Lecture 16

1) Tropical climate

2) Extratropical climate
   • Polar regions
   • Midlatitudes
Hadley circulation - seasonal movement: Fig 4-16

June/July: ITCZ north, wet season in N Hemi Tropics

Dec/Jan: ITCZ south, wet season in S Hemi Tropics
Seasonal surface pressure

Fig 4-19

Dec/Jan: ITCZ south, wet season in S Hemi Tropics

June/July: ITCZ north, wet season in N Hemi Tropics
Seasonal Precipitation (Fig 4-26)

**Dec/Jan: ITCZ south, wet season in S Hemi Tropics**

**June/July: ITCZ north, wet season in N Hemi Tropics**
Causes:
- descending arms of the Hadley cell (roughly +/- 30°)
- continental interiors (far from water source)
- leeward (downwind) slopes of mountains
- west coasts with cold ocean (fog and low cloud but no rain)
Air at the poles gets cold and dense $\Rightarrow$ sinks $\Rightarrow$ high pressure
- air generally diverges from high pressure regions

Polar front (45-60° lat.)- where the cold air from poles meets warmer air from midlatitudes, originating from subtropics
Extra-Tropics:
- colliding air masses drives convection
- warm air rises over cold (density effect)

See a general pattern of high / low systems with latitude
Coriolis Effect

On a nonrotating earth, the rocket would travel straight to its target.

The Coriolis effect illustrated using a 1-hour flight of a rocket travelling from the North Pole to a location on the Equator.
East-west motion is also deflected

Here an eastward-moving wind is deflected to the RIGHT (i.e. to the south) because of the horizontal component of centrifugal force.
The Coriolis effect: Summary

Any straight line motion (viewed from a fixed point in space, e.g., the Sun, say) appears to be curved to someone who is co-rotating with the Earth.

It looks like an object (e.g., moving air) is being continuously pushed to one side by a force. We call this hypothetical force the “Coriolis force” (after Gustav Coriolis (1792-1843))

**BASIC FAILSAFE RULES TO REMEMBER:**

1) deflection is to the RIGHT in the northern hemisphere
2) deflection is to the LEFT in the southern hemisphere (i.e. the opposite to that in the northern hemisphere)
Idealized pattern of surface winds

Fig 4-11
Along the polar front:
Low pressure zones (cyclones); High pressure zones (anticyclones)
Each about 1000 km diameter

Cause day-to-day variation in wintertime weather in midlatitudes

Upper level flow:
Essentially from tropics to pole because of the pressure gradient at any given level

Jet stream = narrow channel of strong winds below the tropopause
(~2 km deep, ~100 km wide)