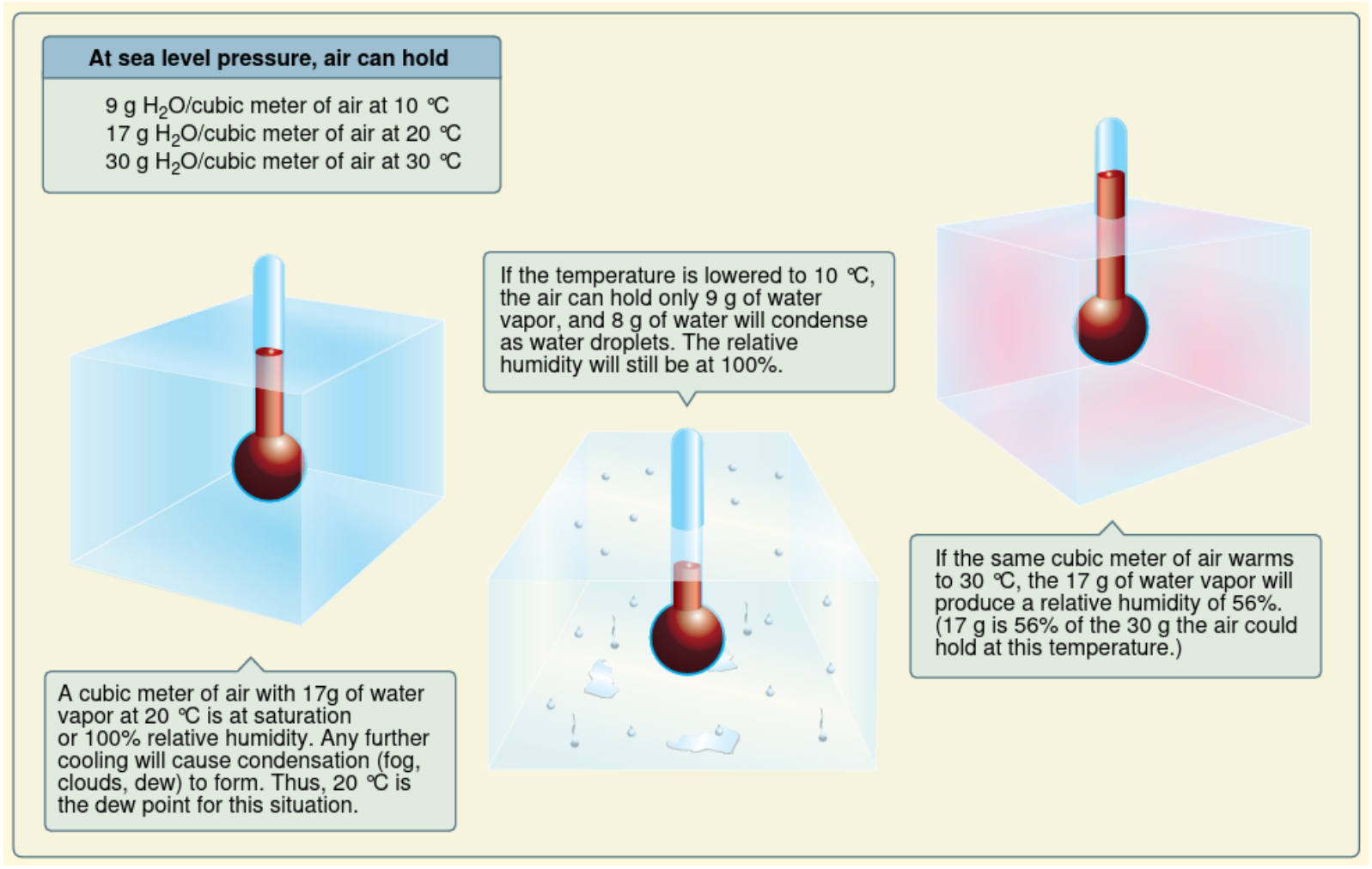
Weather

Chapter 6

Questions

1. What is the Coriolis Force
2. Why do winds go from a high-pressure area to a low-pressure area?
3. If you were to take an volume of air that is 15°C from sea level to 1,000 feet, how would you expect the temperature of that volume of air to change?
4. What is a microburst?
5. Why is it called radiation fog if there is no radioactive material involved?
6. If the winds on the surface are 120° at 3 knots and 220° at 13 knots at 500 feed AGL, is there a wind sheer?
7. In the northern hemisphere, which way would you expect surface winds to be traveling north of a high-pressure area?

Humidity and Dewpoint



Radiation Fog

Photo by Uoaei1.

Advection Fog

Photo by Joonas Suominen.

Upslope Fog

Photo by Nigel Brown.

Steam Fog or Sea Smoke

Photo by Oakley413.

Stability

Lapse rate is the decrease in temperature with altitude.

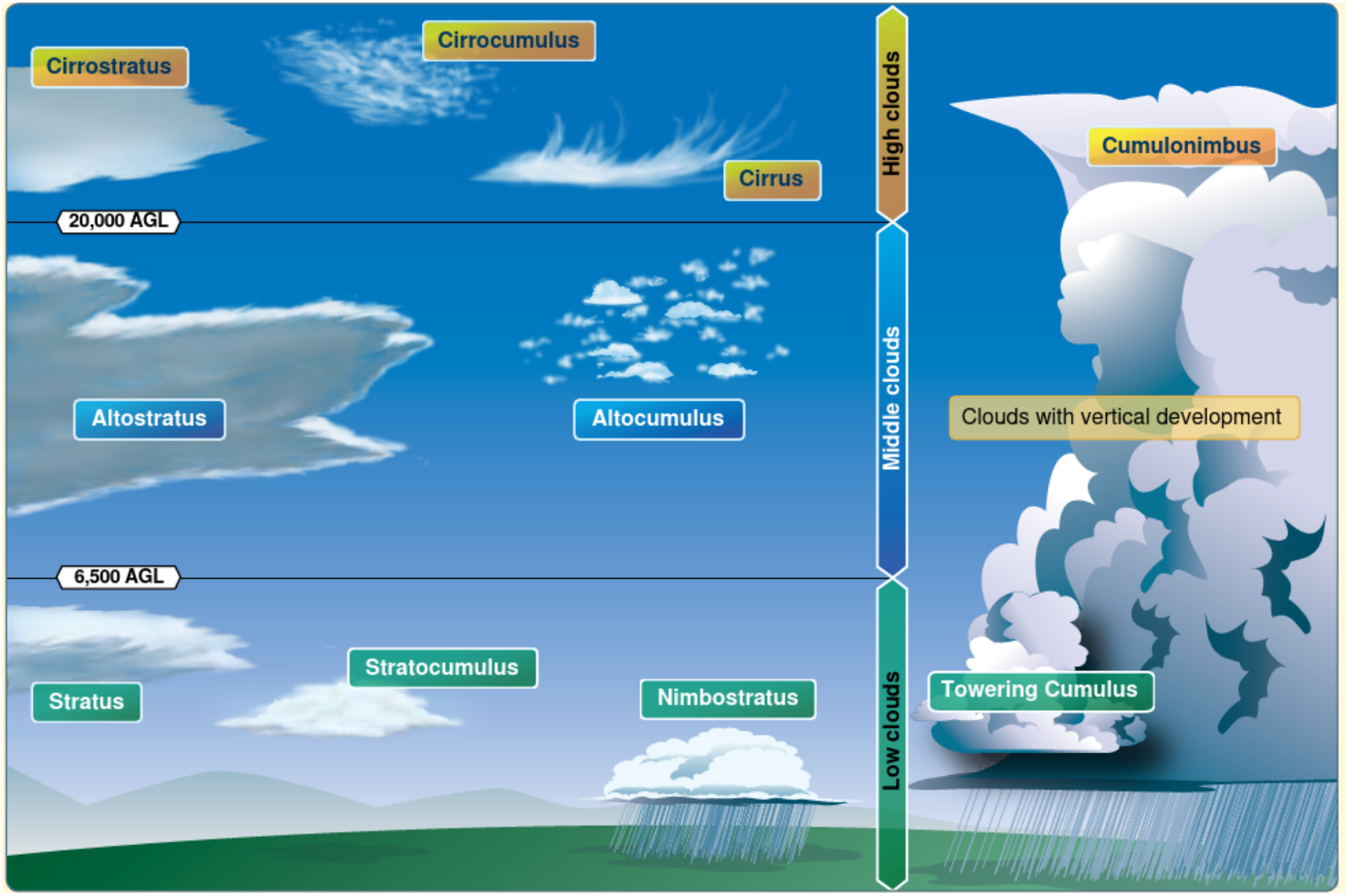
The dry adiabatic lapse rate is 3°C per $1,000$ feet.

The moist adiabatic lapse rate is...complicated. Lets use 1.5°C per $1,000$ feet as a good guess.

If the surrounding air has a lapse rate of at most 2°C per $1,000$ feet, the airmass is considered stable. Why?

If the surrounding air has a lapse rate of more than 2°C per $1,000$ feet, the airmass is considered unstable. Why?

Clouds


Cirrostratus
Cirrocumulus
Cirrus
High clouds
20,000 AGL
Cumulonimbus
Altostratus
Altocumulus
Middle clouds
Clouds with vertical development
6,500 AGL
Stratocumulus
Stratus
Nimbostratus
Towering Cumulus
Low clouds

Clouds

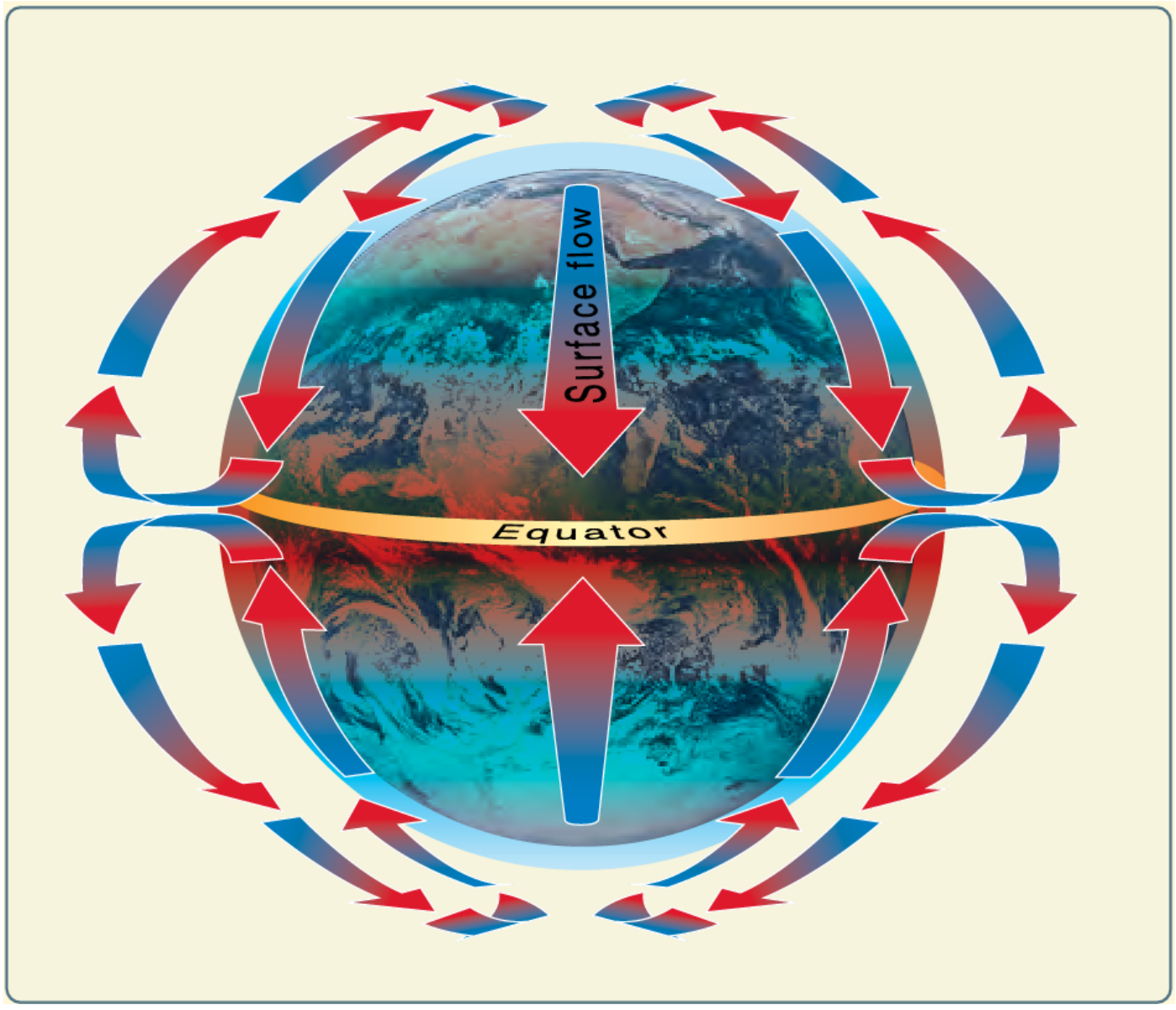
Cumulus	heaped or piled clouds
Stratus	formed in layers
Cirrus	ringlets, fibrous clouds, also high level clouds above 20,000 feet
Castellanus	common base with separate vertical development, castle-like
Lenticularus	lens-shaped, formed over mountains in strong winds
Nimbus	rain-bearing clouds
Fracto	ragged or broken
Alto	middle level clouds existing at 5,000 to 20,000 feet

Lenticularus

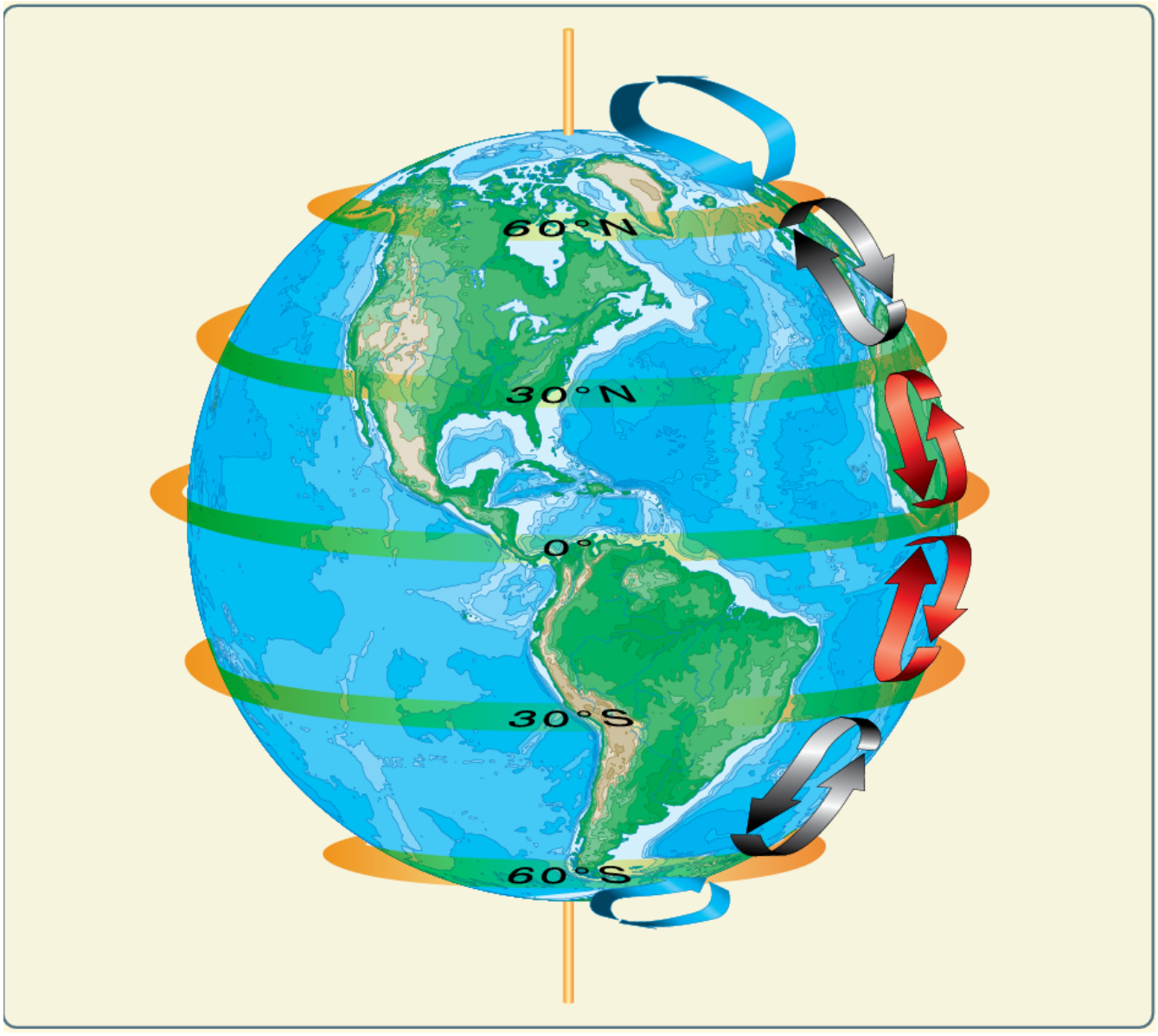
Castellanus

Photo by GerritR.

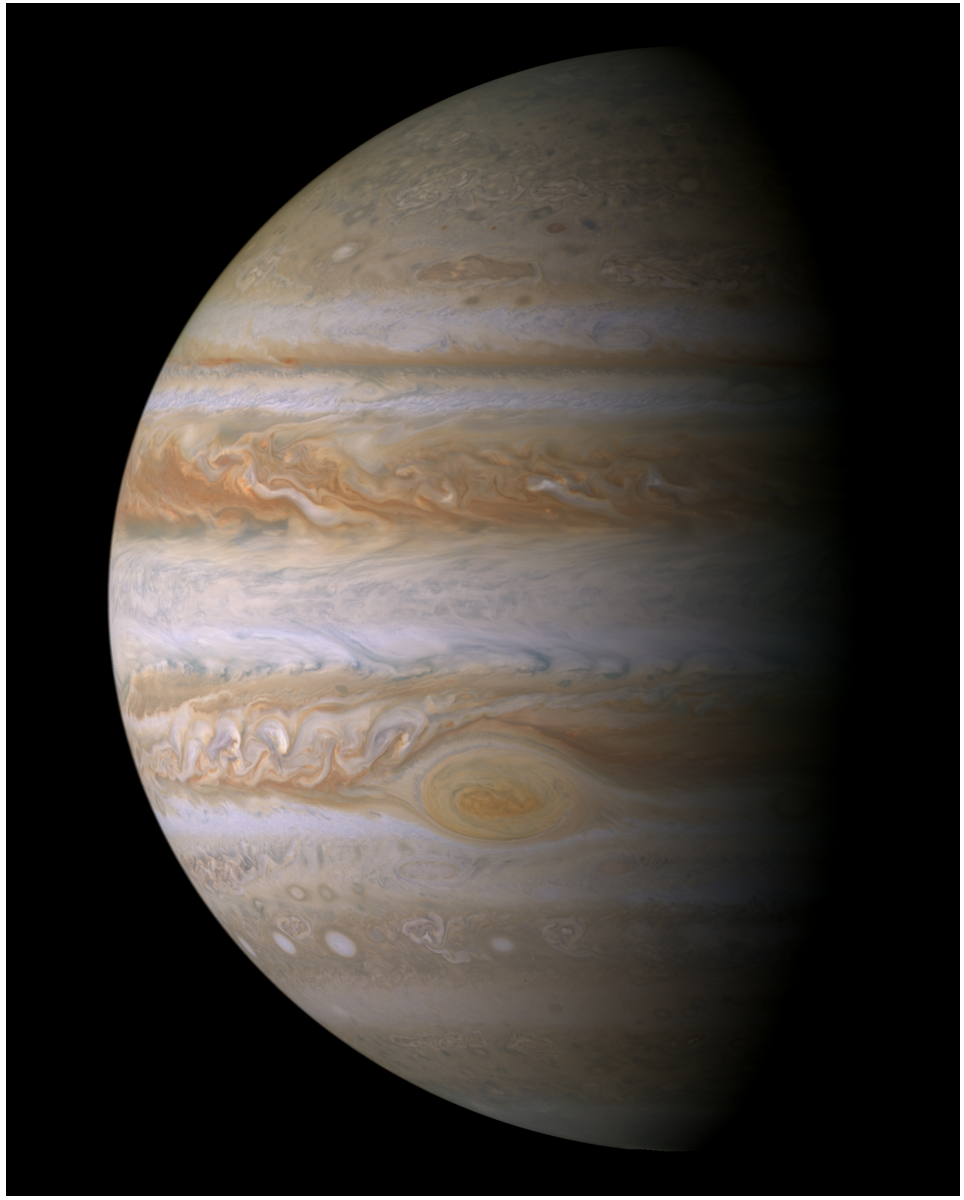
Circulation Patterns



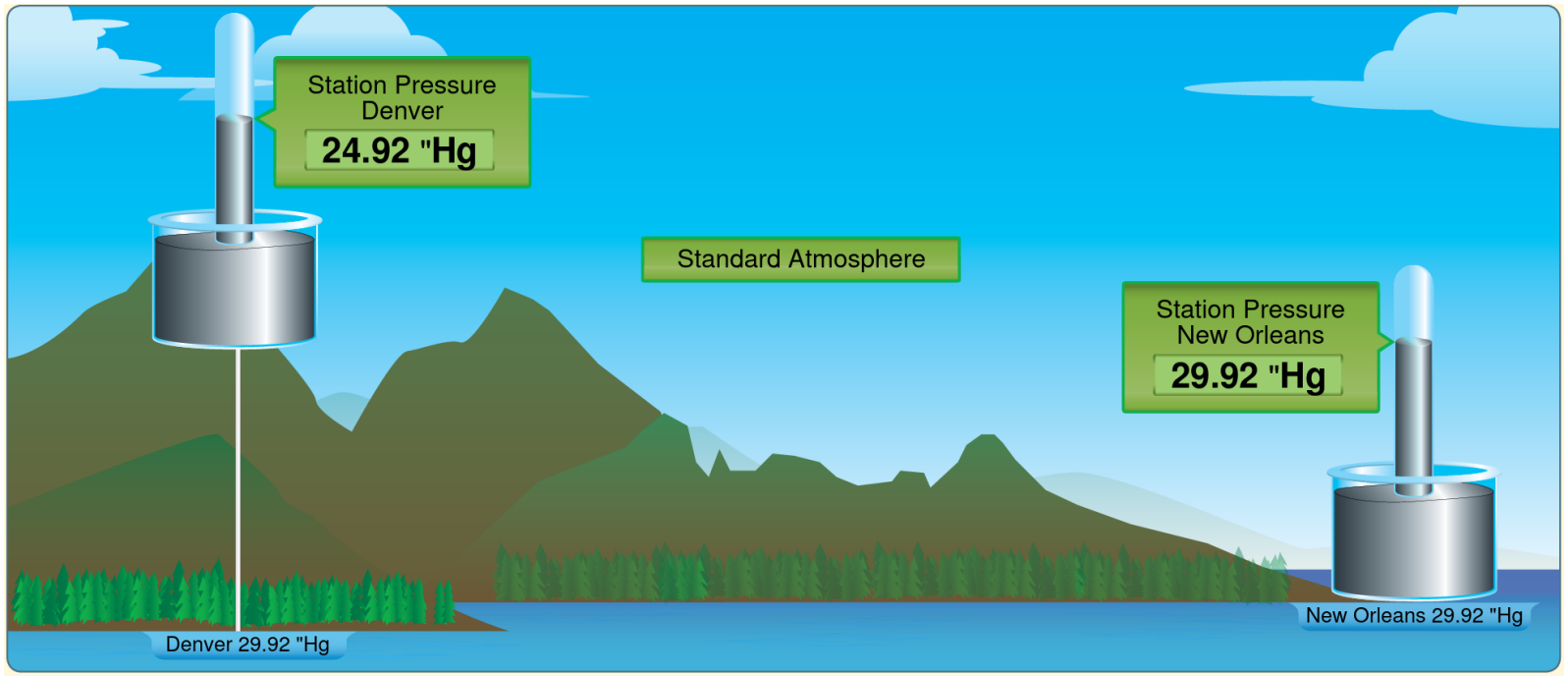
Circulation Patterns



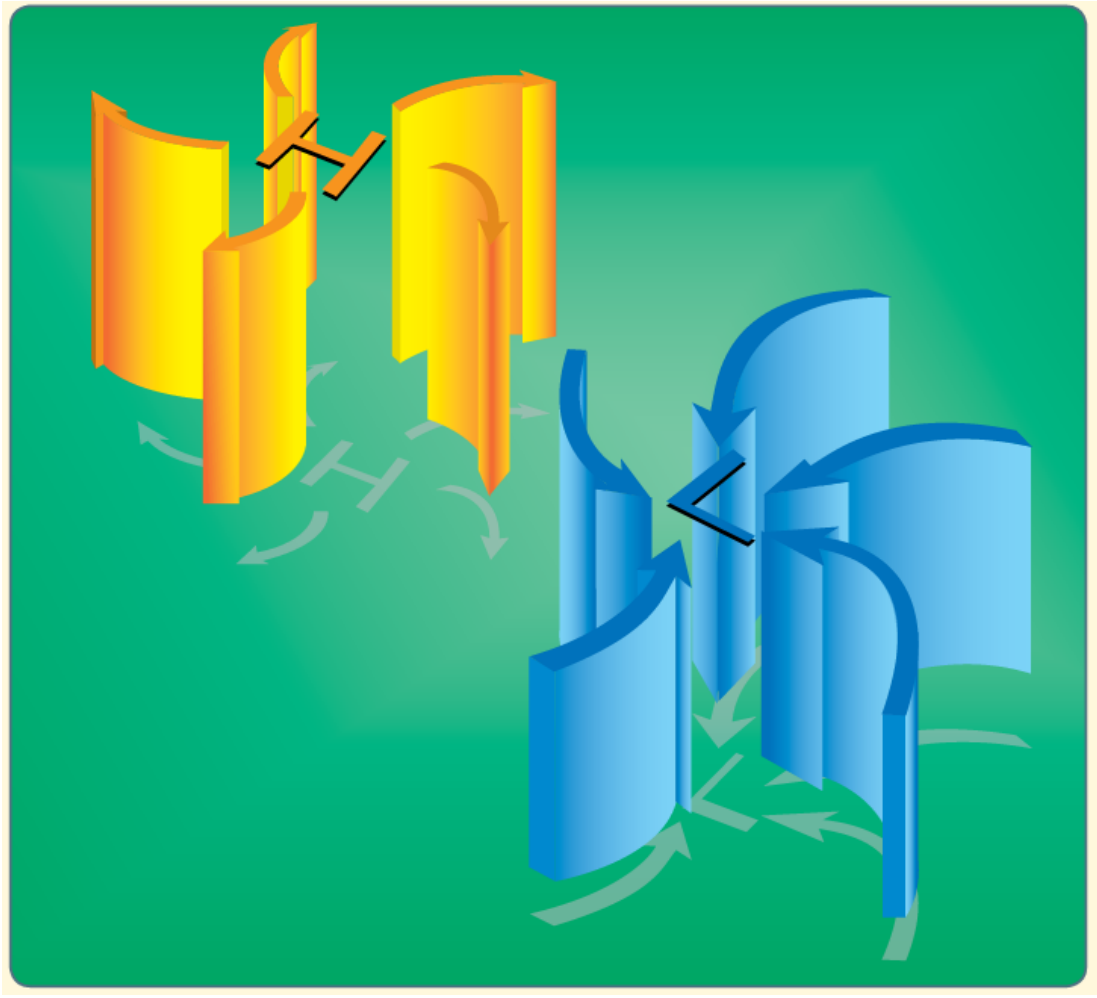
Circulation Patterns



Pressure


Station Pressure
Denver
24.92 "Hg
Standard Atmosphere
Station Pressure
New Orleans
29.92 "Hg
Denver 29.92 "Hg
New Orleans 29.92 "Hg

Circulation Patterns



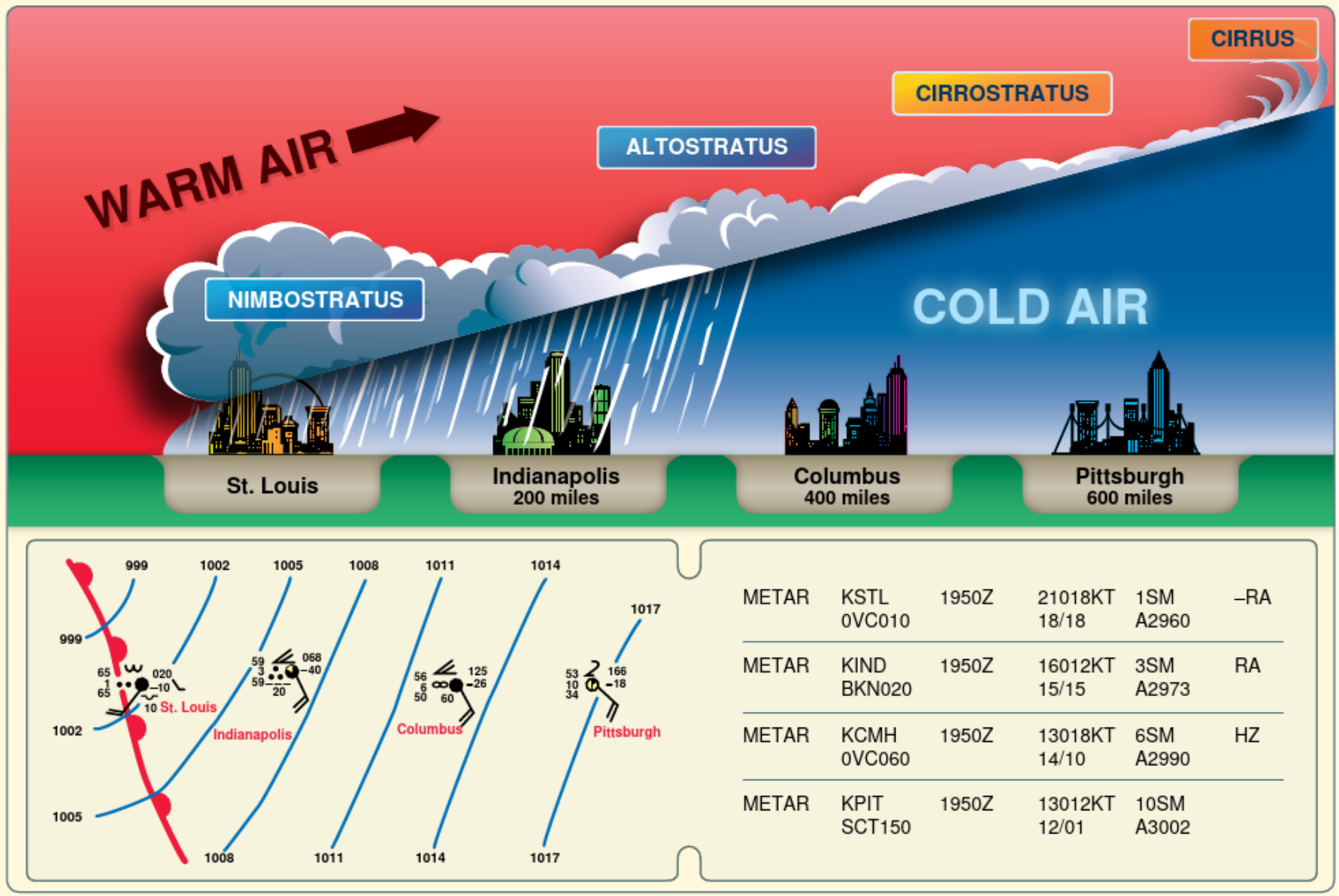
https://www.youtube.com/watch?v=pWc9SfwnSxM

https://ventusky.com/

Fronts

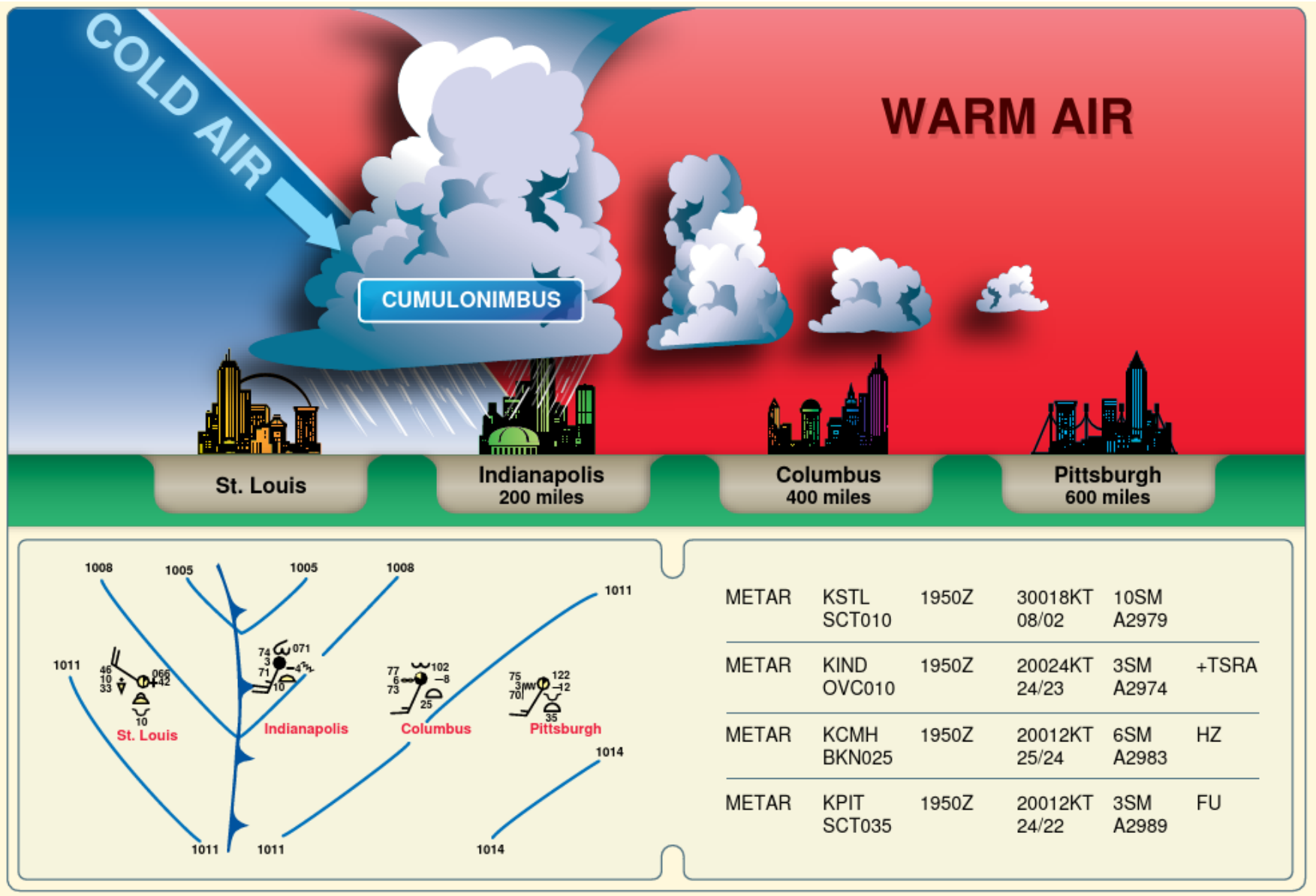
https://aviationweather.gov/gfa/#obs

Warm Front

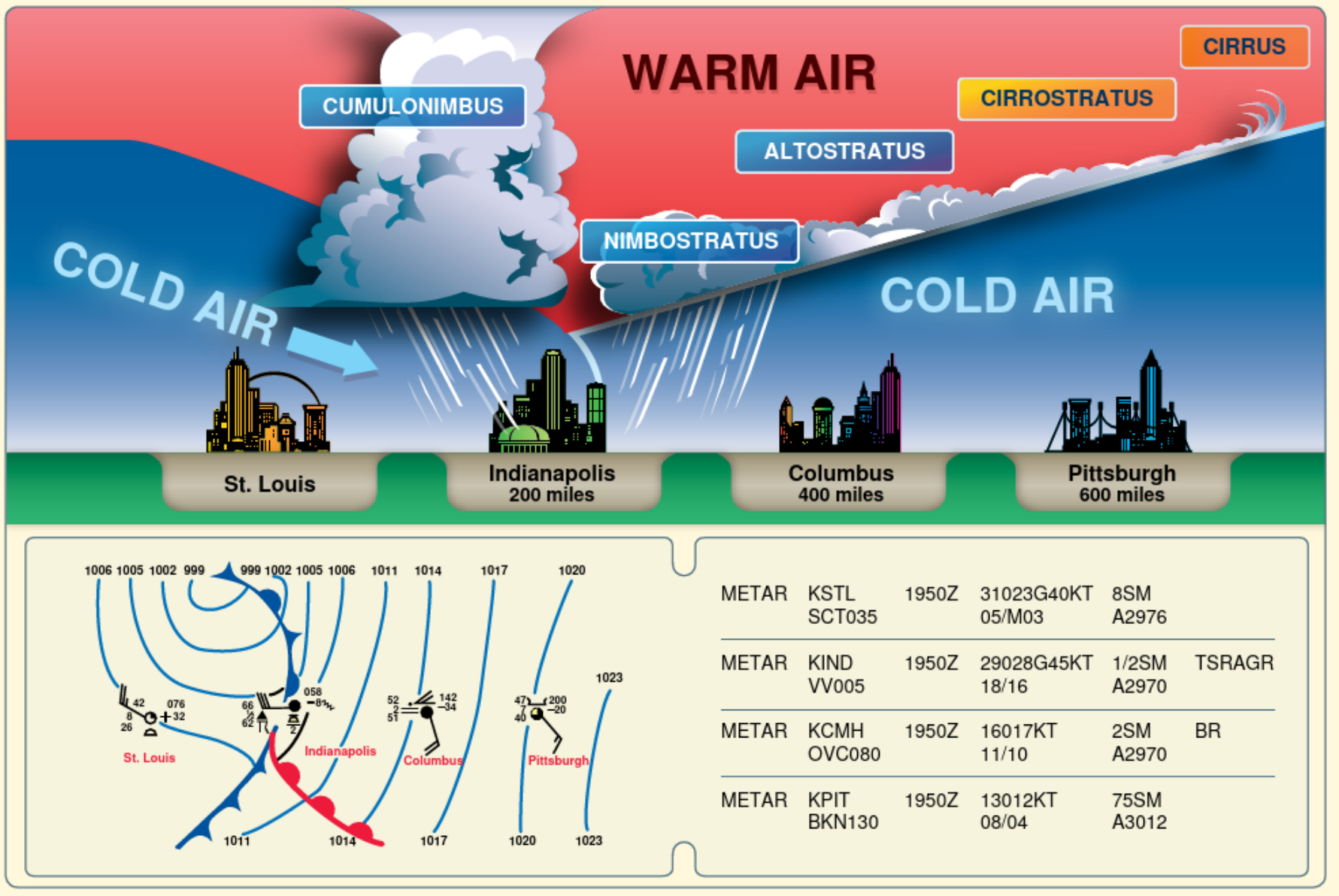


METAR	KSTL 0VC010	1950Z	21018KT 18/18	1SM A2960	–RA
METAR	KIND BKN020	1950Z	16012KT 15/15	3SM A2973	RA
METAR	KCMH 0VC060	1950Z	13018KT 14/10	6SM A2990	HZ
METAR	KPIT SCT150	1950Z	13012KT 12/01	10SM A3002	

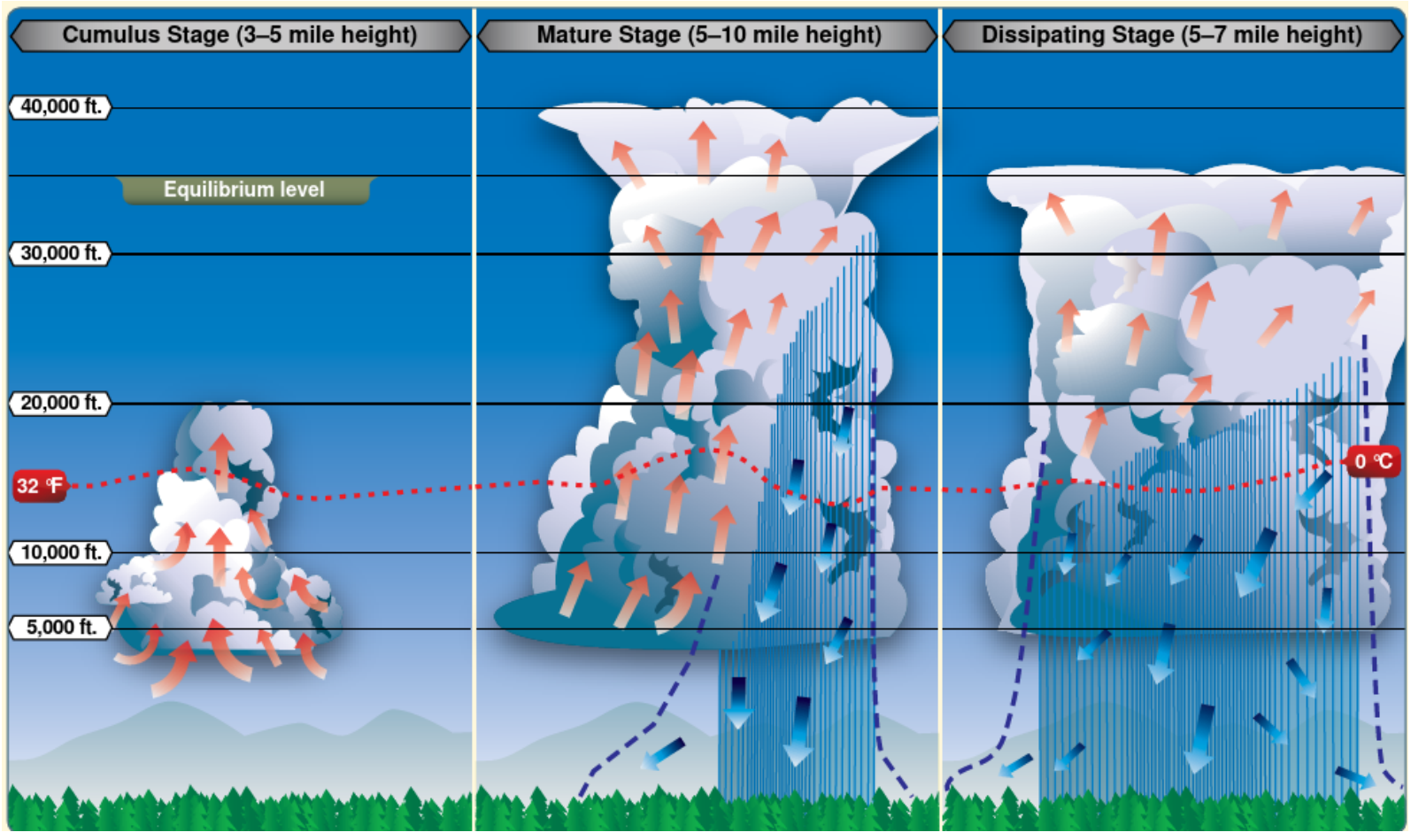
Cold Front


COLD AIR
WARM AIR
CUMULONIMBUS
St. Louis
Indianapolis
200 miles
Columbus
400 miles
Pittsburgh
600 miles
1008
1005
1005
1008
1011
1011
1011
1014
1014
St. Louis
Indianapolis
Columbus
Pittsburgh
METAR KSTL 1950Z 30018KT 10SM SCT010 08/02 A2979
METAR KIND 1950Z 20024KT 3SM +TSRA OVC010 24/23 A2974
METAR KCMH 1950Z 20012KT 6SM HZ BKN025 25/24 A2983
METAR KPIT 1950Z 20012KT 3SM FU SCT035 24/22 A2989

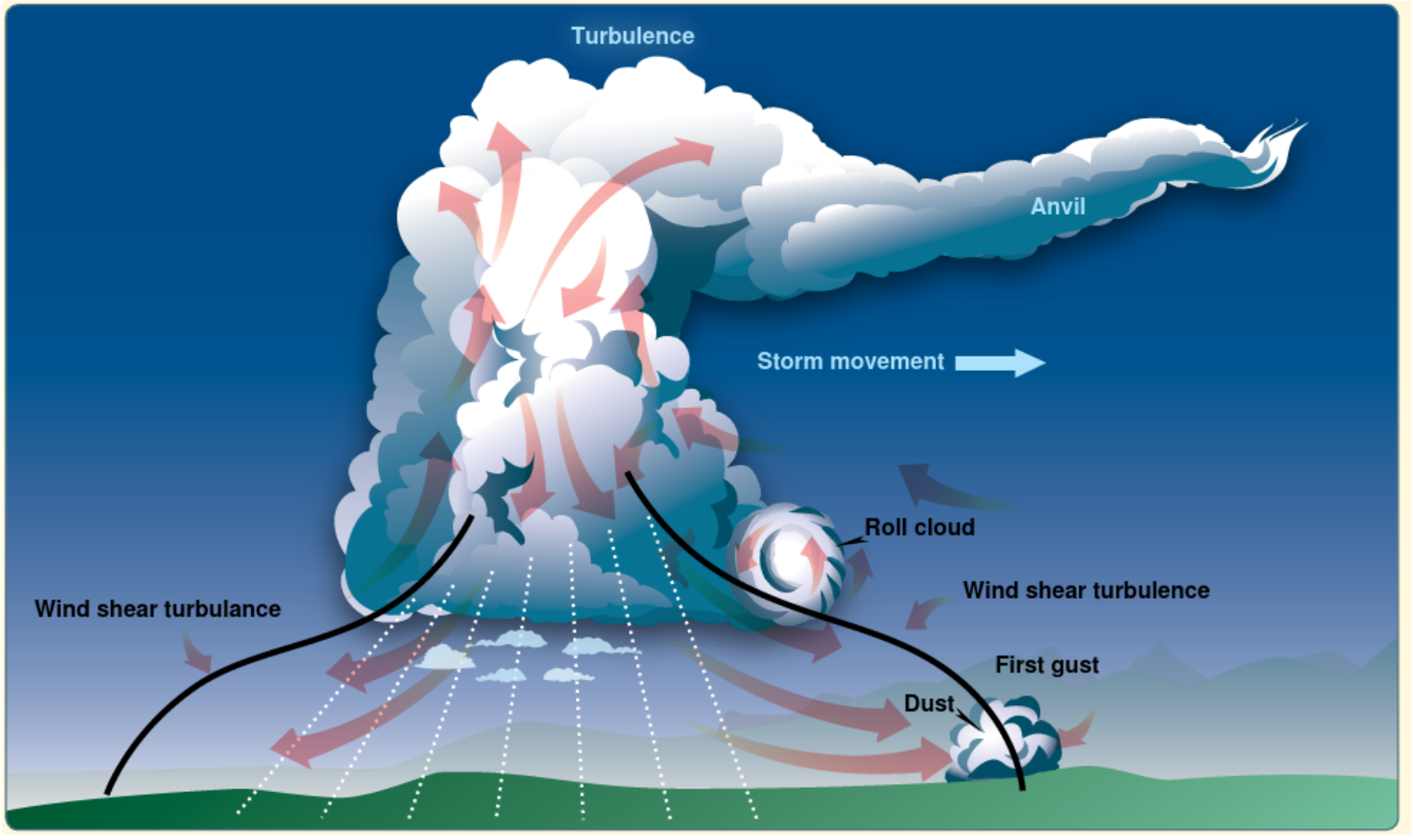
Occluded Front



Thunder Storms



Thunder Storms



Thunder Storms

Lightning Can puncture aircraft skin, destroy electrical equipment, but serious accidents are unlikely.

Hail Ice sometimes larger than 1" in diameter can cause sever structural damage.

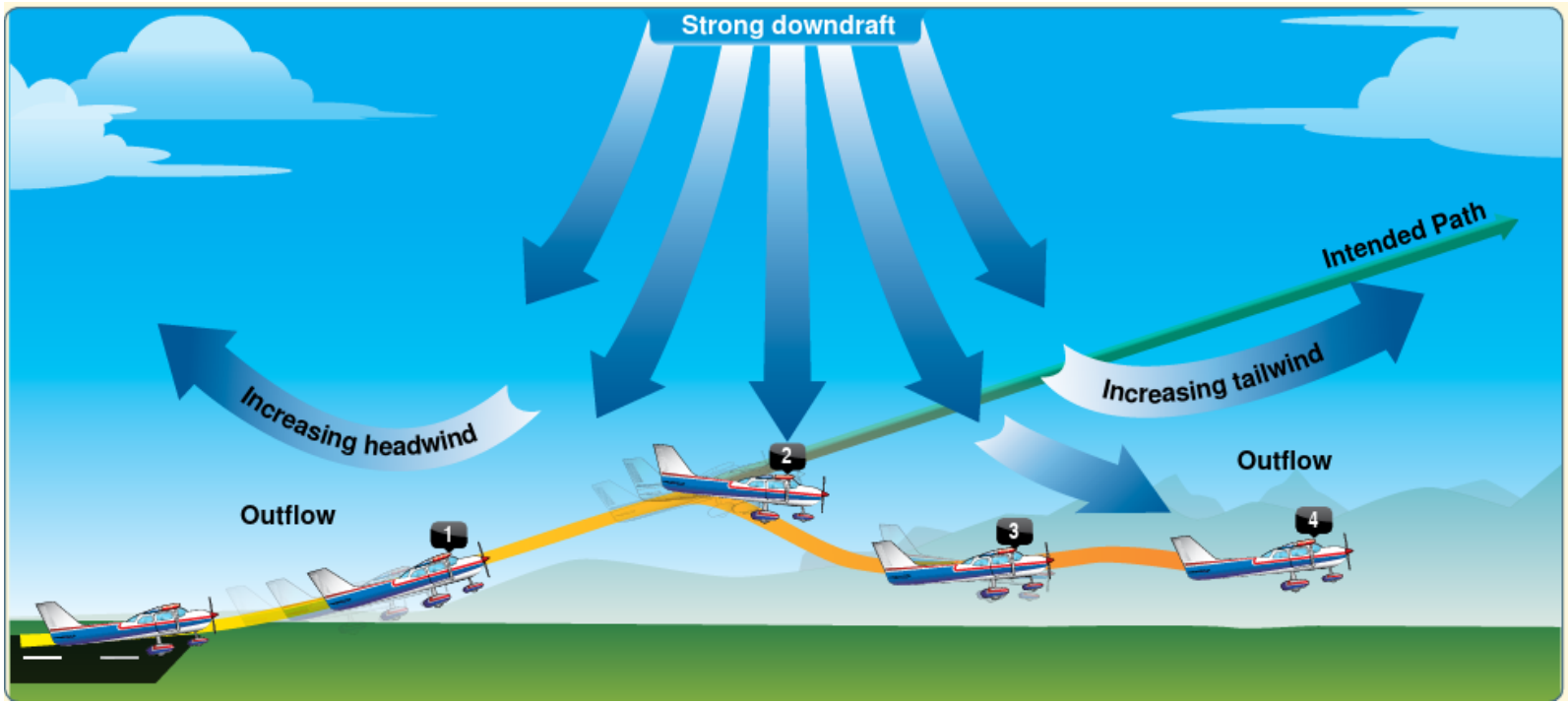
Turbulence Uncontrollable changes in altitude and altitude. Can exceed V_A due to gusts.

Icing Supercooled water freezes instantly on the airframe cause disruption of airflow and increased weight.

Microbursts Sudden, localized downdrafts exceeding climb performance of even airliners.

Altimeter Pressure differences can be quick (15 minutes) and profound (more than 100 feet of altitude changes).

Microburst


Strong downdraft
Intended Path
Increasing headwind
Increasing tailwind
Outflow
Outflow
1
2
3
4

Cold Weather and Icing

- Ice accumulation.
- Performance changes.
- Altimeter inaccuracies.

1) The conditions necessary for the formation of cumulonimbus clouds are a lifting action and

A unstable air containing an excess of condensation nuclei.

B unstable, moist air.

C either stable or unstable air.

2) The wind at $5,000$ feet AGL is soth-westerly while the surface wind is southerly. This difference in direction is primarily due to

A stronger pressure gradient at higher altitudes.

B friction between the wind and the surface.

C stringer Coriolis force t the surface.

3) Clouds, fog, or dew will always form when

A water vapor condenses.

B water vapor is present.

C relative humidity reaches 100 percent.

4) Steady precipitation preceding a front is an indication of

A stratiform clouds with moderate turbulence.

B cumuliform clouds with little or nor turbulence.

C stratiform clouds with little or no turbulence.

5) How dows frost affect the lifting surface of an airplane on takeoff?

A Frost may prevent the airplane from becoming airborne at normal takeoff speed.

B Frost will change the camber of the wing, increasing lift during takeoff.

C Frost may cause the airplane to become airborne with a lower angle of attack at a lower indicated airspeed.

6) What types of fog depend upon wind in order to exist?

A Radiation fog and ice fog.

B Steam fog and ground fog.

C Advection fog and upslope fog.

7) What conditions are necessary for the formation of thunderstorms?

A High humidity, lifting force, and unstable conditions.

B High humidity, high temperature, and cumulus clouds.

C Lifting force, moist air, and extensive cloud cover.

8) If there is thunderstorm activity in the vicinity of an airport at which you plan to land, which hazardous atmospheric phenomenon might be expected on the landing approach?

A Precipitation static.

B Wind-sheer turbulence.

C Steady rain.

9) An almond or lens-shaped cloud which appears stationary, but which may contain winds of 50 knots or more, is referred to as

A an inactive frontal cloud.

B a funnel cloud.

C a lenticular cloud.

10) Every physical process of weather is accompanied by, or is the rsult of, a

A movement of air.

B pressure differential.

C heat exchange.

11) What causes variations in altimeter settings between weather reporting points?

A Unequal heating of the Earth's surface.

B Variation of terrain elevation.

C Coriolis force.

12) What are the standard pressure and temperature values for sea level?

A 15°C and 29.92" Hg.

B 59°C and 1013.2 millibars.

C 59°F and 29.92 millibars.

13) Upon encountering sever turbulence, which flight condition should the pilot attempt to maintain?

A Constant altitude and airspeed.

B Constant angle of attack.

C Level flight attitude.

14) In which situation is advection fog most likely to form?

A A warm, moist air mass on the windward side of mountains.

B An air mass moving inland from the coast in winter.

C A light breeze blowing colder air out to sea.