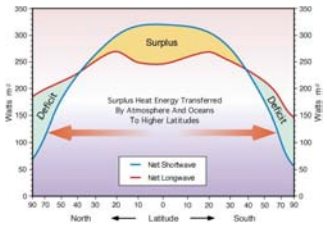
“General Circulation”

- Usually described as the long term (climatological) averaged flow for a month, season or year
- The gross aspects of the essential General Circulation can be explained by considering a rotating planet the size of Earth and with roughly the same GH gases, without worrying about continents and mountain ranges

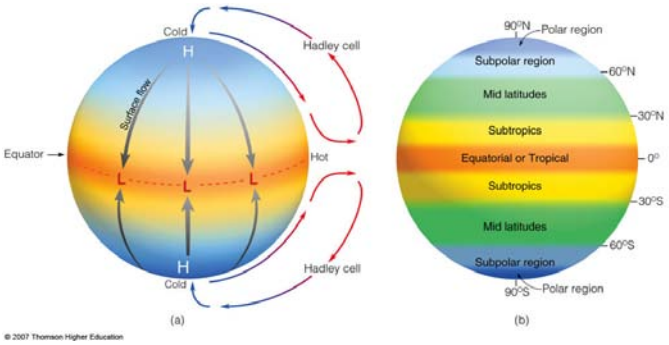
“General Circulation”

- More energy is absorbed in the tropics than is emitted to space.
- Less energy is absorbed in the polar regions than is emitted to space.



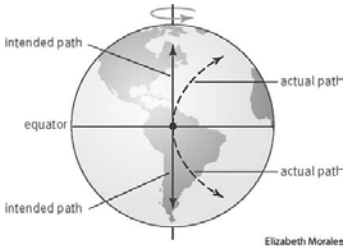
- As a result the tropics are warmer than the polar regions *and* the subsequent pressure gradients drive circulation that move the excess heat in the tropics to the poles

Slowly Rotating Earth



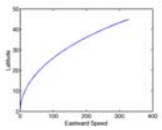
Like a *large scale* sea-breeze (hot tropics/cold poles)

Idealized Model of Realistic Rotating Earth (24hrs)



To conserve angular momentum, moving air at rest from the equator to X° N or S would have to be moving eastward at …

Latitude	Eastward Speed
Equator	0 m/s (540m/s as seen from space)
20°	58 m/s
45°	375 m/s



The Equator-to-Pole Cell is broken because conservation of angular momentum creates large shear in the flow, which wobbles and creates storms

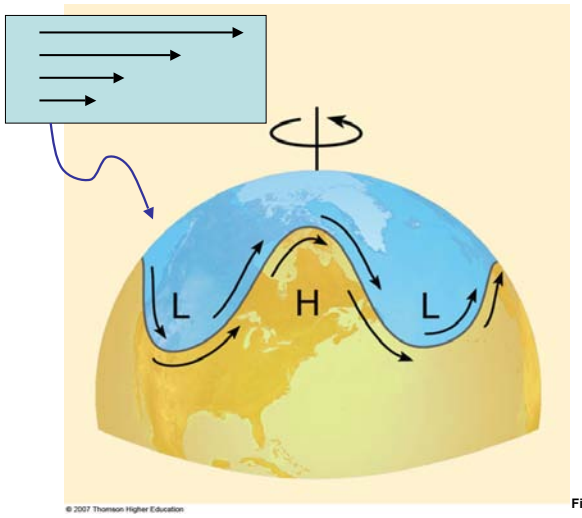


Fig. 3, p. 266

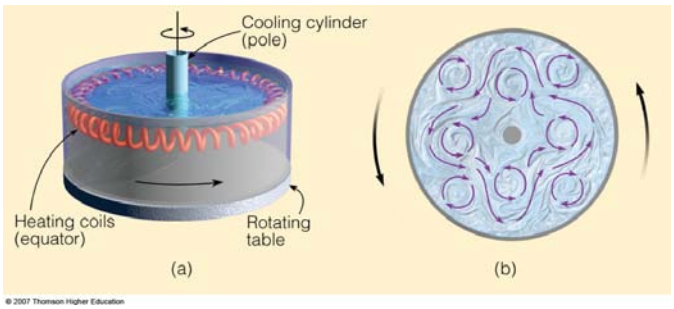
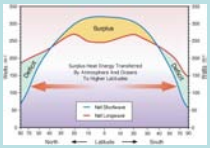


Fig. 2, p. 266

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)