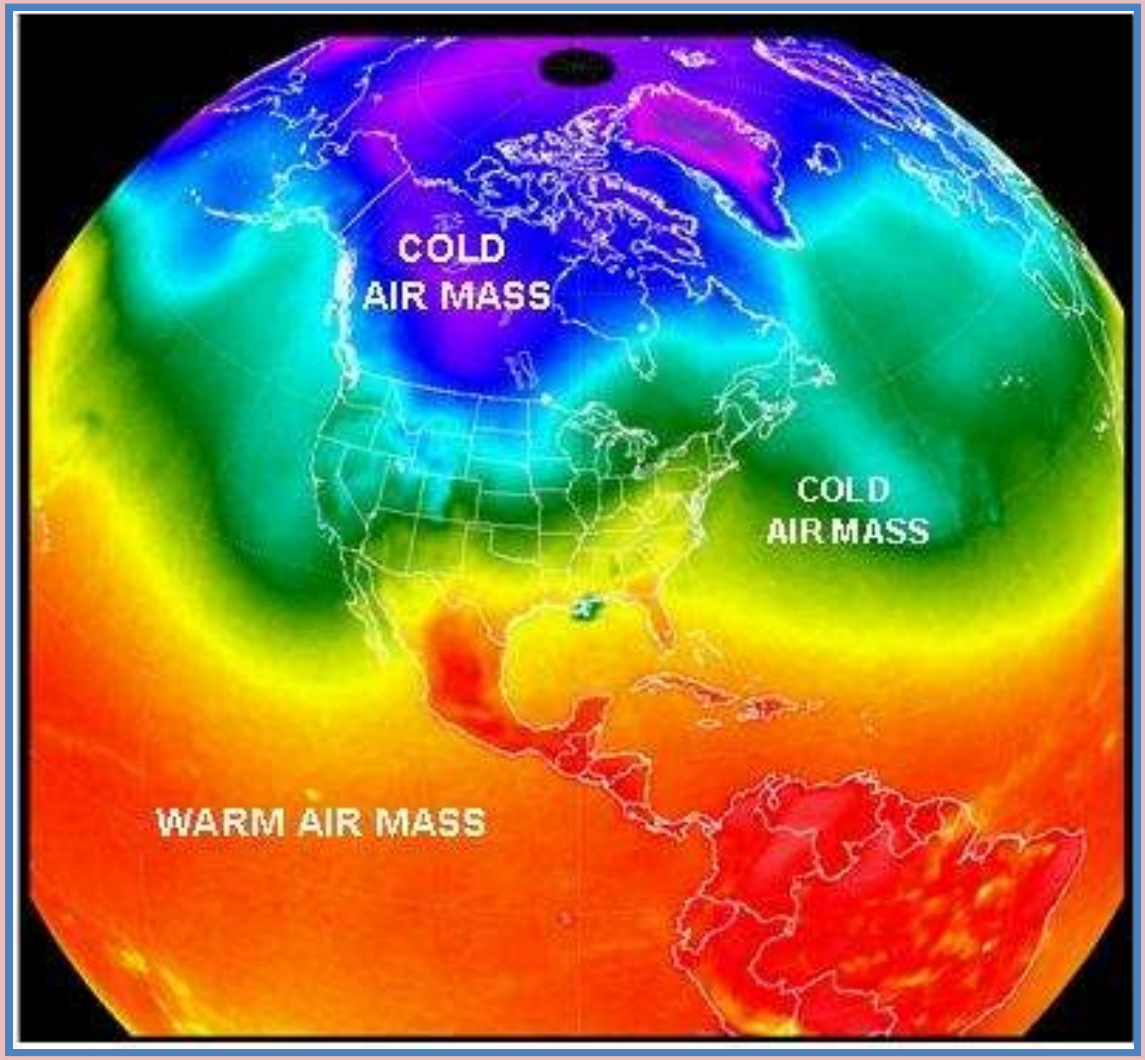
Air Masses



Definition:

- Air mass - a large dome of air which has similar horizontal temperature and moisture characteristics throughout.

- Very similar to a balloon.

Continental Arctic (cA):

- Frigid – record low temperatures
- Dry - very low dew points
- Dense - very high barometric pressure
- Usually originate north of the Arctic Circle
  - *Siberian Express*
- Usually once or twice a winter
- very rarely form during the summer
  - because the sun warms the Arctic.

Continental polar (cP):

- Cold and dry - stable
- Usually originates in NW Territory of Canada
- Influences mainly the northern USA
- Responsible for clear and pleasant weather during the summer
- Usually in winter
- Creates troughs in the polar jet stream
- Lake effect snow in Great Lakes areas

Maritime polar (mP):

- Cool and moist - unstable
- Originate over N. Atlantic and N. Pacific
- Main Influence - the Pacific Northwest and the Northeast.
- can form any time of the year
- Generally not as cold as cP air masses

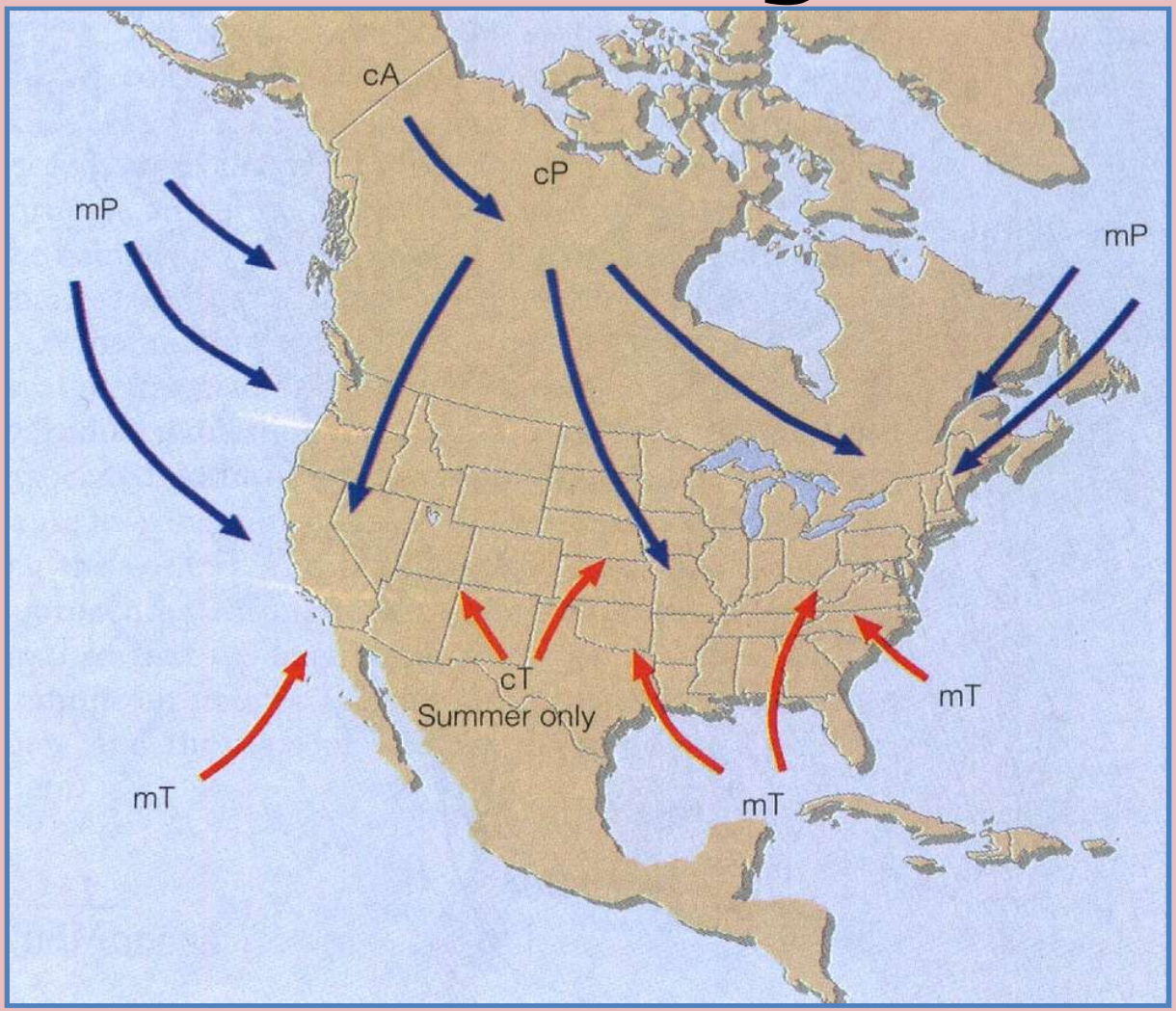
Maritime tropical (mT):

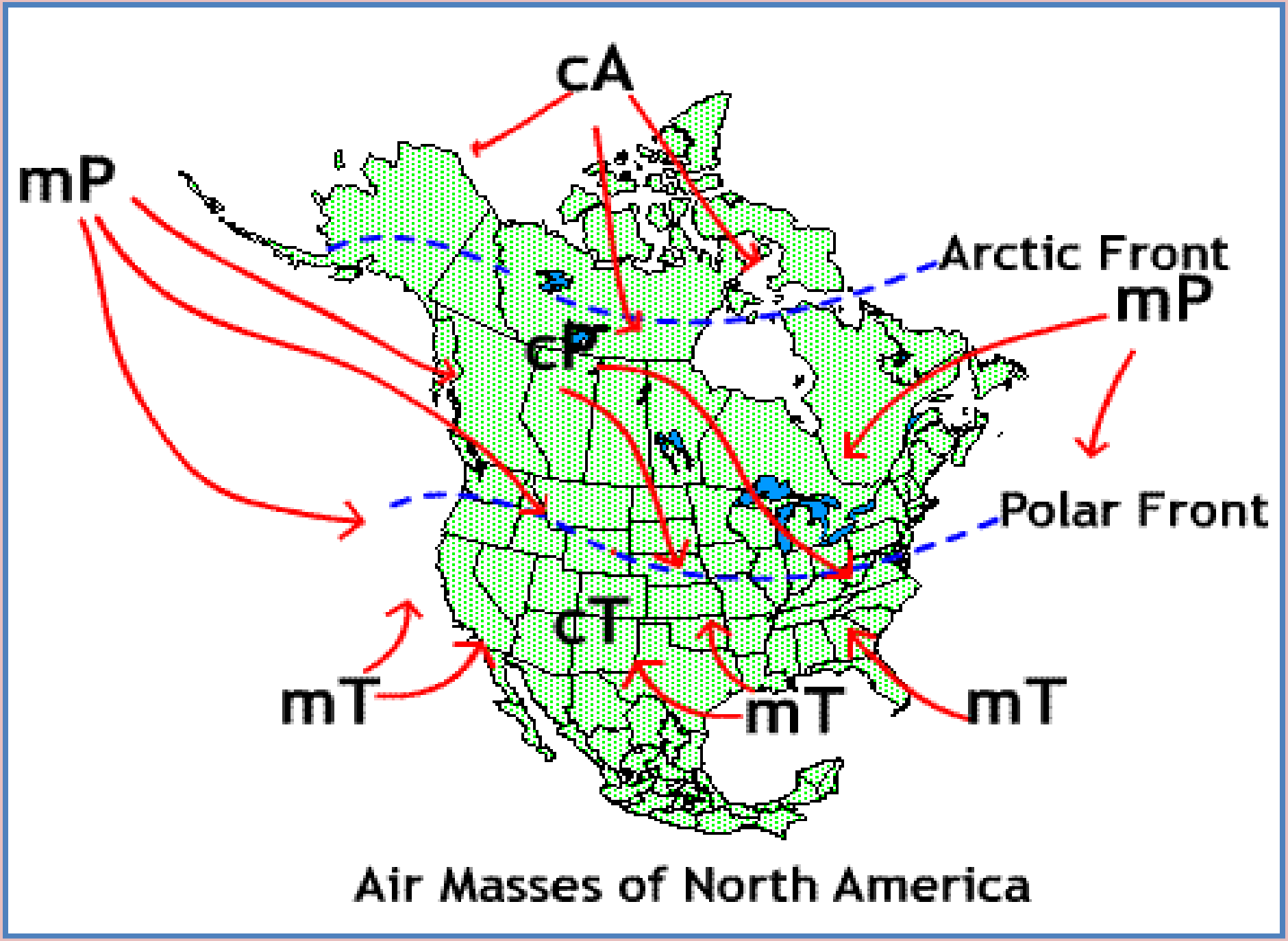
- Warm and very moist – unstable
- Originate in the Gulf of Mexico and the Southern Atlantic Ocean
- Influences the eastern USA
- Most prevalent during summer
- Responsible for hot, humid summer days across the South and the East.

Continental Tropical (cT):

- Very Hot and very dry – stable aloft
- Originates in Desert Southwest and northern Mexico
- Occurs in the summer, rarely in winter
- Usually keeps the Desert Southwest scorching above 100^{o}F during summer
- Generally clear skies, hot, low humidity

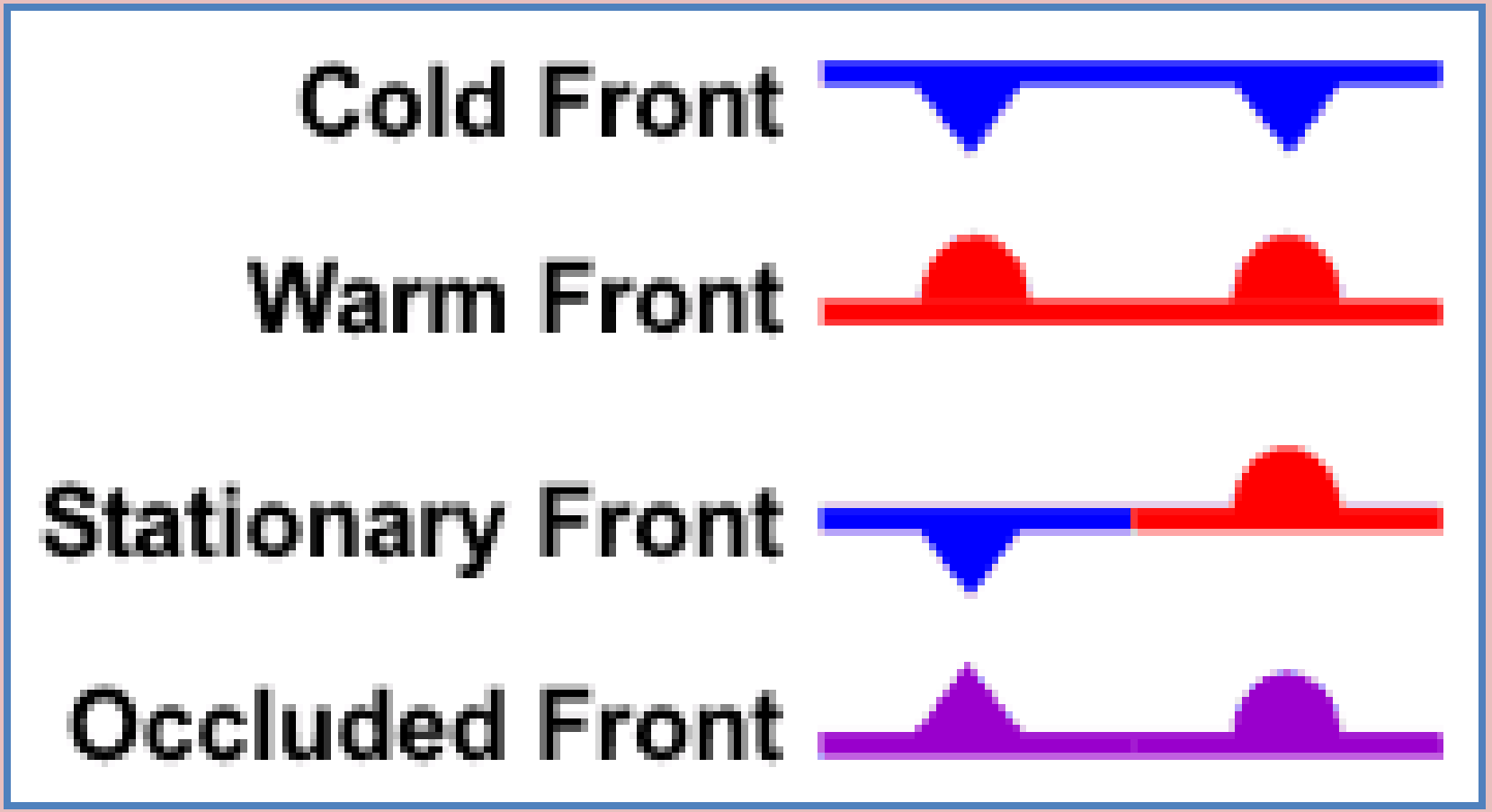
Source Regions





Air Masses of North America

Fronts and their symbols



Fronts:

- Boundary between two air masses
- Characterized by shift in weather

  - Cold
  - Warm
  - Stationary
  - Occluded

5 Characteristics of a Front

- Sharp temperature changes over a relatively short distance.
- Changes in air moisture content
- Shifts in wind direction
- Pressure changes
- Clouds and precipitation

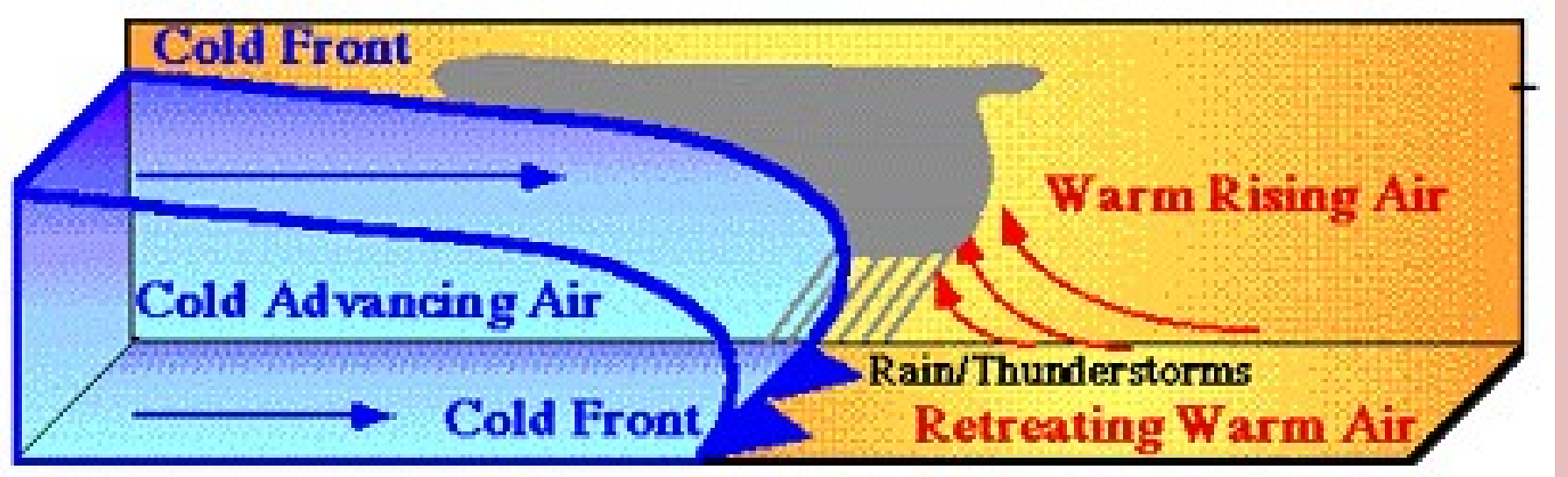
Cold Front

Cold Fronts

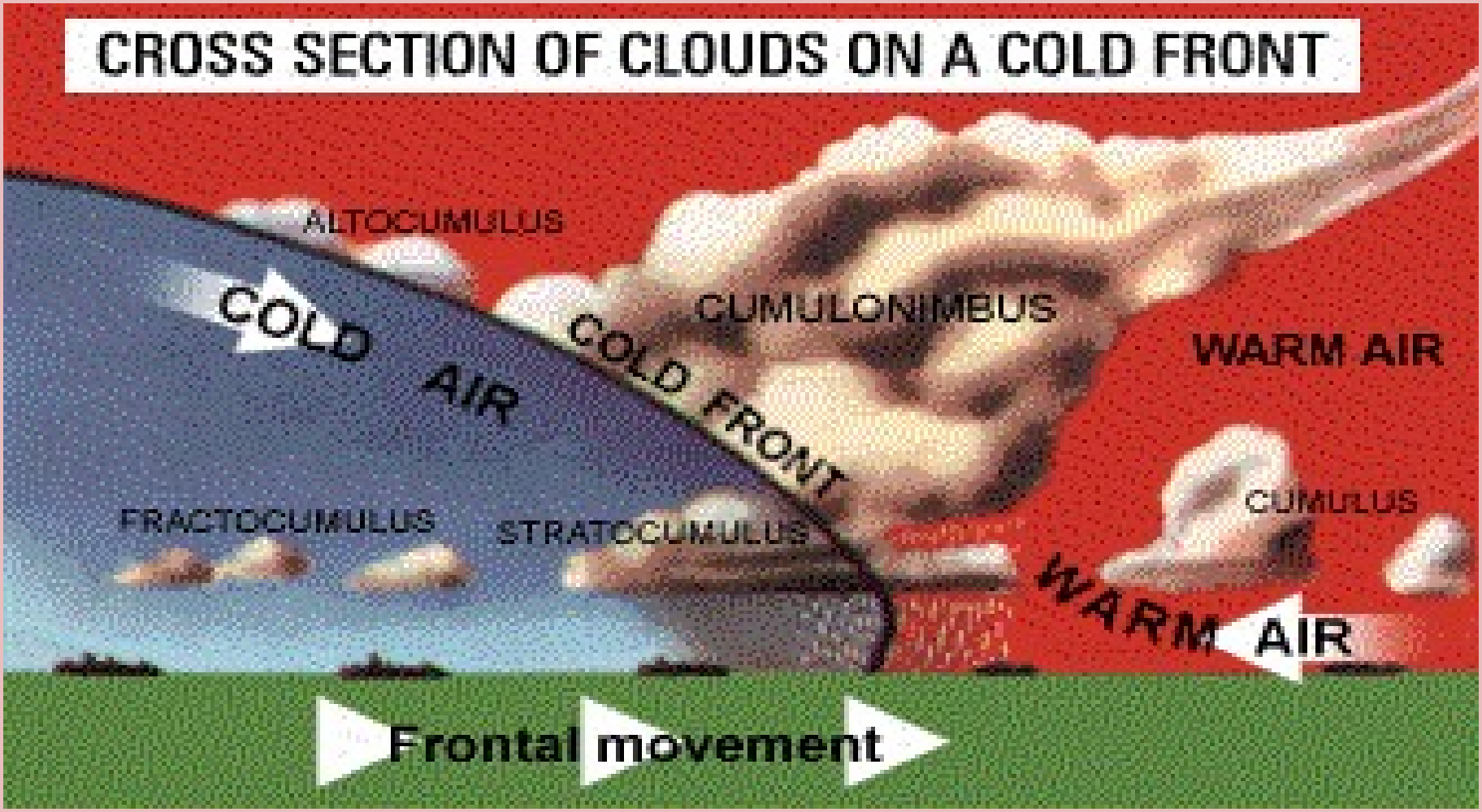
- Temperature – drops rapidly
- Pressure – rises steadily
- Clouds – Vertical building
- Precipitation – Heavy along front
- Winds – Strong and shifting

- Typically move faster than warm front

Cold Front

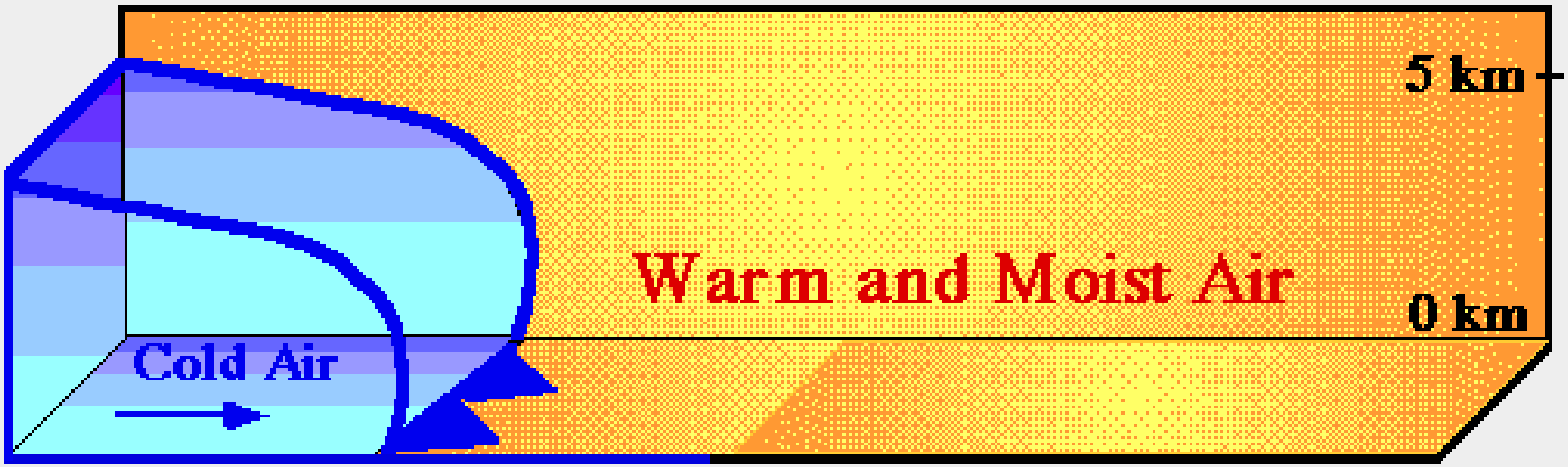

Cold Front
Warm Rising Air
Cold Advancing Air
Rain/Thunderstorms
Cold Front
Retreating Warm Air

Cold Front



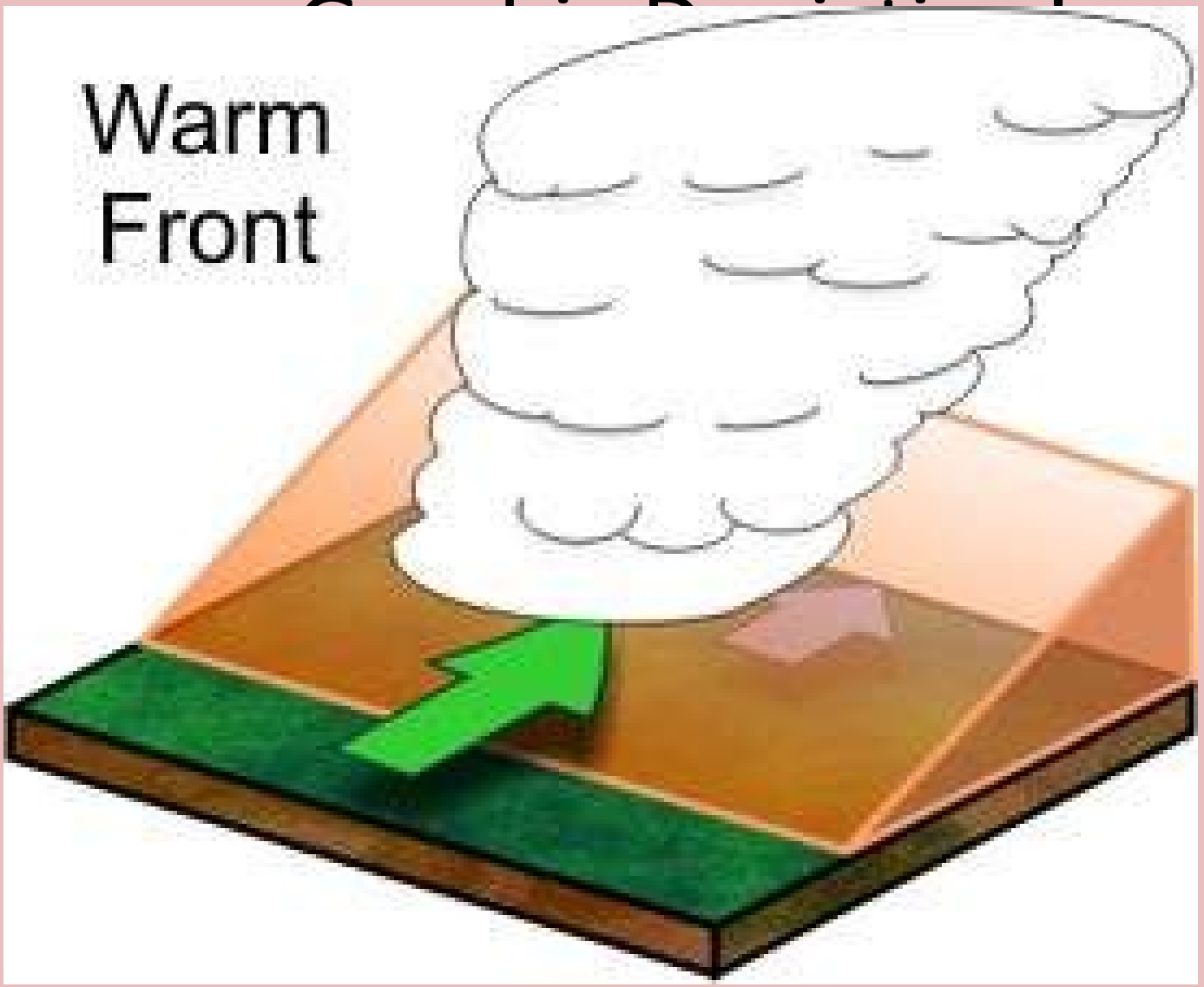
(Fozzy)

Cold Front


5 km
Warm and Moist Air
0 km
Cold Air
Cold Front
100 km
Department of Atmospheric Sciences
University of Illinois at Urbana-Champaign

In the summer, cold fronts can trigger:

- thunderstorms
- large hail
- dangerous winds
- tornadoes

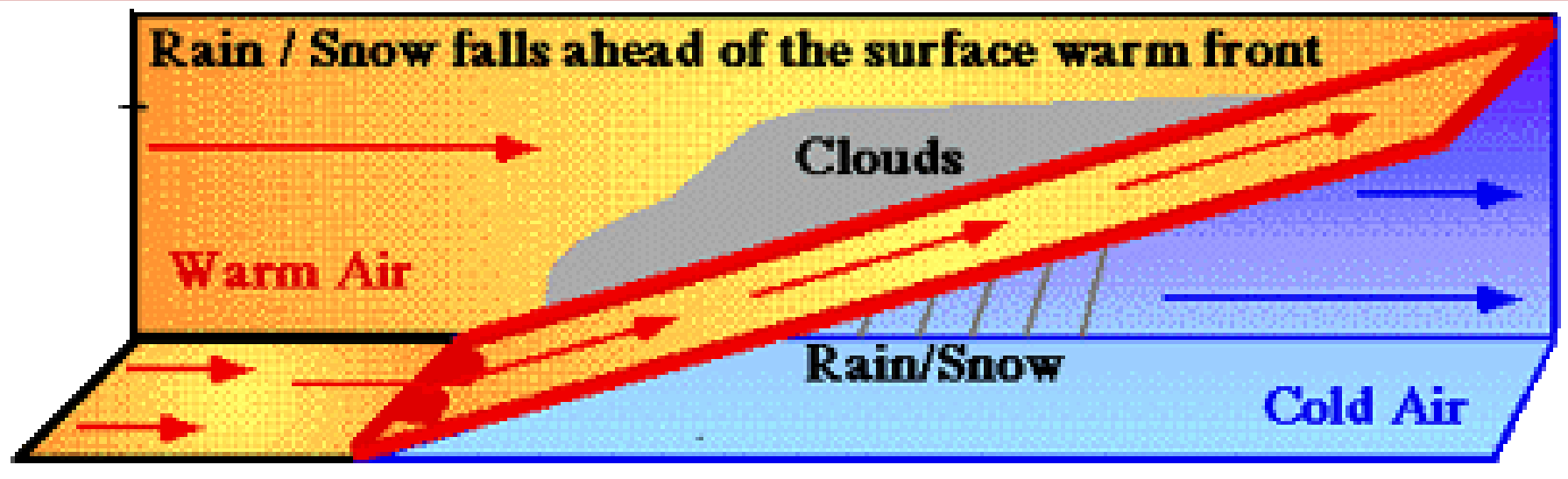

Warm
Front

Warm Fronts

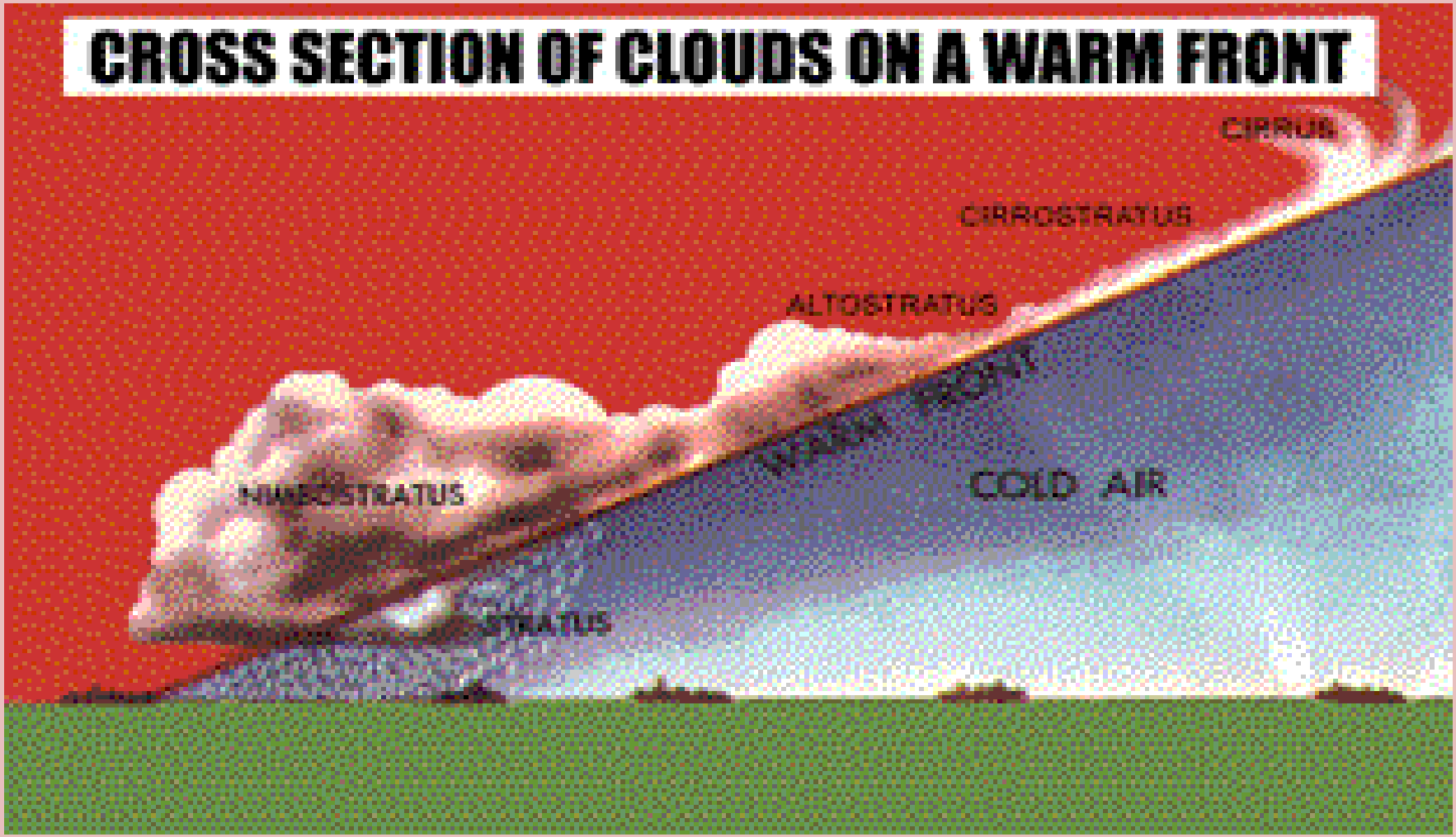
- Temperature – rises slowly
- Pressure – slight rise, then fall
- Clouds – strato- and cirro-
- Precipitation – long, steady
- Winds – variable and light

- Typically will have affect for days

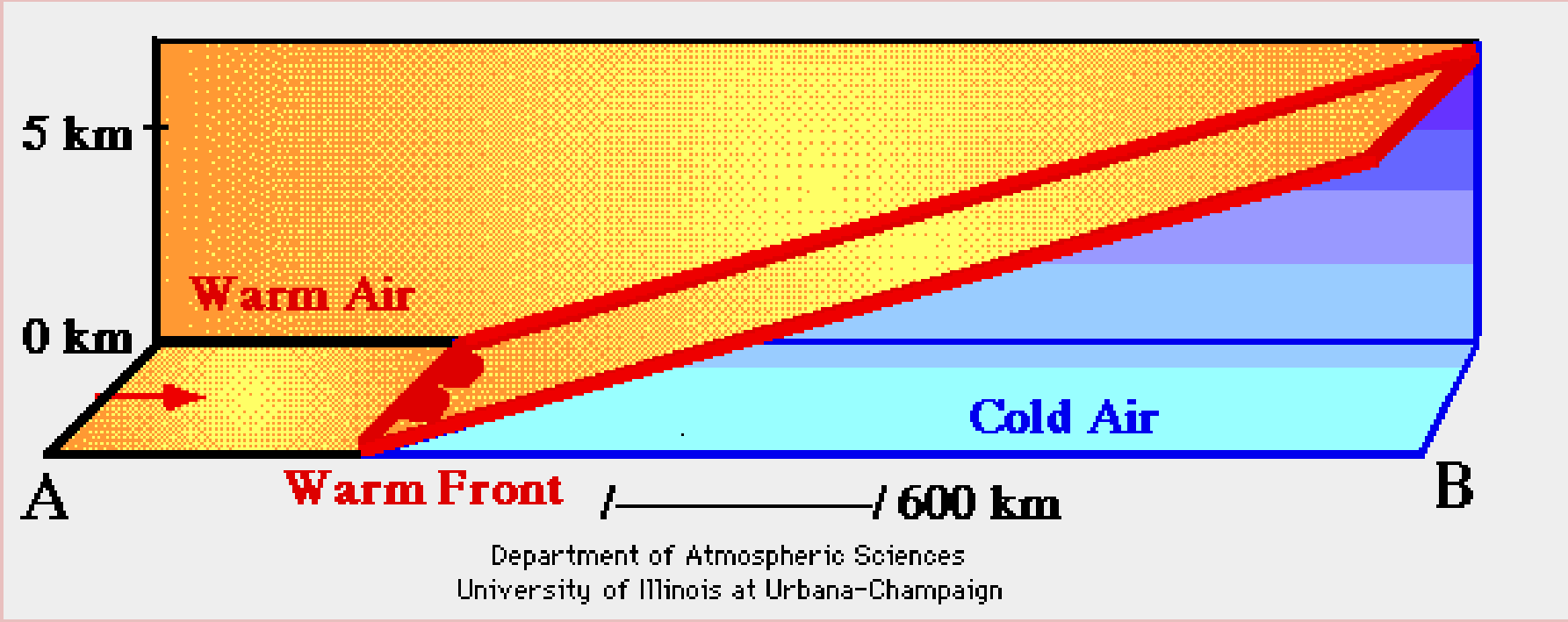
Warm Front


Rain / Snow falls ahead of the surface warm front
Clouds
Warm Air
Rain/Snow
Cold Air

Warm Front


CROSS SECTION OF CLOUDS ON A WARM FRONT
CIRRUS
CIRROSTRATUS
ALTOSTRATUS
WARM AIR
COLD AIR
NIMBOSTRATUS
STRATUS

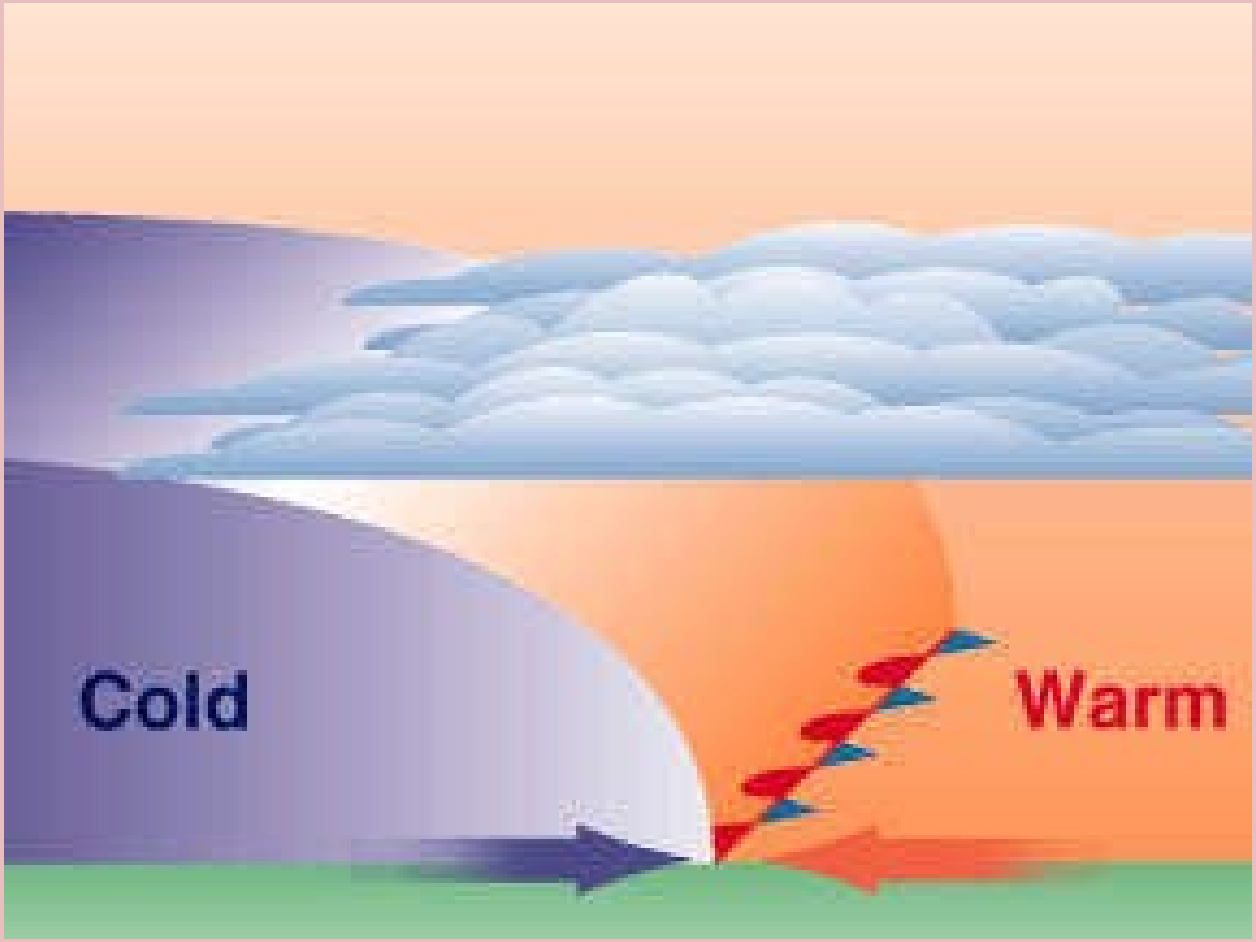
Warm Front


5 km
0 km
Warm Air
Cold Air
A
Warm Front
600 km
B
Department of Atmospheric Sciences
University of Illinois at Urbana-Champaign

Effects of warm fronts

- Slow-moving warm front can mean days of wet weather before warm air
- Sometimes water vapor in warm fronts condense to produce
  - rain
  - snow
  - sleet
  - freezing rain

Stationary Front

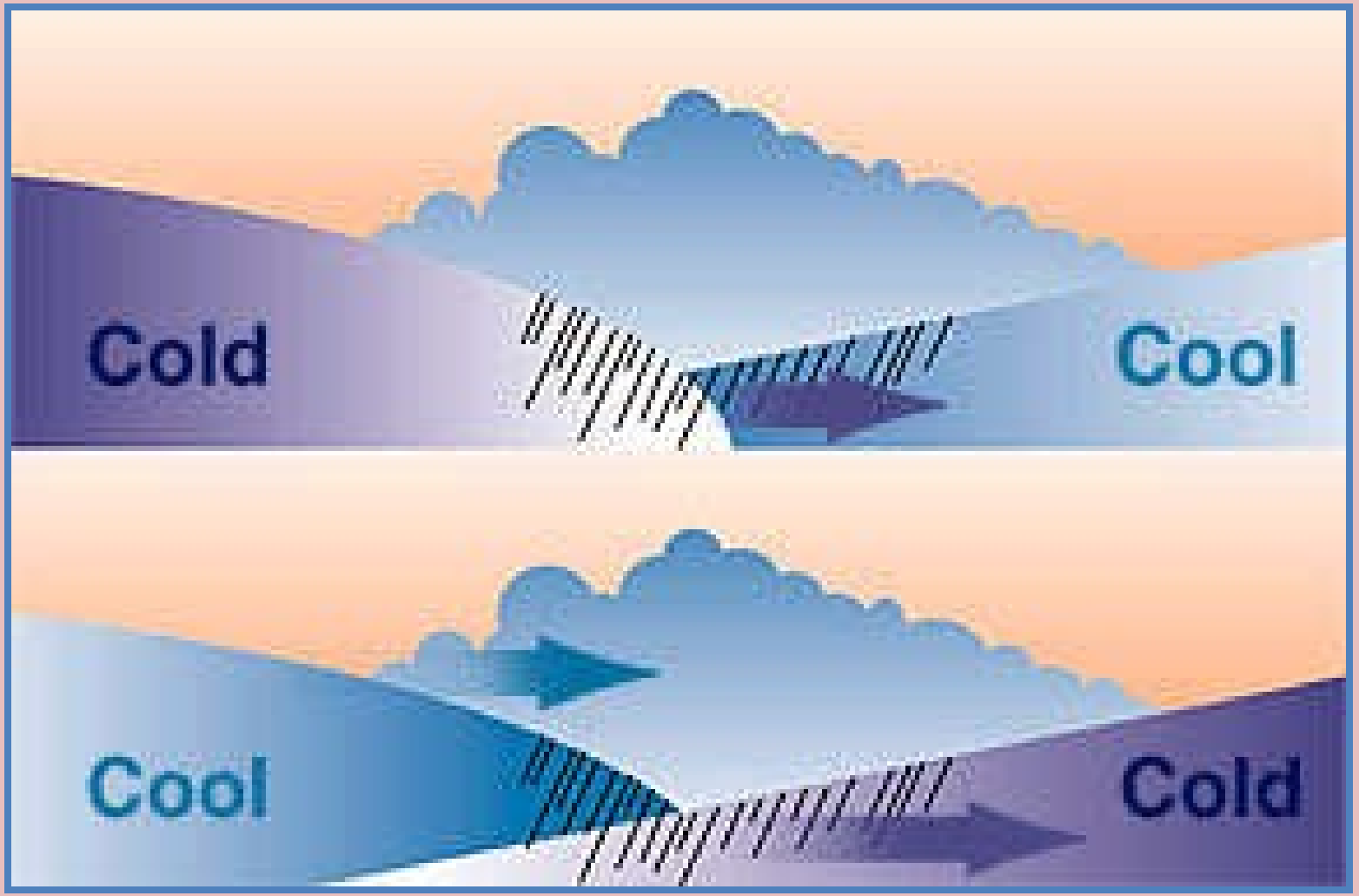


Stationary Fronts

- Temperature – stagnent
- Pressure – slightly fluctuates
- Clouds – altocumulus
- Precipitation – none
- Winds – variable and light

- Can last for days weeks

Occluded Front



Occluded Fronts

- Temperature –
  - Warm – gets milder
  - Cold – gets colder
- Pressure –
  - Warm - slight drop
  - Cold – slight rise
- Clouds – cumulus
- Precipitation – steady and light
- Winds – variable and light

Occluded Front