embedded in the flow.
(b) Twenty-four hours later the shortwaves have moved rapidly around the longwave. Notice that the shortwaves labeled 1 and 3 tend to deepen the longwave trough, while shortwave 2 has weakened as it moves into a ridge.

EOM

Vorticity

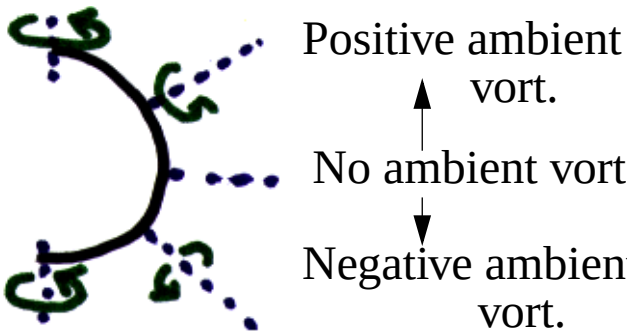
- *Vorticity* is ‘spin’ of air parcel about vertical axis.

- Total or ‘absolute’ vorticity has two parts:
  Relative vorticity = Spin of air relative to earth

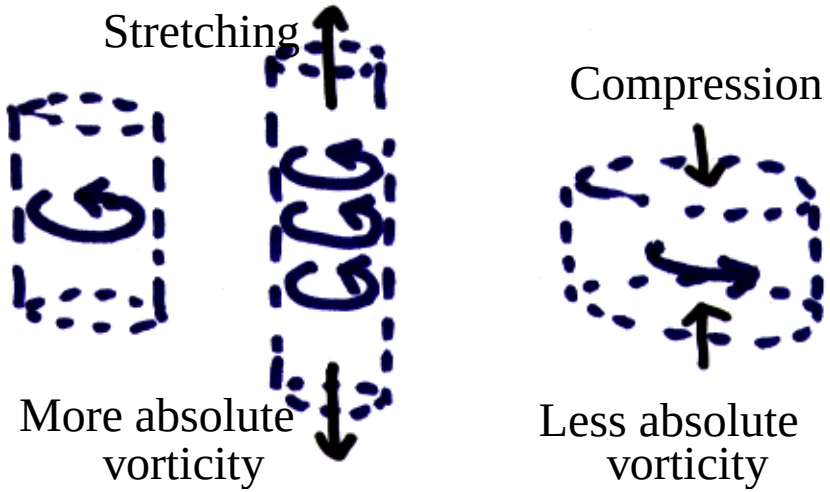


+ Ambient vorticity = vertical part of earth’s spin

- Ambient vorticity is large at poles, zero at equator.

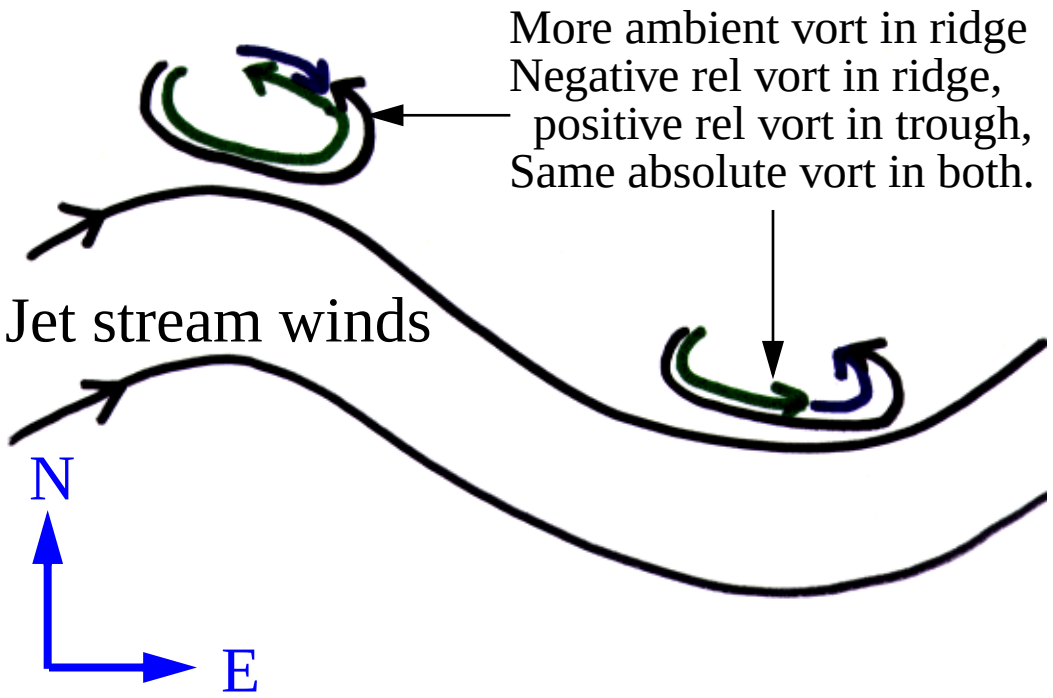


- Absolute vorticity only changed by stretching



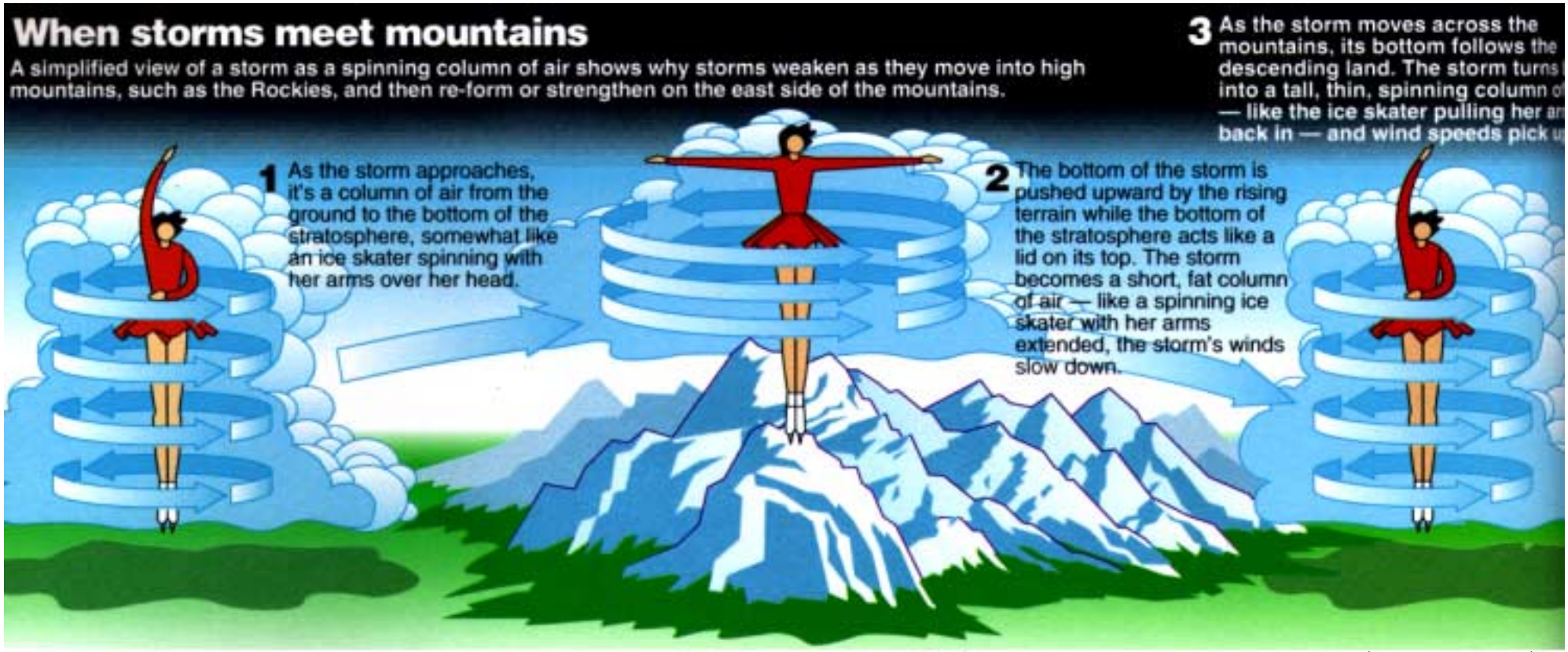
Long (Rossby) waves

- Are set up by the pattern of oceans, land, and mountains around the globe.
- Involve little stretching or compression of air columns, so air keeps the same absolute vorticity as it moves from W to E throughout the wave.



- Named after a famous meteorologist of the 1920s and 1930s who was one of the first people to recognize the role of the jet stream in weather.

Storms crossing over the Rockies



(TWB p 54)

Storm Tracks

- Surface lows disappear over the Rockies
- Low formation in lee of Rockies and Gulf of Mexico
- Cold highs descend from Canada behind storms

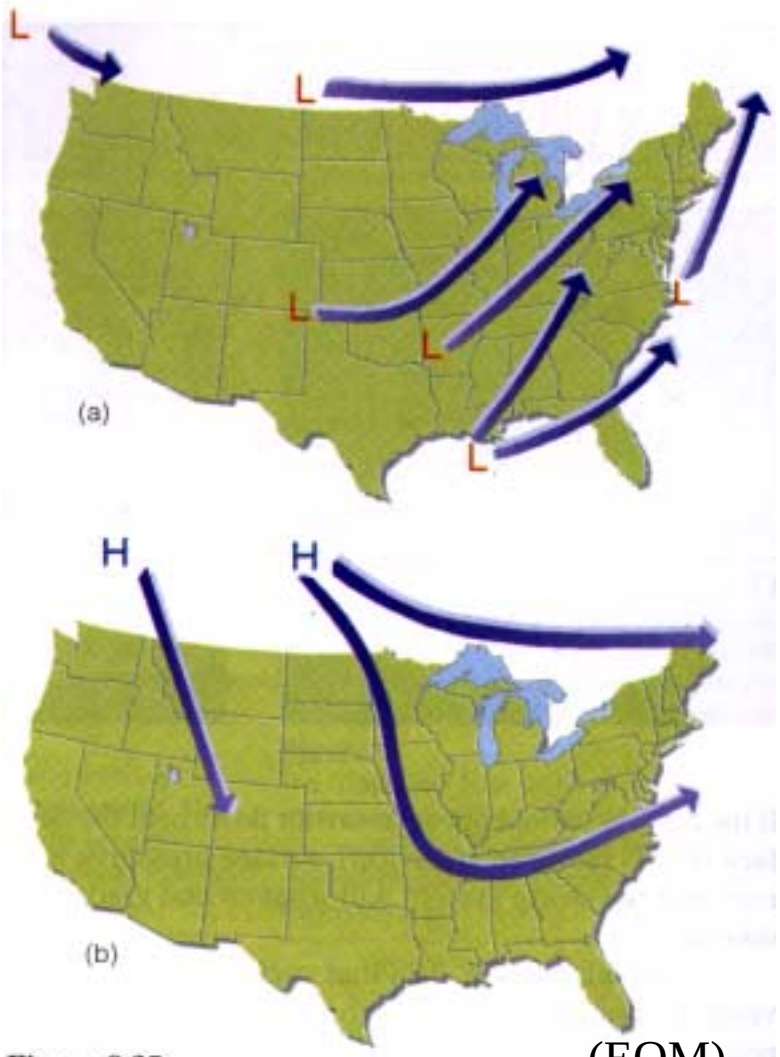


Figure 8.25
Typical paths of (a) winter mid-latitude cyclones and (b) winter anticyclones.

(EOM)