Clouds and Precipitation
Pressure and Wind

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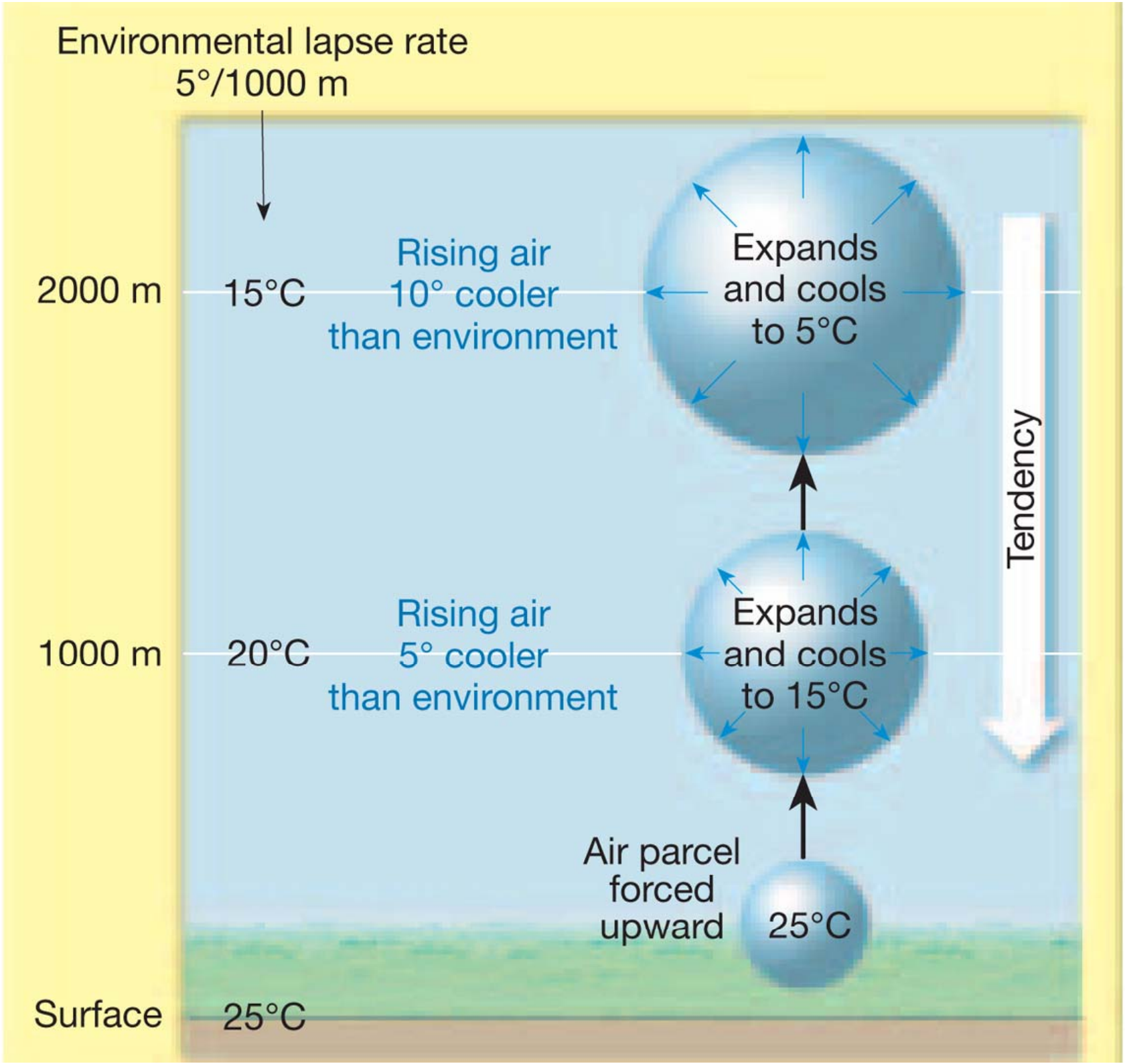
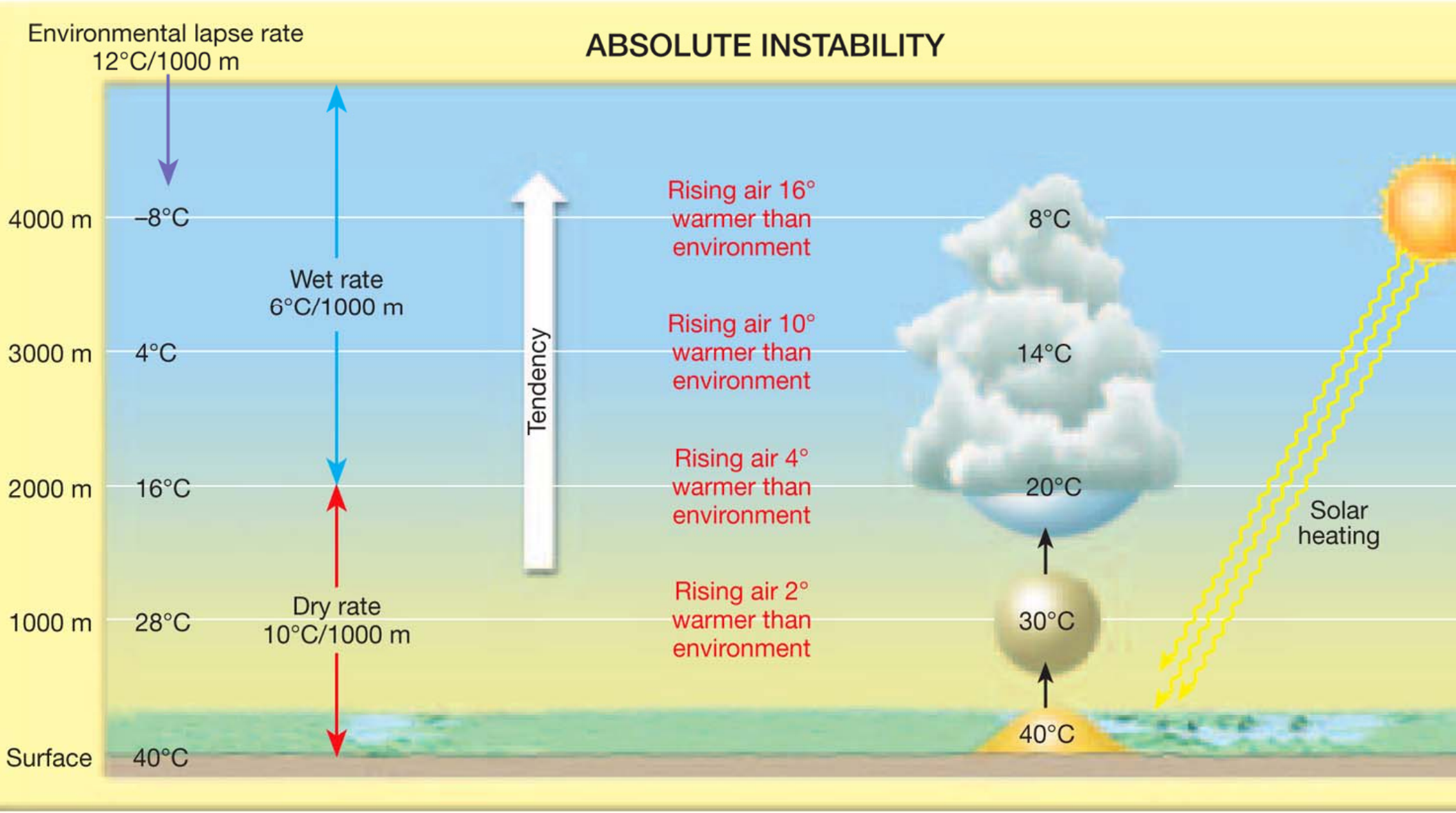
Stability of Atmosphere

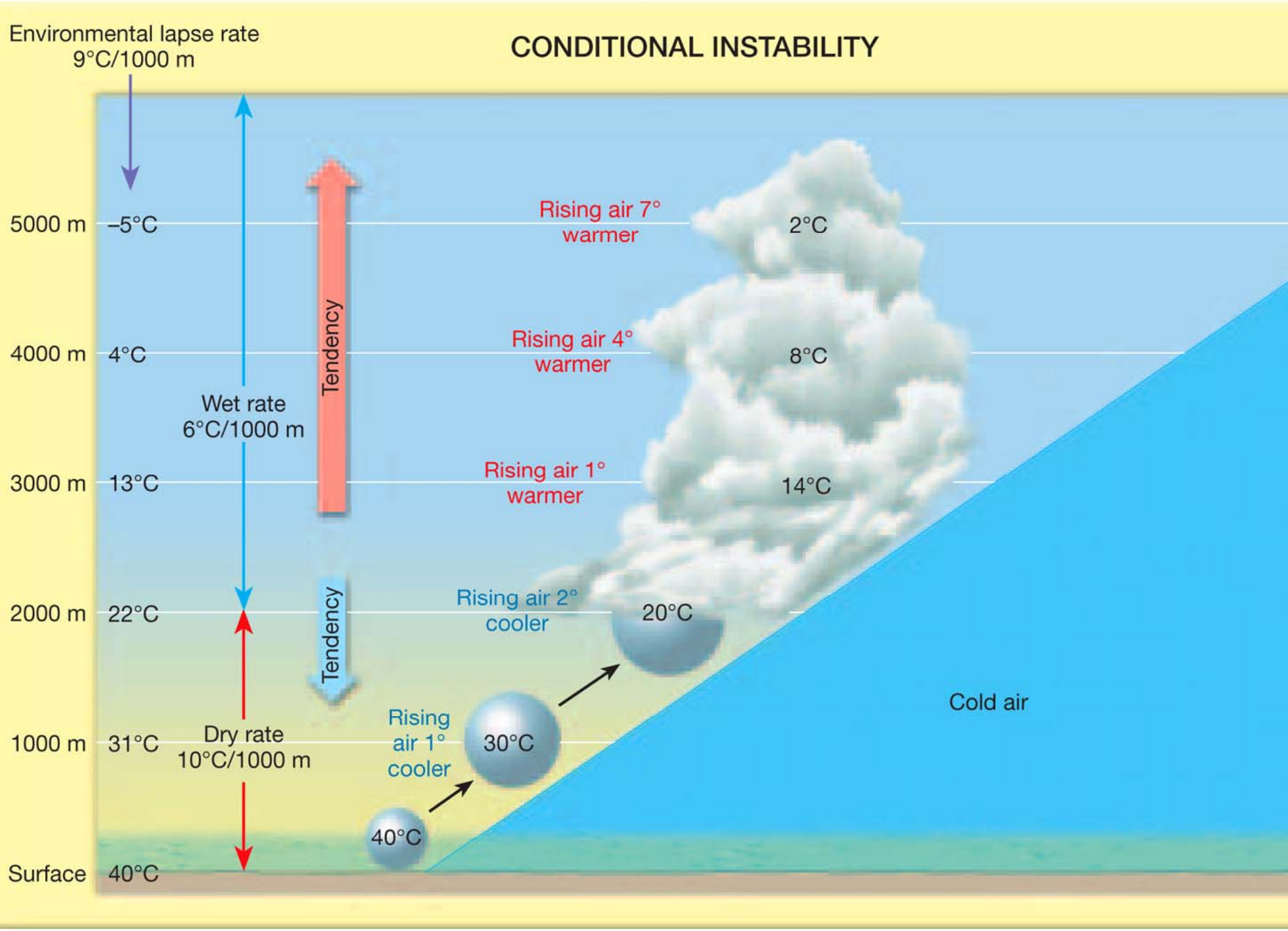
- Air rises due to a number of factors
- Expands as it rises: cools as it does so
  - Can calculate the new temperature
  - Use the adiabatic lapse rate:
    - Dry for unsaturated
    - Wet for saturated
  - Compare the temperature of the air that has risen to the temperature of the air at that height
  - Use the environmental lapse rate
    - Higher density air that has risen is stable (cooler)
    - Lower density air that has risen is unstable (warmer)


Environmental lapse rate
5°/1000 m
2000 m
15°C
Rising air
10° cooler
than environment
Expands
and cools
to 5°C
Tendency
1000 m
20°C
Rising air
5° cooler
than environment
Expands
and cools
to 15°C
Air parcel
forced
upward
25°C
Surface
25°C

Stability

- Environmental lapse rate
  - 5°C/1000 m
- Dry adiabatic lapse rate
  - 10°C/1000 m
- Rising air is cooler than area it rises into
- Stable!!





Cloud Development

- Air cools upon rising
- Cools to dew–point temperature
- Condensation begins
- “Lifting condensation level”

Cloud Shapes

- Cirrus—curl (of hair): thin wisps
- Stratus—blanket: extensive layers
- Cumulus—pile: puffy masses

Additional modifier of name

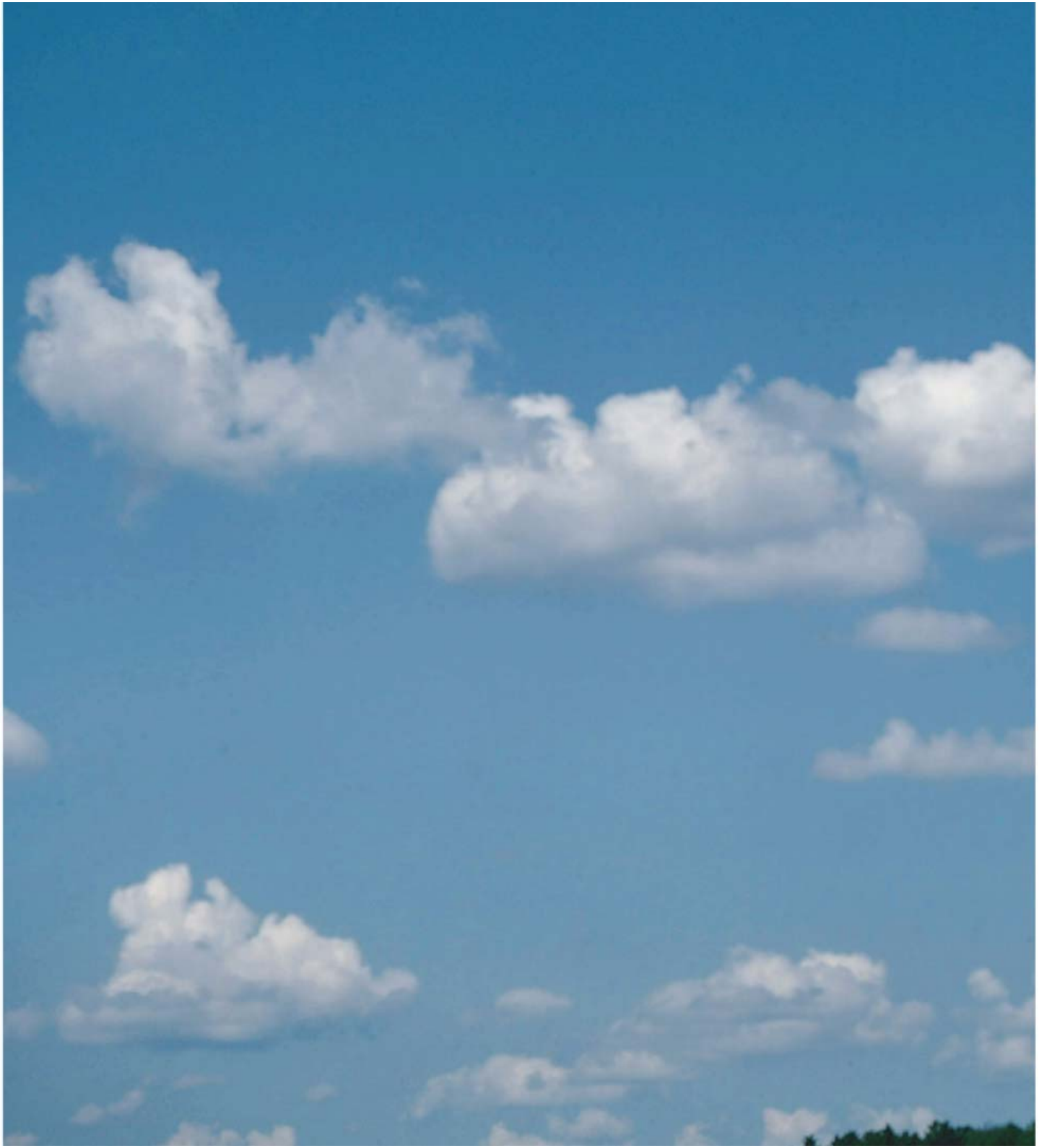
- Nimbus = rain

➢ Cumulonimbus: puffy rain clouds

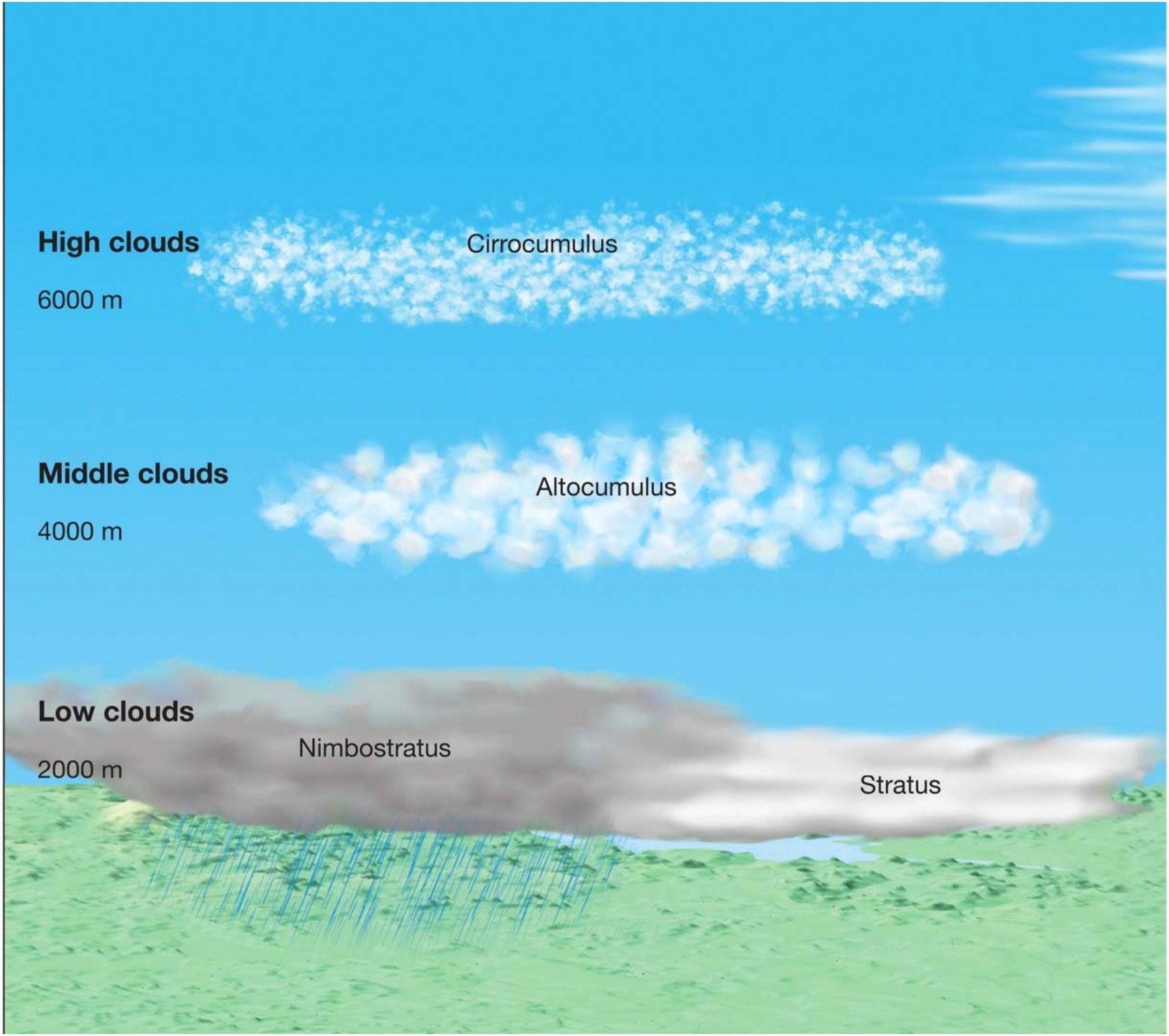
➢ Nimbostratus : layered rain clouds

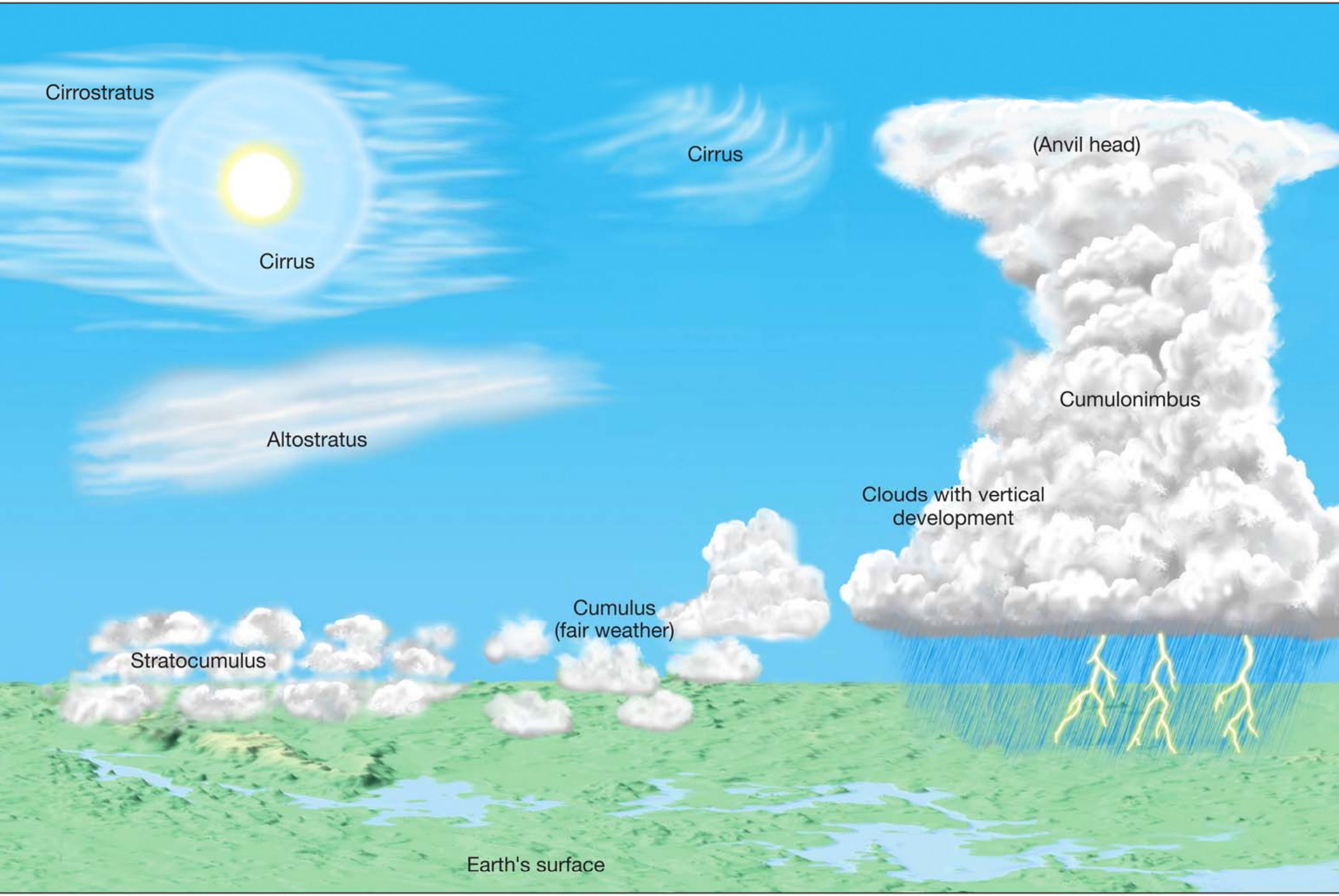
Cloud Groups

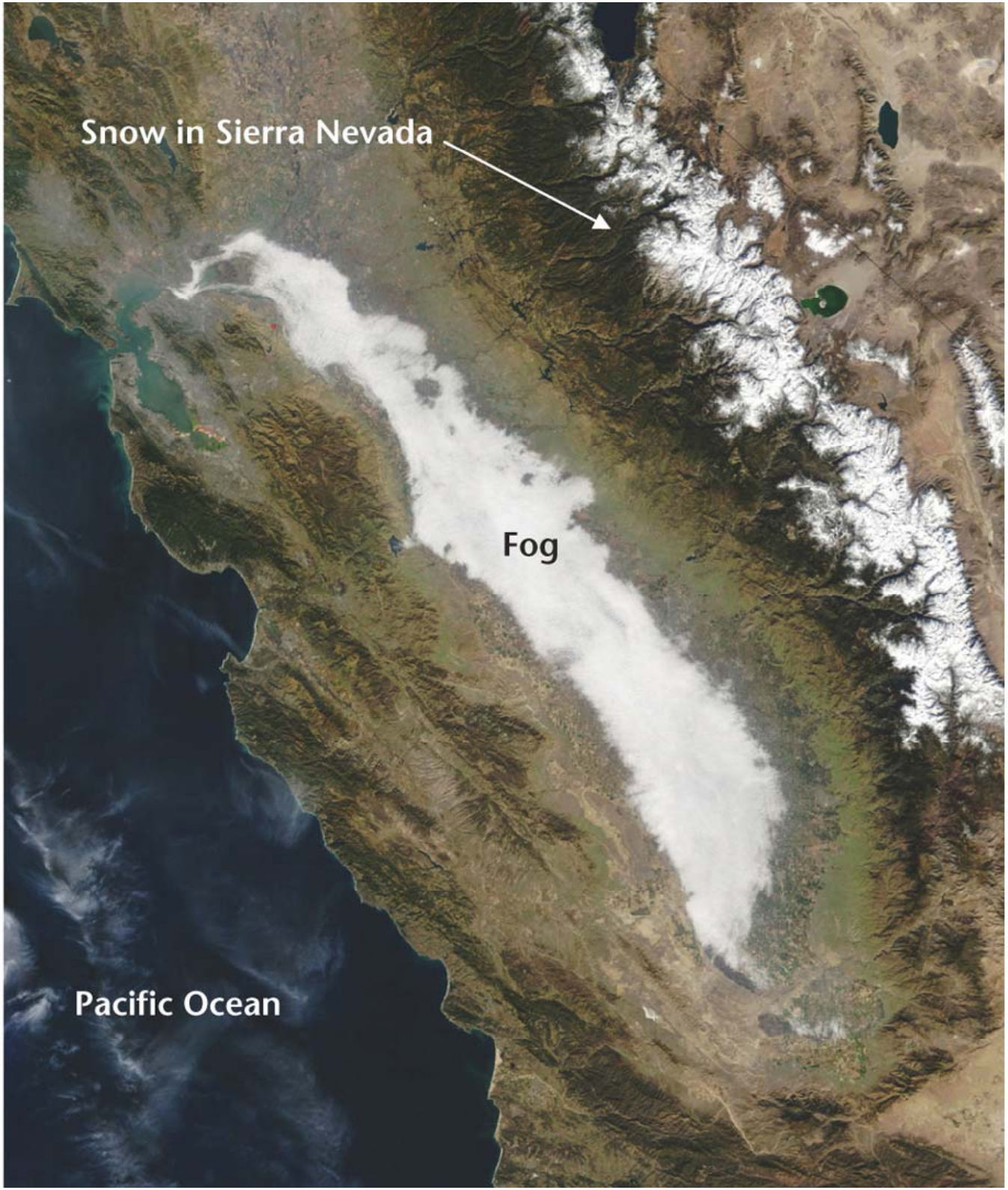
- High clouds—6000 m or more above surface
- Middle clouds—2000 m to 6000 m above
- Low clouds—less than 2000 m above surface
- Clouds of vertical development
  - Present through more than one level
  - Product of atmospheric instability



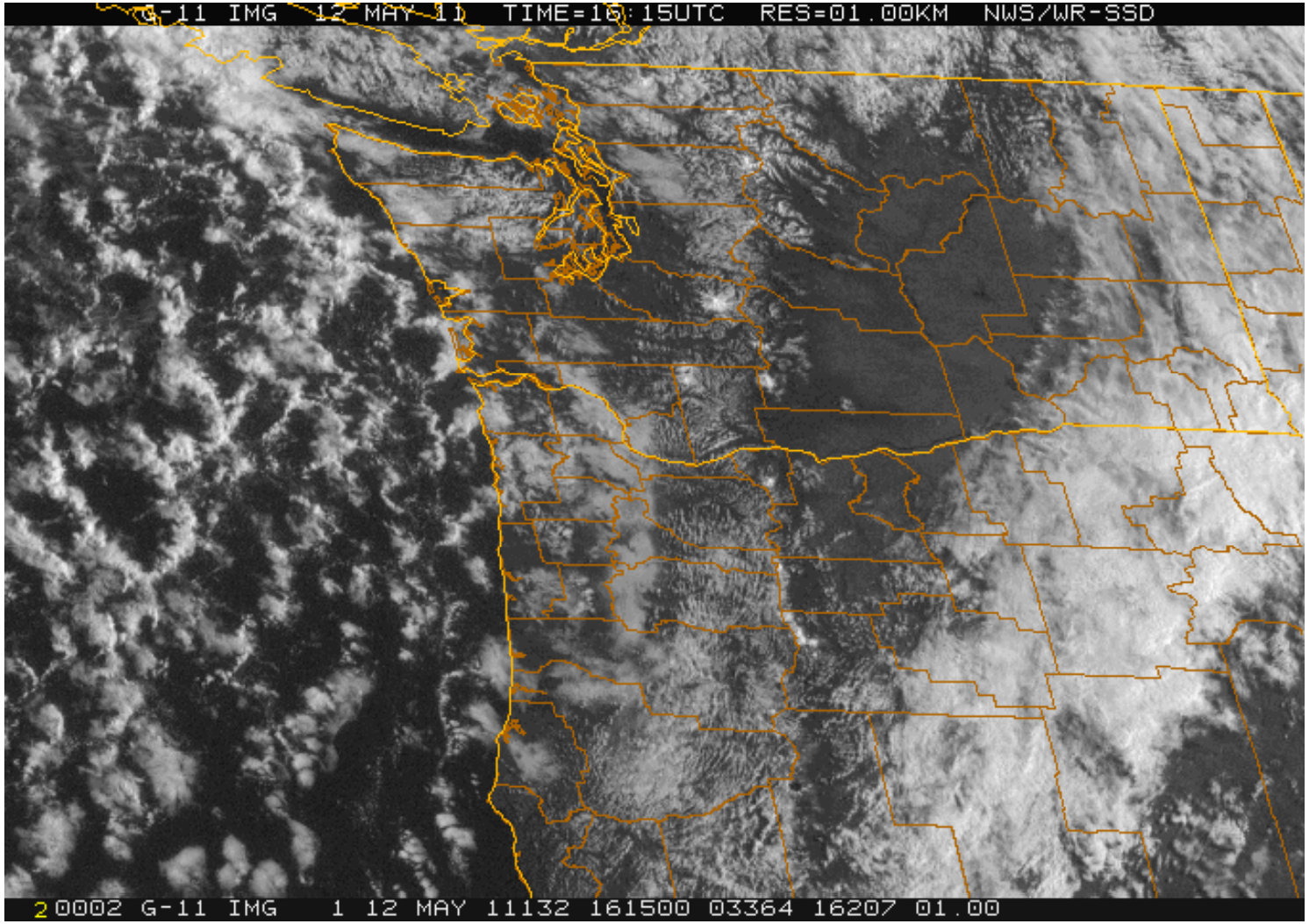
G. Cumulus

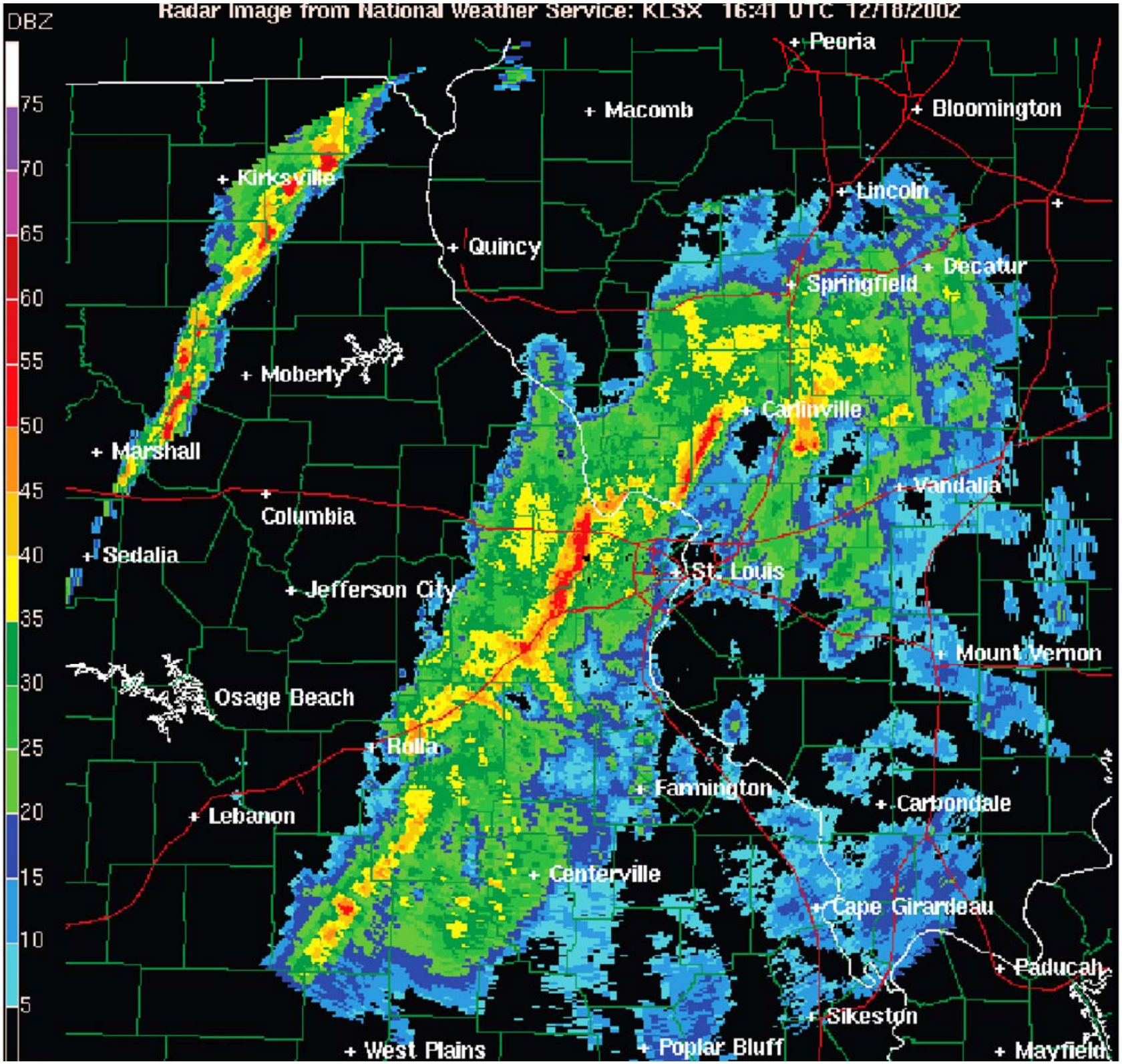

High clouds
6000 m
Cirrocumulus
Middle clouds
4000 m
Altocumulus
Low clouds
2000 m
Nimbostratus
Stratus




Snow in Sierra Nevada
Fog
Pacific Ocean

Willamette Valley Fog



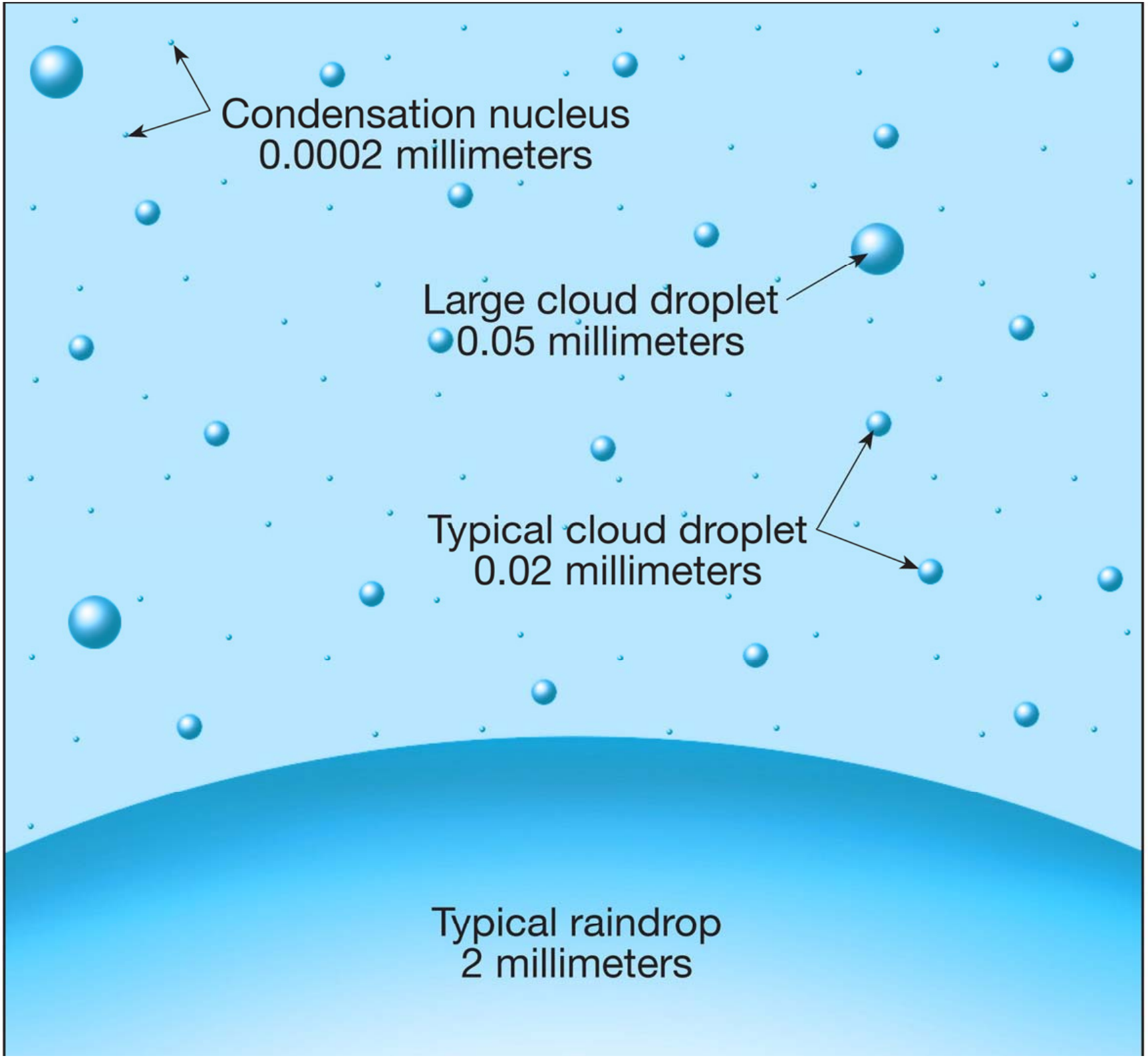

Radar Image from National Weather Service: KLSX 16:41 UTC 12/18/2002
DBZ
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
Peoria
Macomb
Bloomington
Kirksville
Lincoln
Quincy
Decatur
Springfield
Moberly
Carlinville
Marshall
Vandalia
Columbia
Sedalia
St. Louis
Jefferson City
Mount Vernon
Osage Beach
Rolla
Farmington
Carbondale
Lebanon
Centerville
Cape Girardeau
Paducah
Sikeston
West Plains
Poplar Bluff
Mayfield

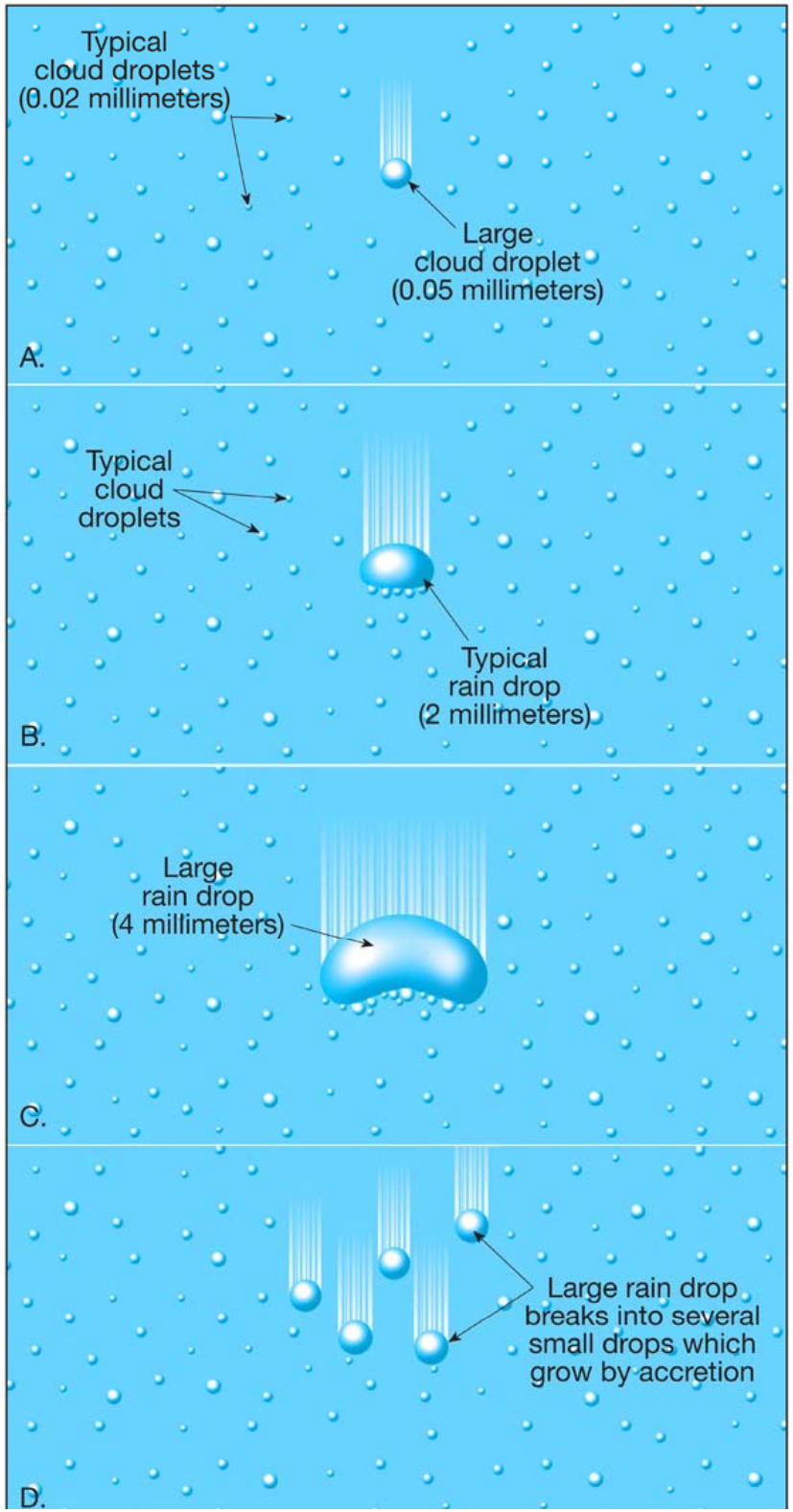
Storms of 2011

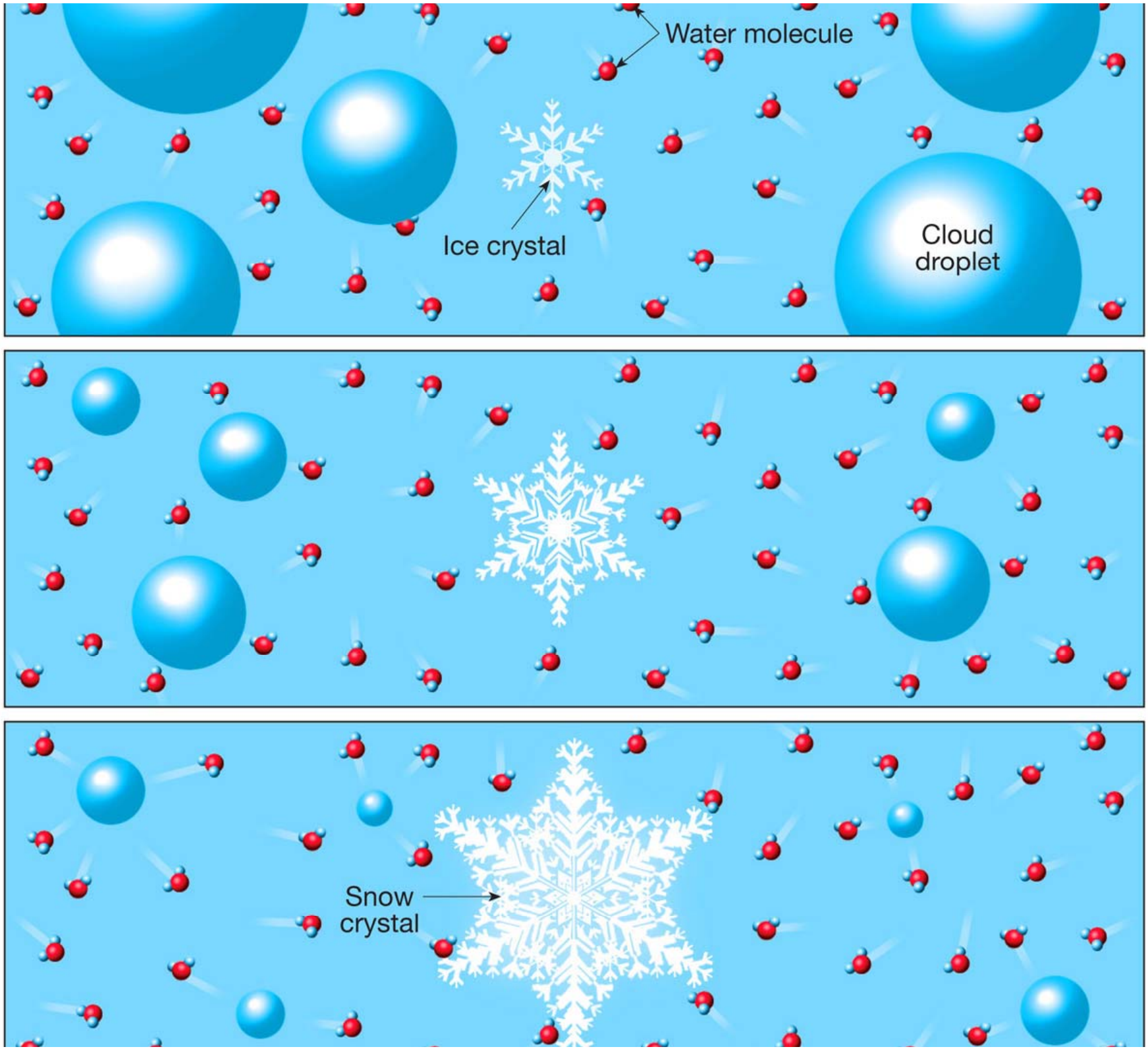
- Tornadic activity at all time high in May
- Wide swath across southeast
- http://media.nola.com/weather_impact/photo/severe-weather-27apr11-0745-utc-animatedgif-4f51095f52e087b4.gif

High rainfall led to severe flooding

- 75-year flood?
- Last happened in 1937…
- Some areas are at record levels

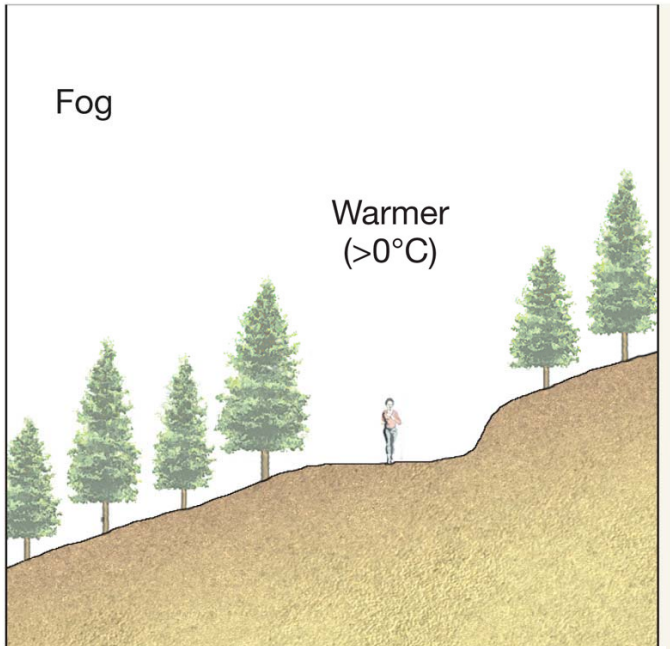

Condensation nucleus
0.0002 millimeters
Large cloud droplet
0.05 millimeters
Typical cloud droplet
0.02 millimeters
Typical raindrop
2 millimeters

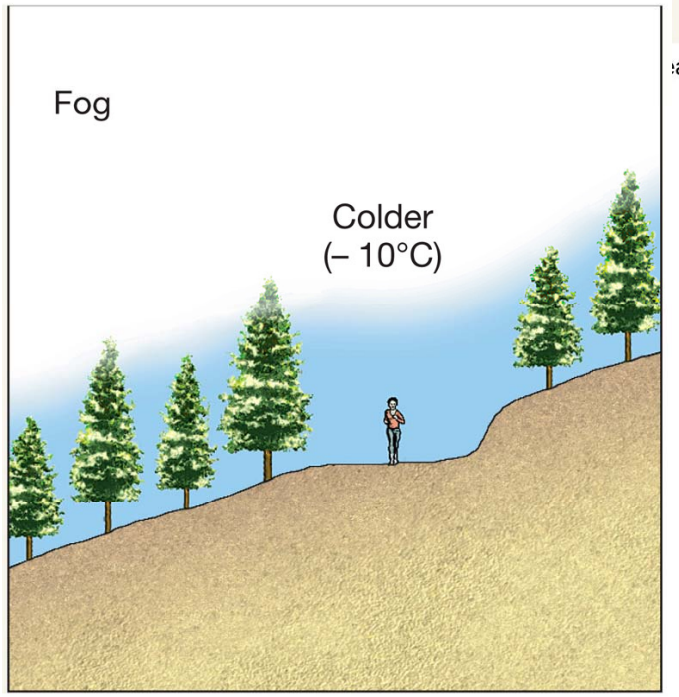

Typical
cloud droplets
(0.02 millimeters)
Large
cloud droplet
(0.05 millimeters)
A.
Typical
cloud
droplets
Typical
rain drop
(2 millimeters)
B.
Large
rain drop
(4 millimeters)
C.
Large rain drop
breaks into several
small drops which
grow by accretion
D.


Water molecule
Ice crystal
Cloud droplet
Snow crystal

Bergeron Process

- Snow falls from clouds
- Melts as it is falling
- Result is rain
- Most common method of precipitation in the mid-latitudes



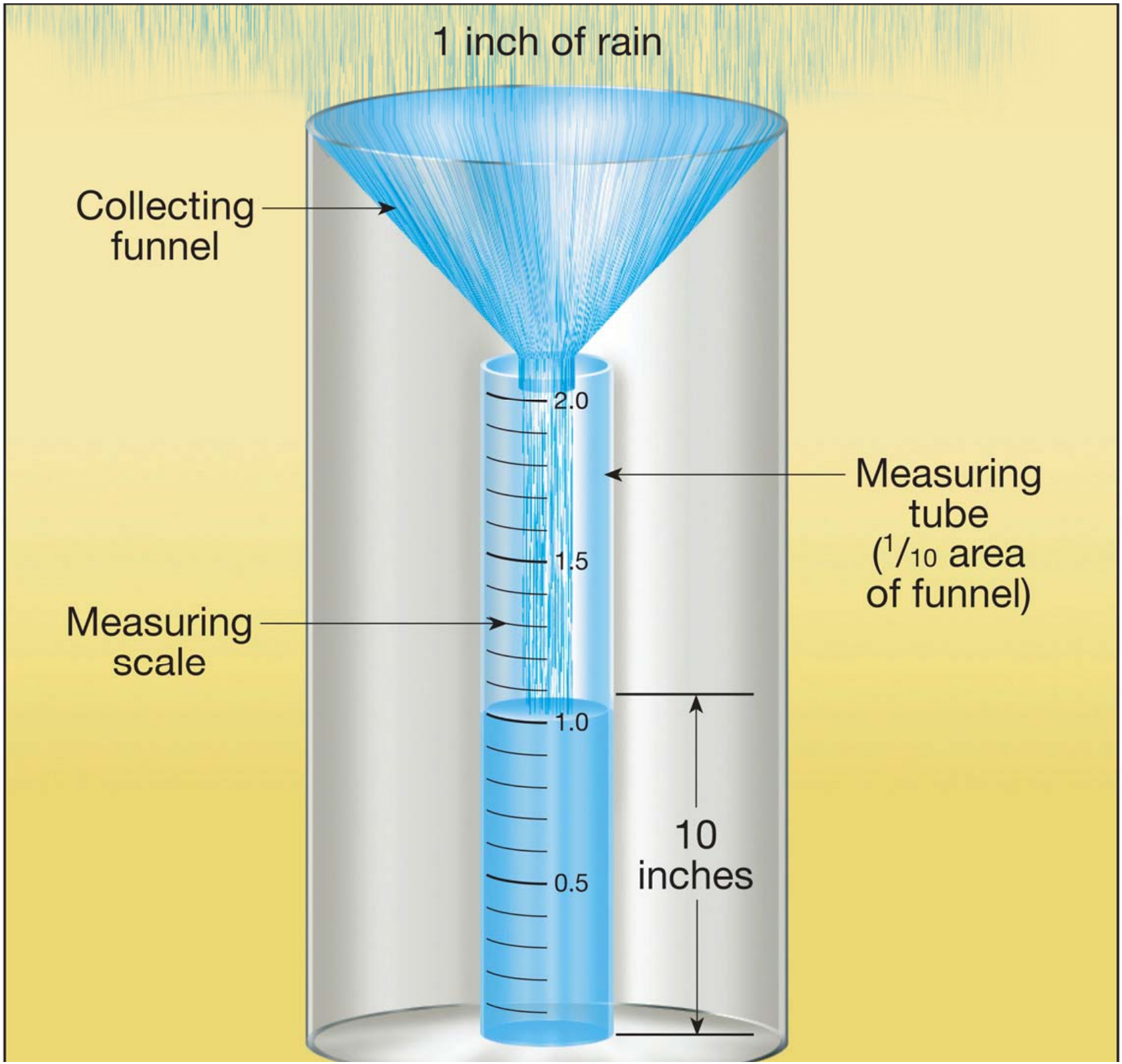


Forms of precipitation

- Mist: tiny droplets
- Drizzle: small droplet
- Rain: larger drops
- Sleet: small frozen raindrops
- Glaze: rain that freezes upon contact
- Rime: frost deposition
- Snow: solid flake-shaped crystals
- Hail: solid concentric balls
- Graupel: collected snowflakes


STOP
TRUCKS
OVER
5 TONS

http://grannysatticquilts.com/pogonip.html


1 inch of rain
Collecting funnel
Measuring tube (1/10 area of funnel)
Measuring scale
2.0
1.5
1.0
0.5
10 inches