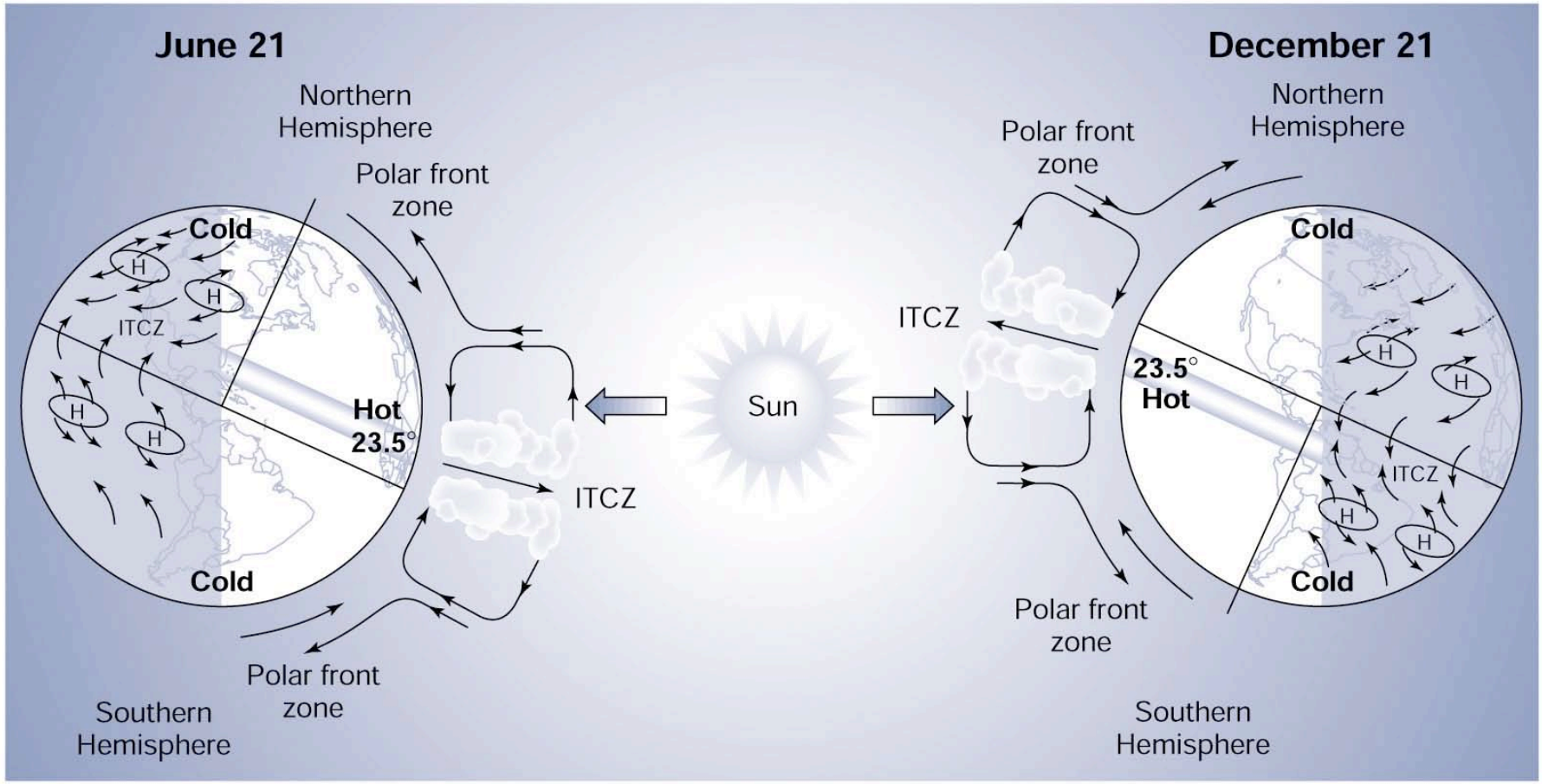
Lecture 16

1) Tropical climate

2) Extratropical climate

- Polar regions
- Midlatitudes

Hadley circulation - seasonal movement: Fig 4-16



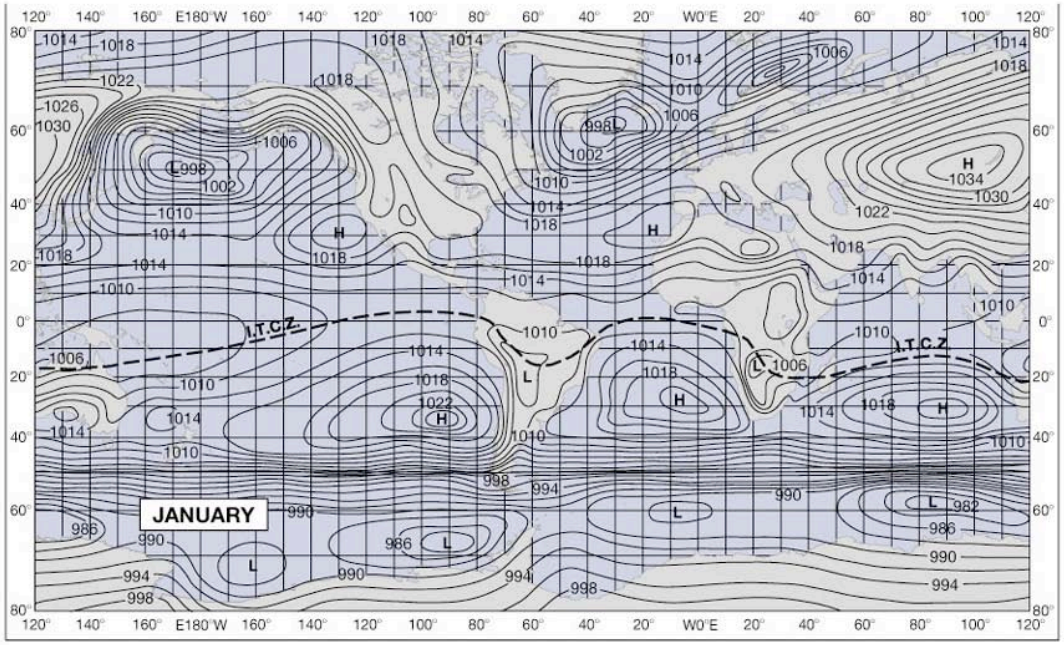
June/July: ITCZ north, wet season in N Hemi Tropics

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

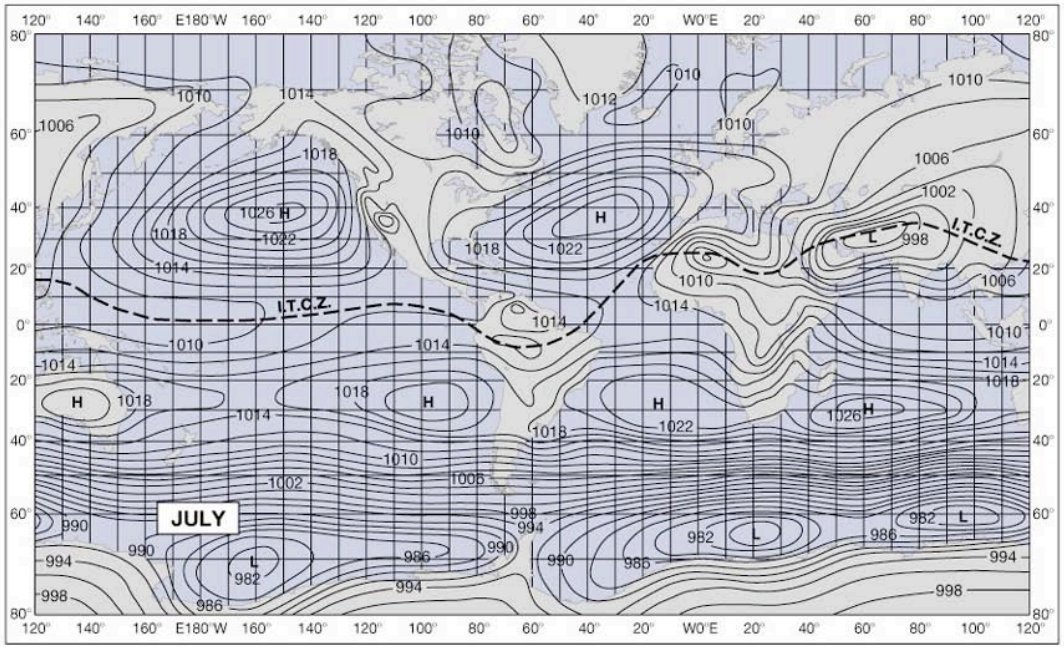
Seasonal
surface pressure
Fig 4-19

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

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



(a)

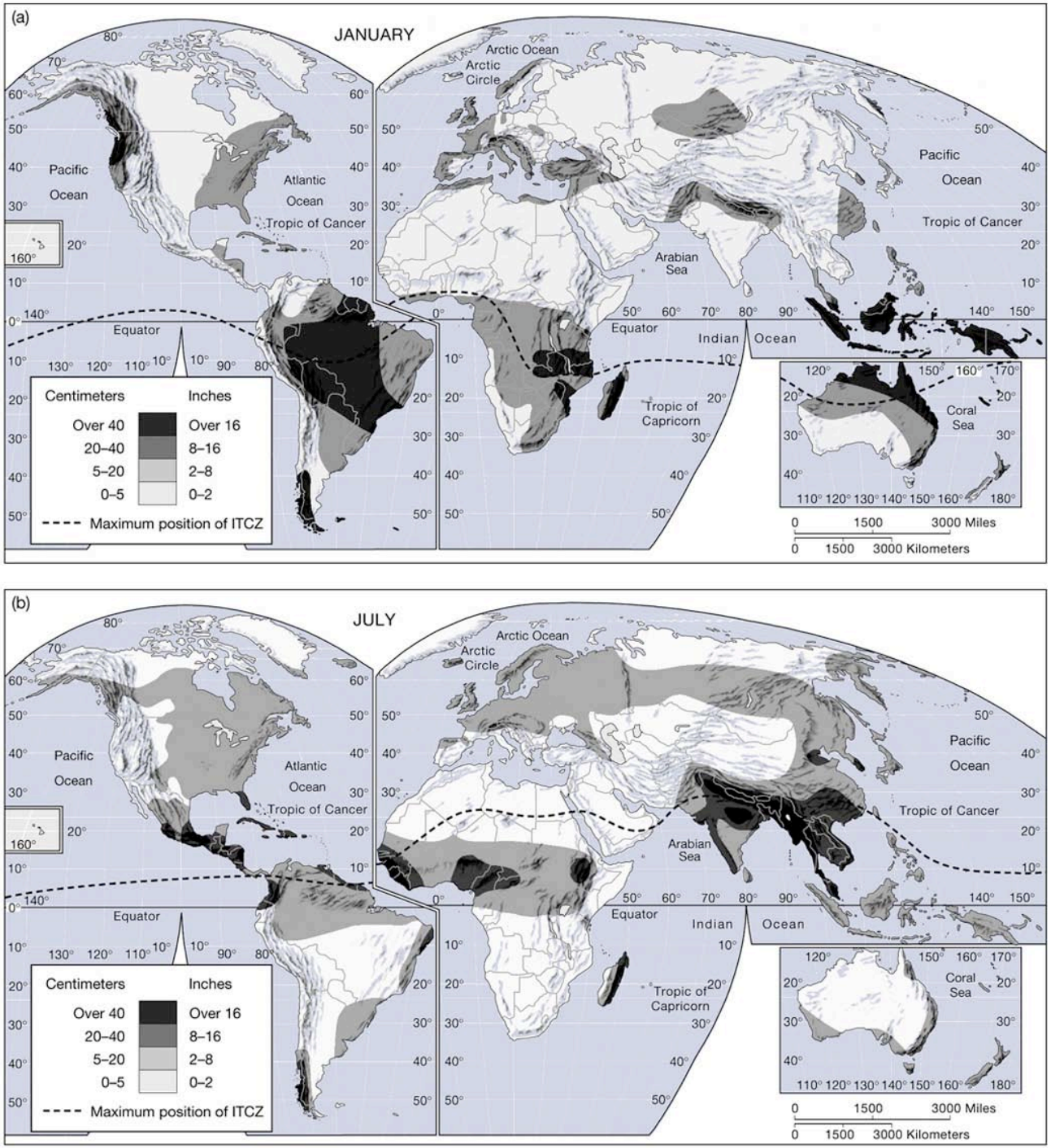


(b)

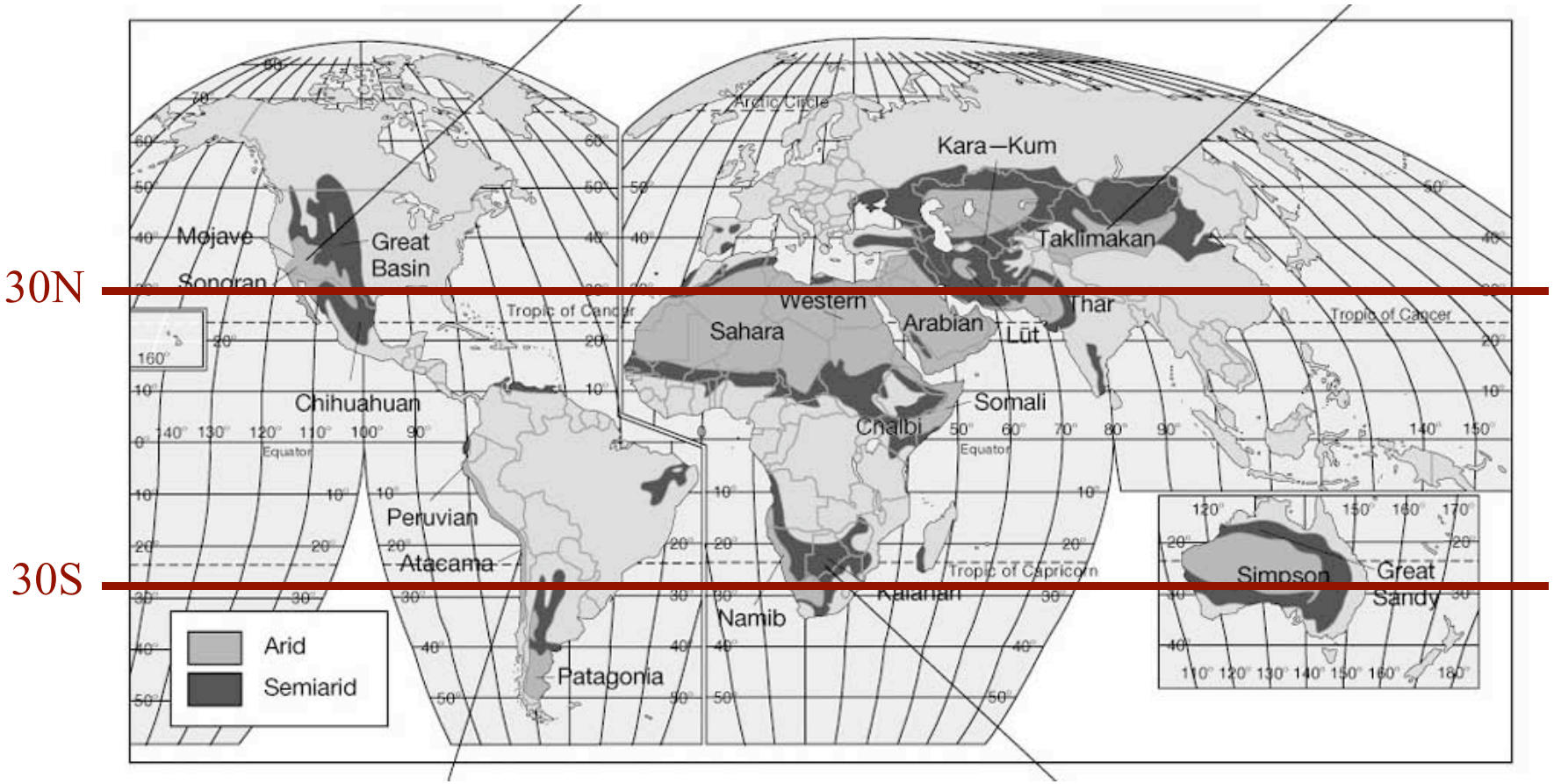
Seasonal Precipitation (Fig 4-26)

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

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



Deserts: Fig 4-27

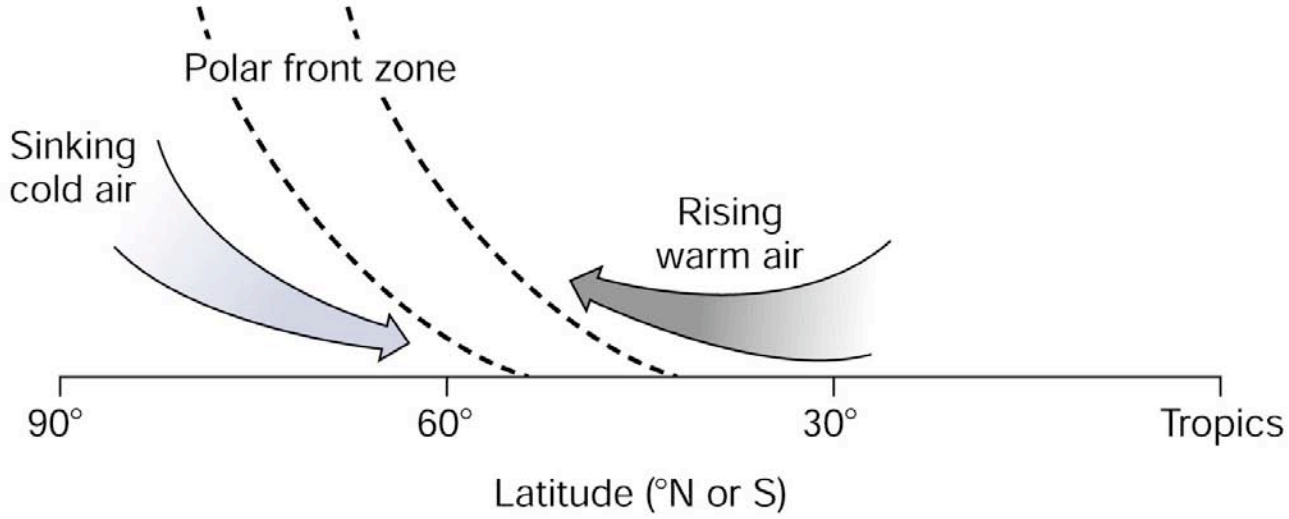


Causes: - descending arms of the Hadley cell (roughly +/- 30º)
- continental interiors (far from water source)
- leeward (downwind) slopes of mountains
- west coasts with cold ocean (fog and low cloud but no rain)

Midlatitude to High Latitude Circulation

Air at the poles gets cold and dense => sinks => high pressure
- air generally diverges from high pressure regions

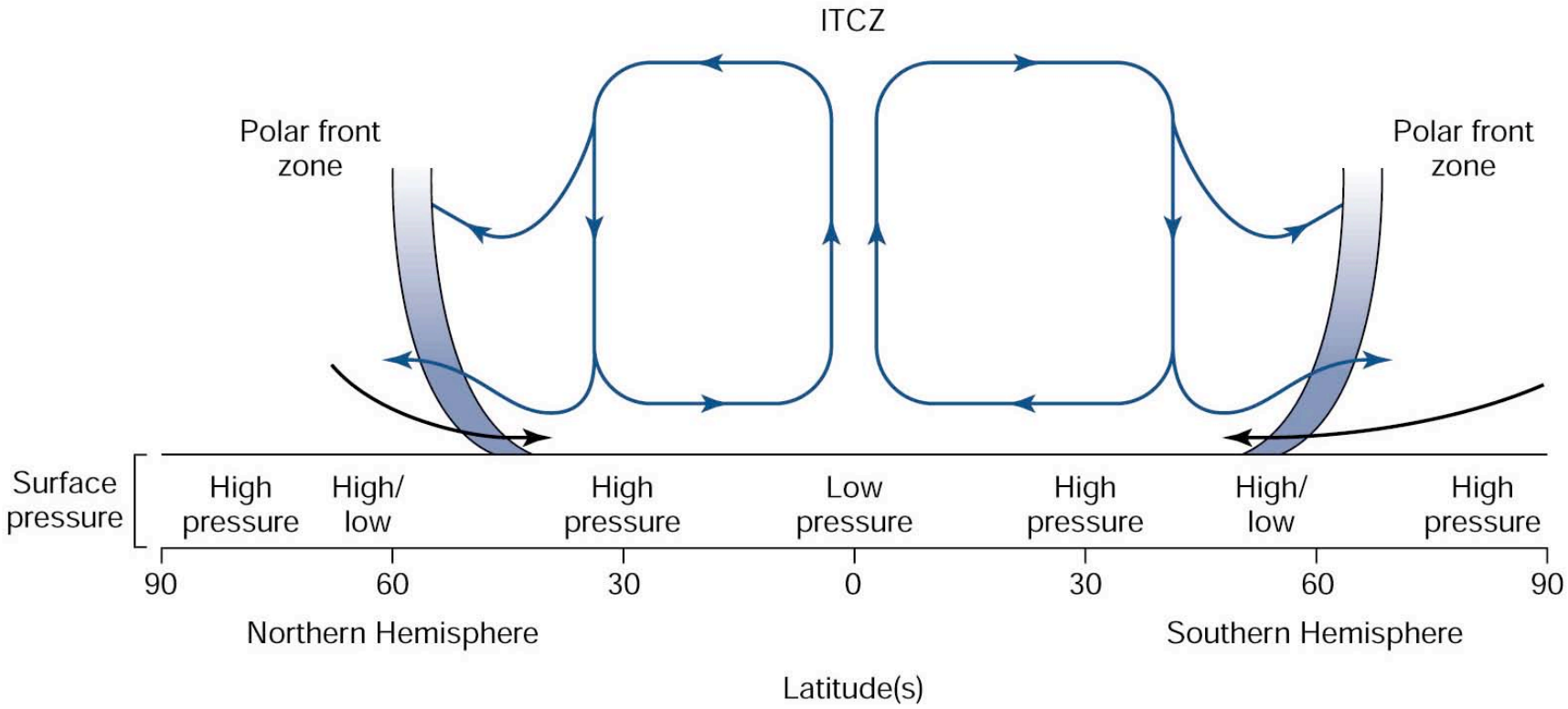
Polar front (45-60° lat.)- where the cold air from poles meets warmer air from midlatitudes, originating from subtropics



Tropics vs extratopics, vertical profile, Fig 04_06

Extra-Tropics:

- colliding air masses drives convection
- warm air rises over cold (density effect)



See a general pattern of high / low systems with latitude

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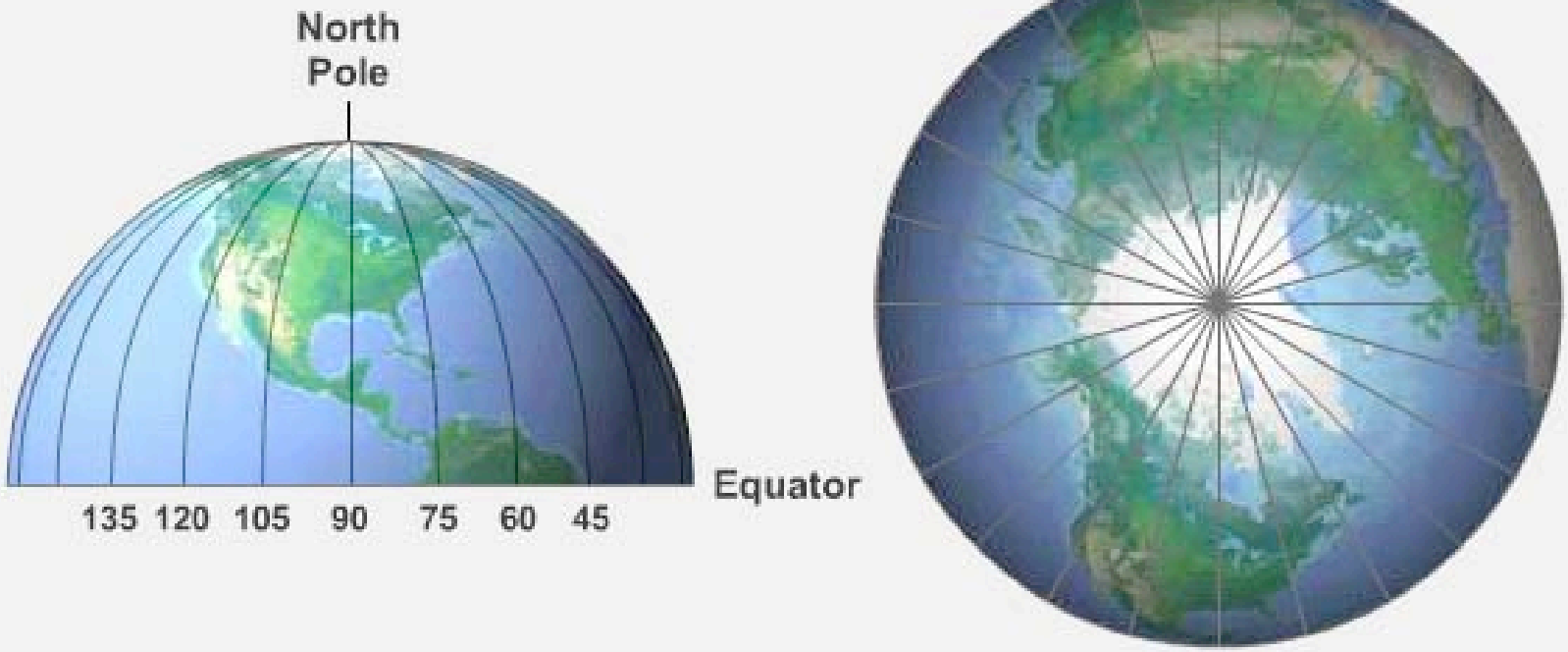
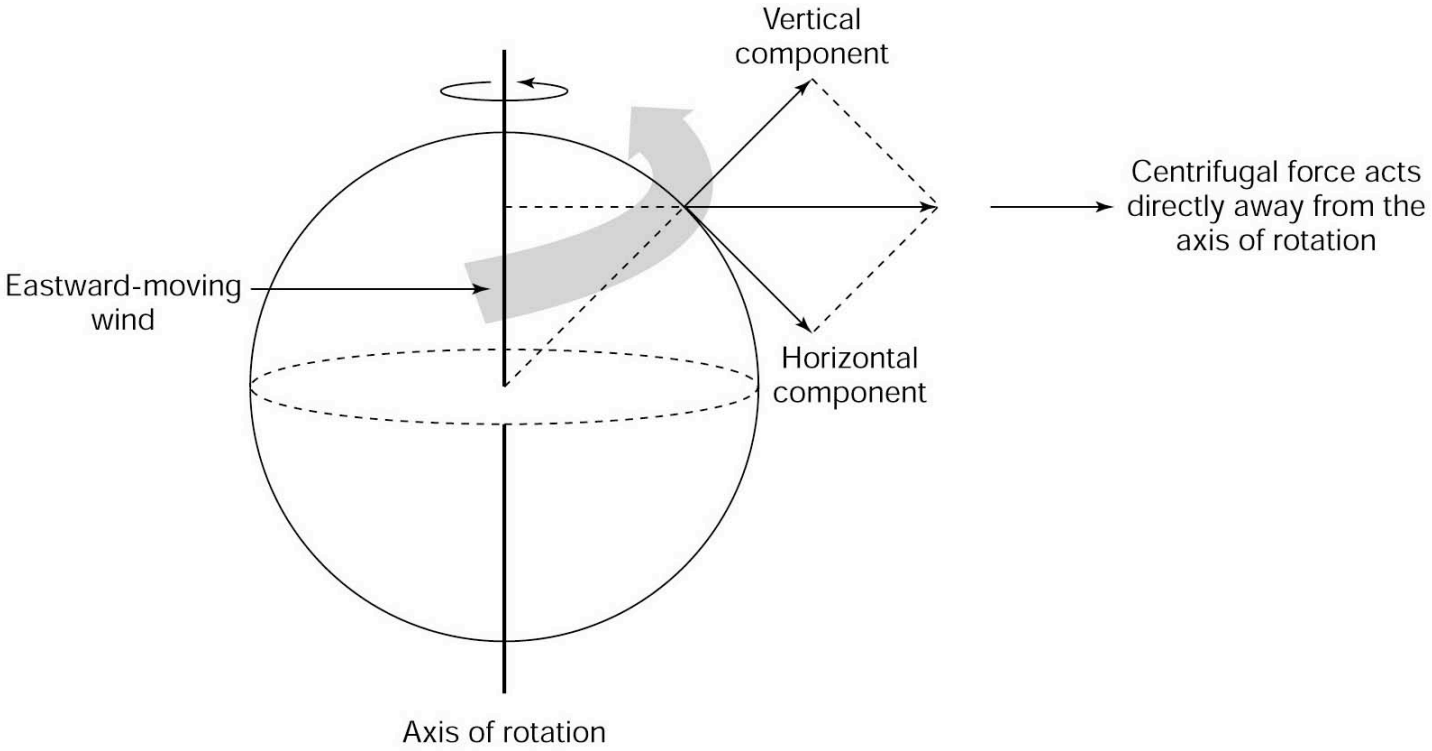
Coriolis Effect

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

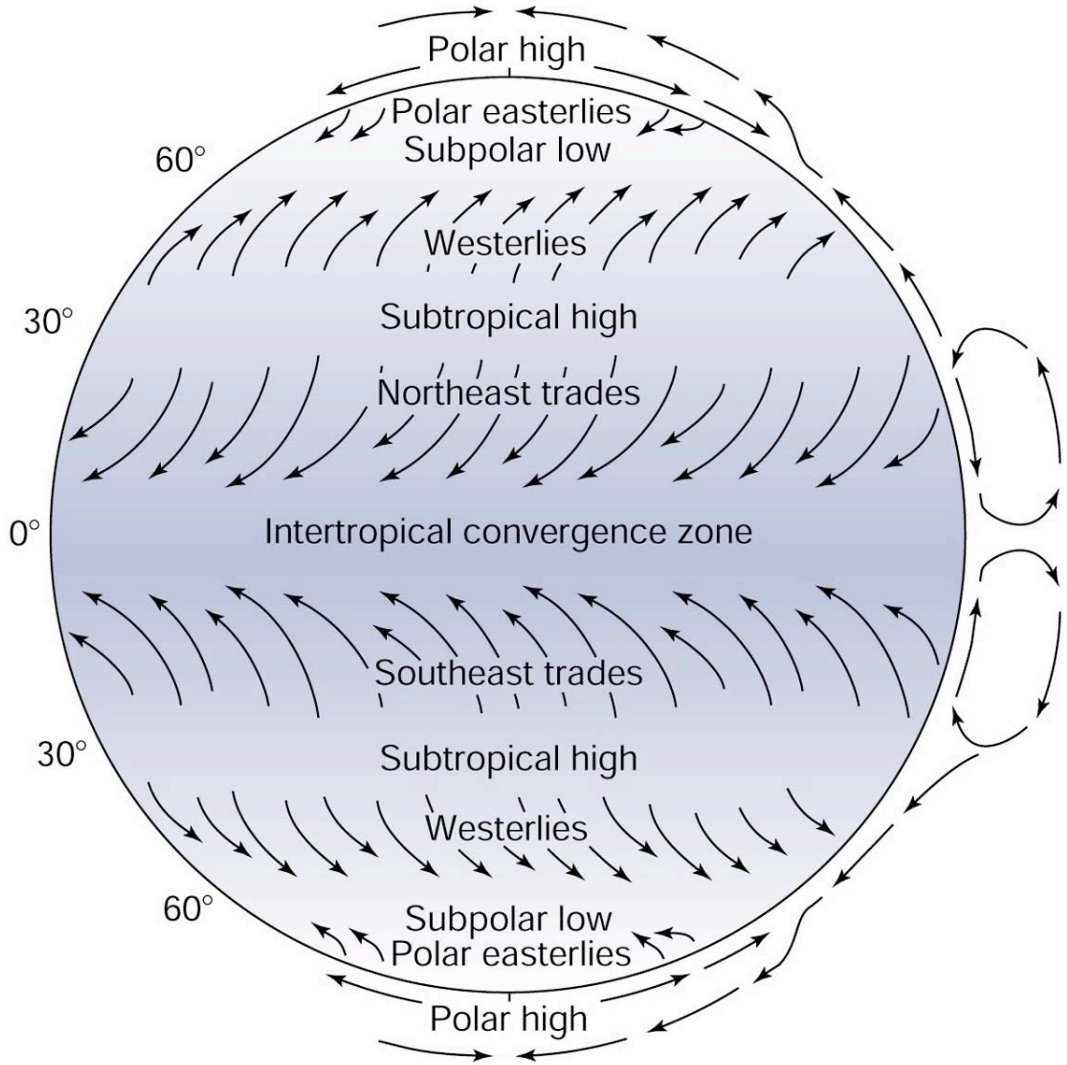


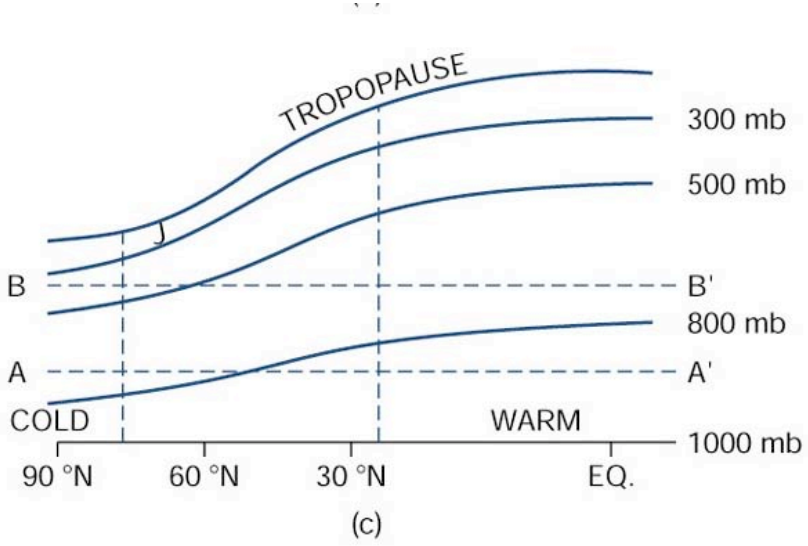
Fig 4-11

Highs, Lows; Upper level flow

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)