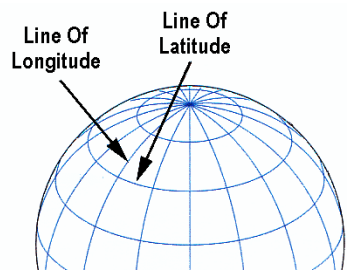
Earth and Atmosphere Review

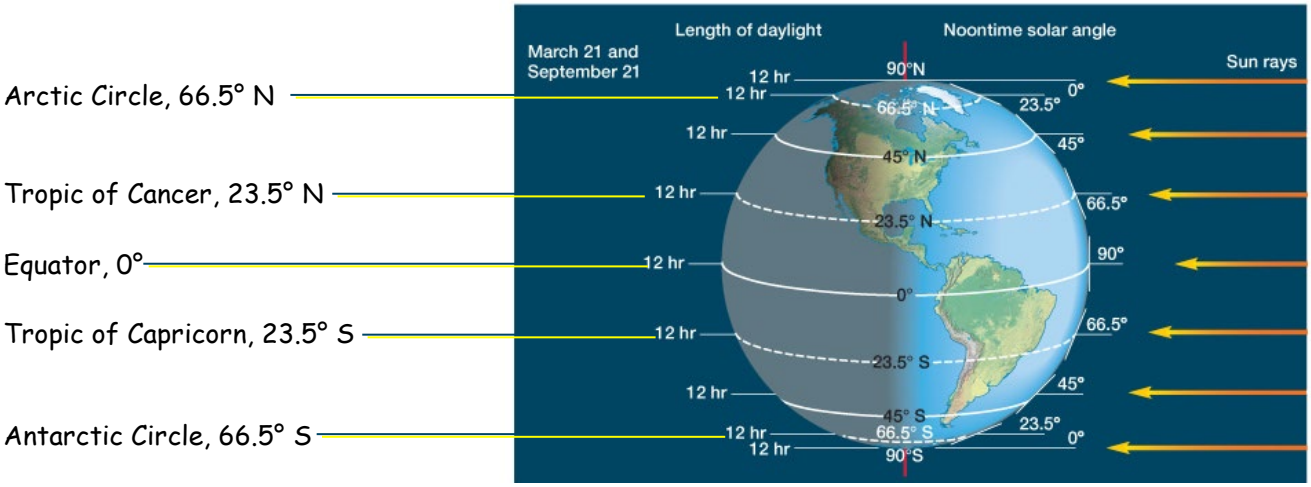
Location on Earth (L1)

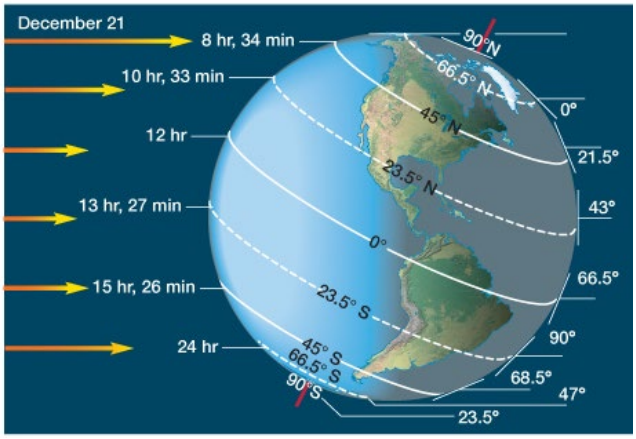
- Latitude & Longitude
  - prime meridian, cardinal points, azimuth
  - know the named latitudes

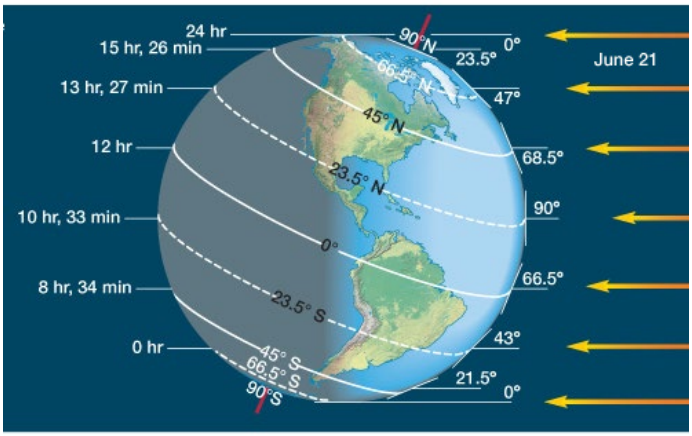
Sun and Earth (L1, JS Global Weather: Introduction)

- Seasons (JS Global Weather: Introduction)
  - Equinoxes & Solstices
  - Named latitudes
    - Equator, Tropics, Arctic & Antarctic Circles
  - ⇒ Understand "Named Latitudes"









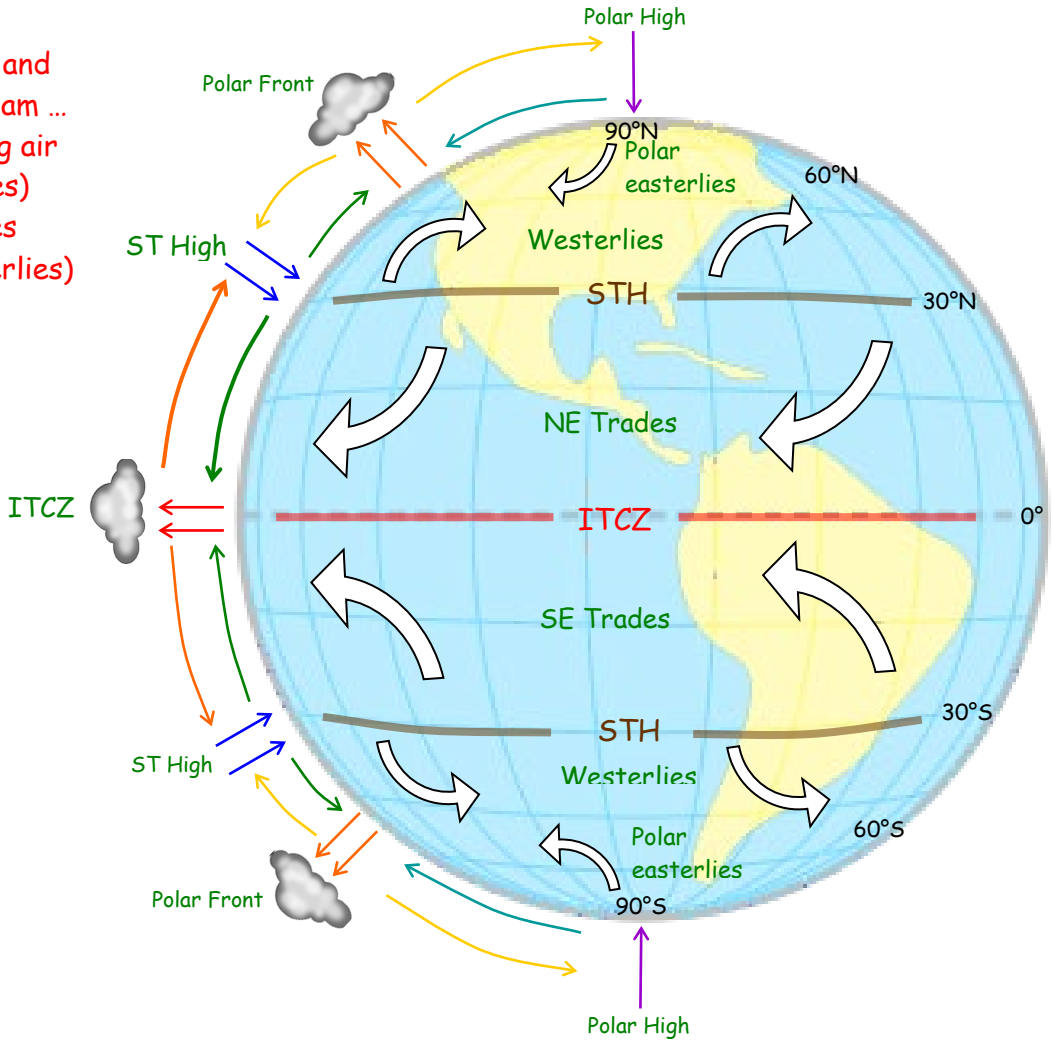
Global (Hadley) Atmospheric Circulation (L9,

JS Global Weather: Global Circulation, Jet Stream, Tropical Weather: ITCZ)

1. Air rises at ITCZ
   - Rising Air = Low Pressure
   - Cools -- moisture condenses -- precipitation
   - Spreads north and south aloft and continues cooling
2. Air sinks at about 30° N and S (STHPC)
   - Sinking Air = High Pressure
   - Dry since it lost moisture when rising
   - Spreads north and south, Coriolis deflection creates Trade Winds & Westerlies
3. Air Sinks at Poles (Polar High)
   - Moves southward (northward) & deflects right (left) along surface
   - Air moving toward equator creates Polar Easterlies
4. Convergence Zone at 60° N and S (Polar Front)
   - Rising Air = Low Pressure
   - Cools -- moisture condenses -- precipitation
   - Spreads north and south aloft, cooling

⇒ Understand "Global Circulation Model"

Be able to draw and explain this diagram … rising & subsiding air (pressure zones) and wind zones (westerlies, easterlies)



Air Masses and Fronts (L11, JS Synoptic Meteorolgy: Air Masses)

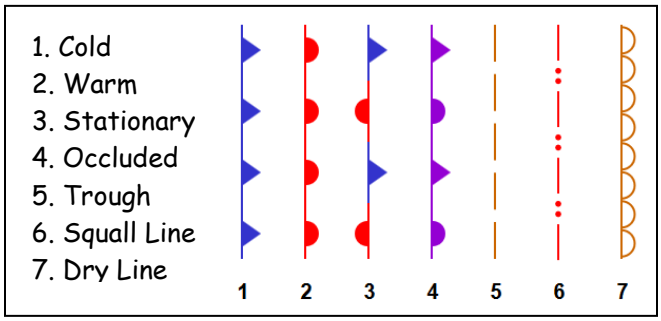
Air Masses

Large volumes of air

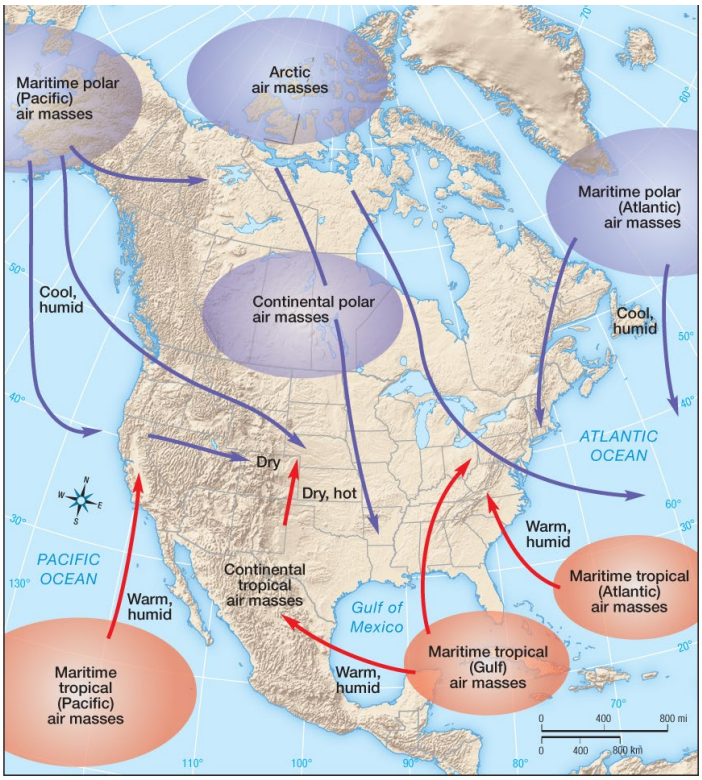
Move and collide

Fronts form at collision zones

Most weather takes place at fronts



Dry lines separate air masses of same temperature but different humidities (*e.g.* cT & mT)



Mid-Latitude Cyclones (L12, JS Synoptic Meteorology: Cyclone Model)

Stationary front where warm and cold air masses push on each other

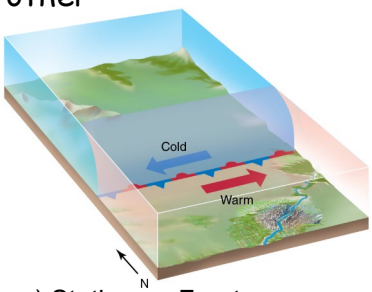
Instability forces a wave to start, then rotation follows

Cold front moves faster than warm front

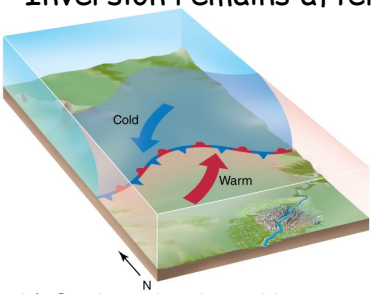
Cold front overtakes warm, pushes warm air aloft

⇒ Occluded front!

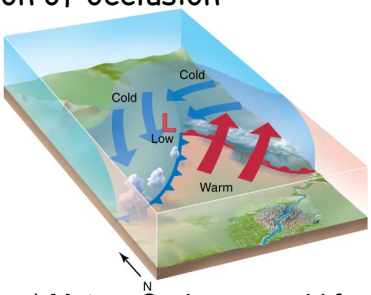
Inversion remains after dissipation of occlusion



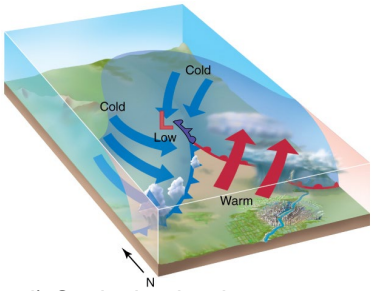
a) Stationary Front



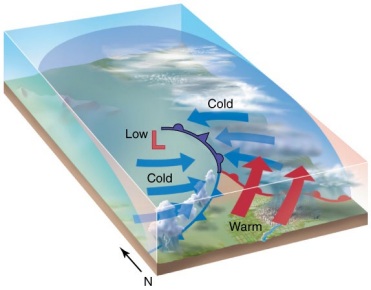
b) Cyclone begins with wave



c) Mature Cyclone … cold front chasing warm front

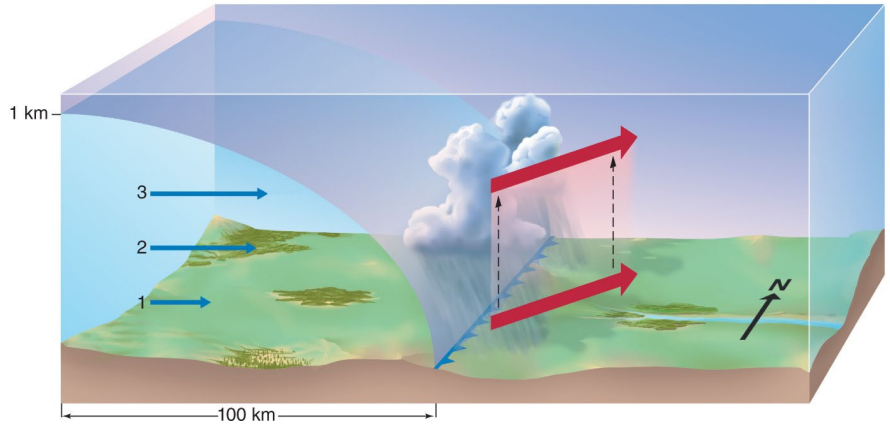


d) Occlusion begins



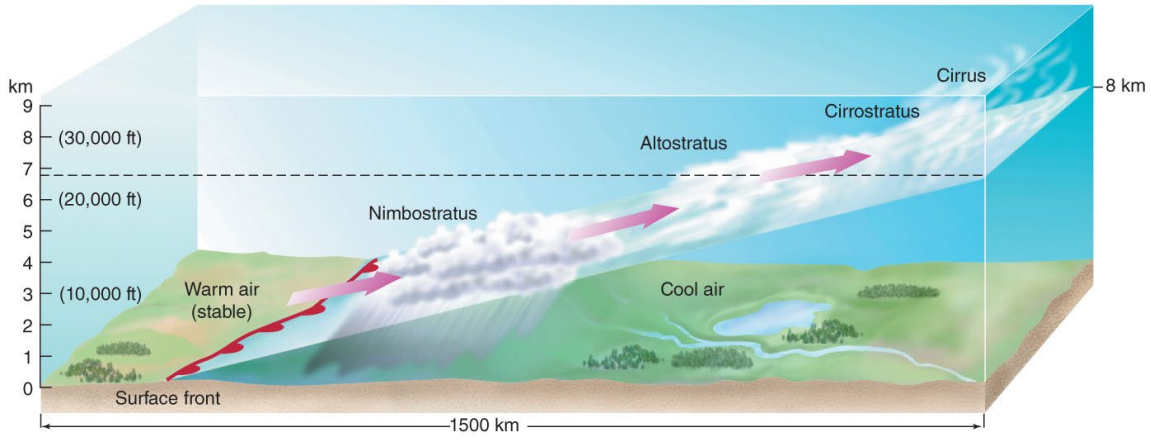
e) Mature Occlusion: warm air aloft (inversion)

Fronts (L11, JS Synoptic Meteorolgy: Air Masses) … what air masses are involved?



Weather associated with a cold front:

Weather Phenomenon	*Before Front Passage*	*Contact with Front*	*After Front Passage*
Temperature	Warm	Sudden Cooling	Cold & Getting Colder
Pressure	Steady Decrease	Level then Increasing	Steady Increase
Wind	South, Southwest	---------	North, Northwest
Precipitation	Showers	Heavy Precip., T-Storms	Showers then Clearing

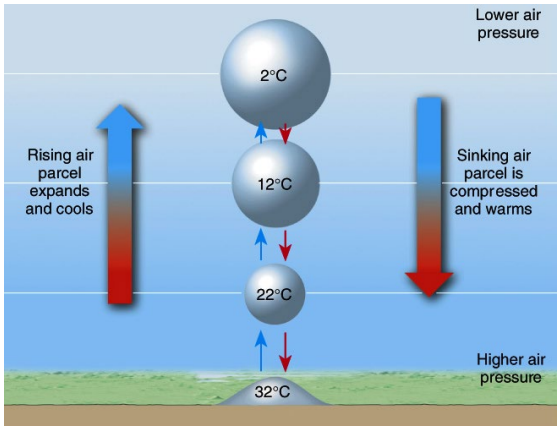


Weather associated with a warm front:

Weather Phenomenon	*Before Front Passage*	*Contact with Front*	*After Front Passage*
Temperature	Cool	Sudden Warming	Warmer then Leveling
Pressure	Steady Decrease	Level	Slight Rise Then Decrease
Wind	North, Northeast	---------	South, Southwest
Precipitation	Showers, snow, sleet or drizzle	Drizzle or Rain	None

Atmospheric Pressure and Winds (L6, JS The Atmosphere: Air Pressure)

Atmospheric Pressure (L6, JS Air Pressure)



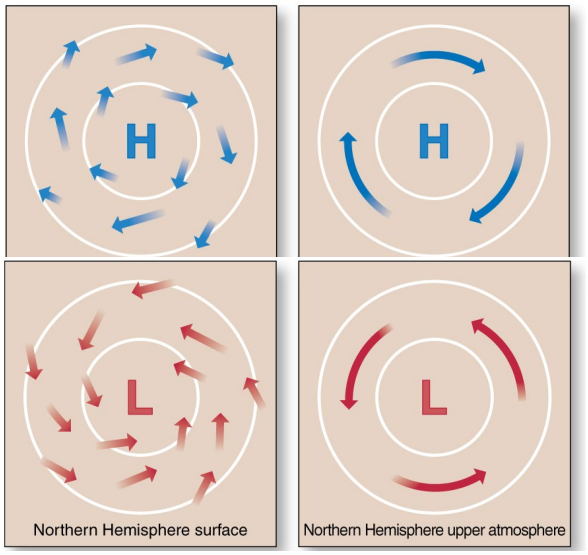
- Pressure -- weight of column of air
- (1 hPa = 10 Newtons/meter^2 = 1 mb)
- Sea-Level Pressure: 1,013 hPa = 29.92 inHg

Vertical Motion

- Rising Air expands & cools
- Subsiding air compresses & heats

Wind (L6, JS Synoptic Meteorology: Wind)

- Air is Moved by Forces
  - Pressure Gradient Force (F_{PG})
    - Starts air moving!
  - Coriolis Force (F_C)
    - Only deflects MOVING air …
      - goes away in still (or very slow) air
  - Friction
    - Friction with Earth's surface slows wind
    - No friction aloft
- Geostrophic Winds (aloft)
  - occur when $F_{PG} = F_C$
  - parallel to isobars
    - Clockwise around highs in N. Hemisphere
    - Counterclockwise around lows in N. Hemis.
- Non-Geostrophic Winds (surface)
  - occur due to wind friction with surface
  - inward to low, outward from high



States and Provinces

Know water bodies, southern provinces, states east of MT, WY, CO, & NM