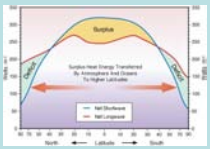
Storms like this one account for about 2/3 of the total heat moved from equator-to-pole by circulation

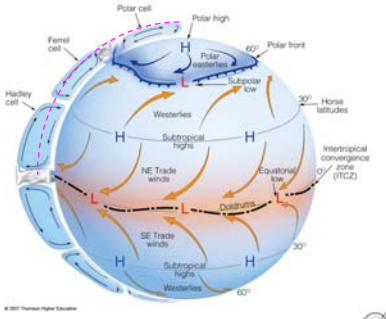
Typical mid-latitude cyclone

Hence, equator-to-pole differences in radiation give rise to equator-to-pole temperature differences and hence circulation.

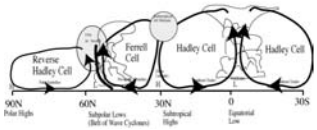


In turn, circulation moves excess heat from the equator to the poles (cooling the tropics and warming the poles)

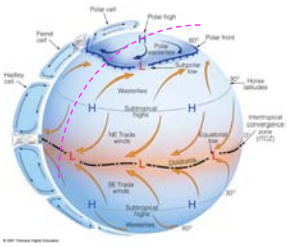
Idealized Model of Realistic Rotating Earth (24hrs)

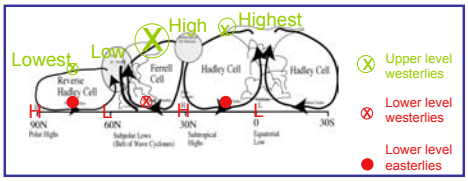


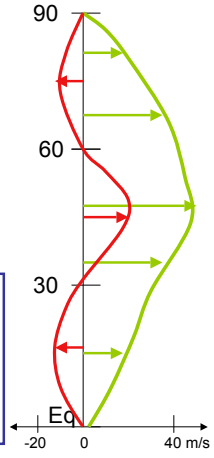
Rotation causes the circulation to form three "cells" in each hemisphere: Hadley, Ferrel and Polar Cells



Idealized Model of Realistic Rotating Earth (24hrs)

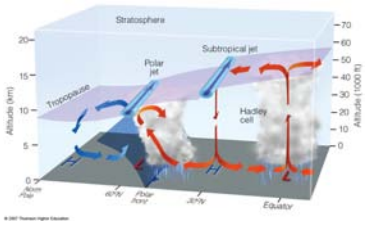






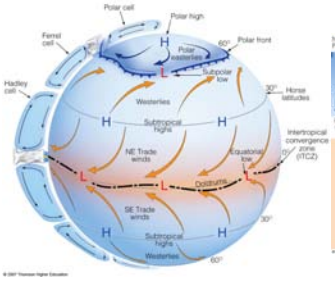
Idealized model of the "General Circulation"

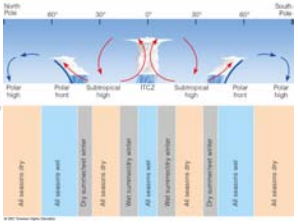
- Hadley Cell in tropics is similar to the land-sea breeze, but CF matters (why?)
  - Hence, surface flow is westward (easterly) at surface and eastward (westerly) aloft
- The largest north-south temperature gradients are in the midlatitude (between the tropics and the polar regions)
  - Hence, the largest equator to pole pressure gradient is in the midlatitude. Westerly JETS are located here



Idealized model of the "General Circulation"

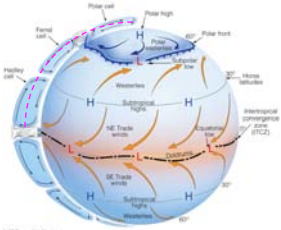
- In general, there is rising motion in near the equator and at about 60° latitude, and sinking motion at 30° latitude and near the pole. Hence, the
  - deep tropics and 60° latitude are wet regions
  - subtropics (20-35° latitude) and polar region are dry regions





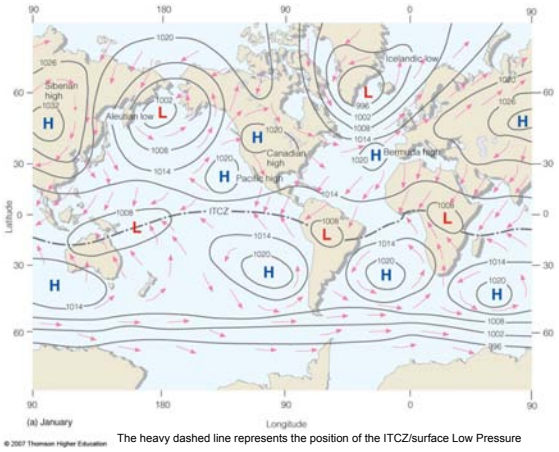
Idealized model of the "General Circulation"

- Near the surface, in general, there are
  - easterlies (Trade Winds) in the tropics and subtropics (25°S-25°N)
  - westerlies in the midlatitudes (30-60° latitude)
  - easterlies in the polar regions (60-90° latitude)
- Aloft (near the tropopause) there are westerlies everywhere, but strongest westerlies are in the midlatitudes



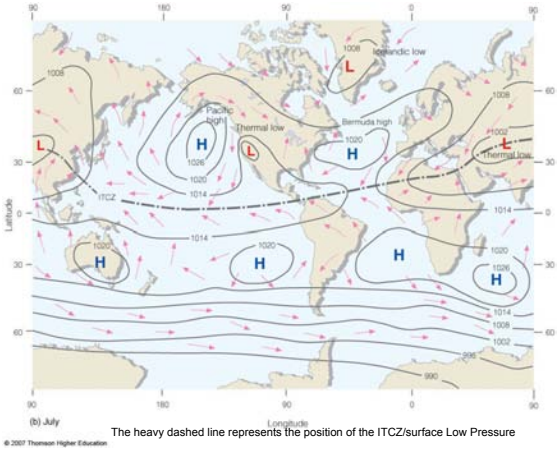
The Real World?

Climatological sea-level pressure and surface wind-flow patterns for January



The heavy dashed line represents the position of the ITCZ/surface Low Pressure

Climatological sea-level pressure and surface wind-flow patterns for July



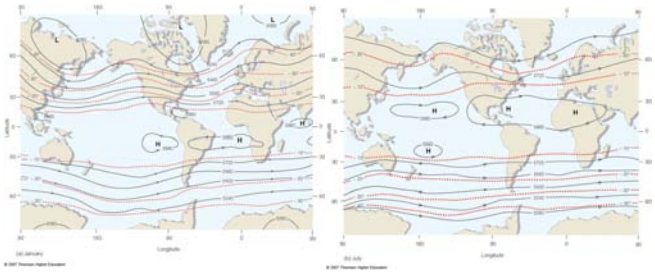
The heavy dashed line represents the position of the ITCZ/surface Low Pressure

What Season is this?

Fig. 10-6, p. 263

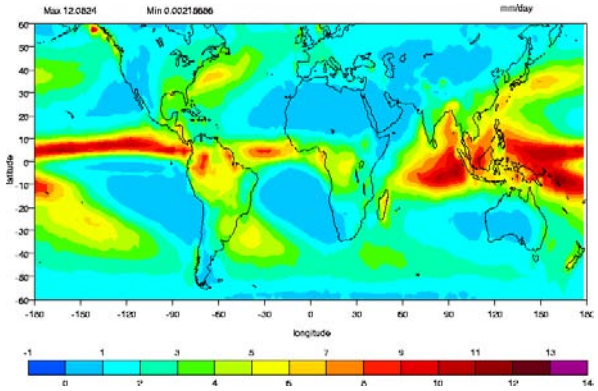
Climatological height of 500mb surface, temperature at 500mb, and wind direction

January July



Largest temperature gradients (elevation gradients) in winter months. Hence, strongest westerlies in midlatitudes of *both* hemispheres in winter!

Climatological Precipiation (annual ave)

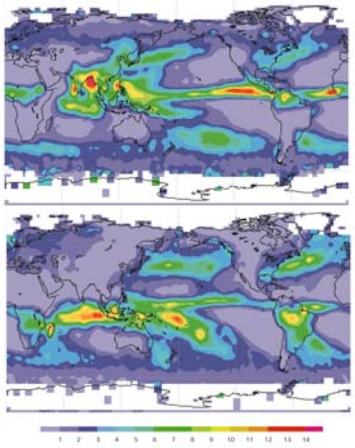


Where are the deserts? Where are the wet regions?

Climatological Precipiation

July

January



Note monsoons in india, south china, australia, amazon, itcz vs spcz

Note dry polar regions year-round