Energy Budget for Earth

Notes:
The total E absorbed by Earth & Atmosphere (70%) powers processes on Earth.
Units are % of incoming solar radiation entering the top of the atmosphere.

Why are the poles colder than the tropics?

- a) the flux of radiation is smaller
- b) the flux of radiation is larger
- c) they are farther from the sun
- d) they are mountainous
- e) the atmosphere is denser

Flux = W/m²

absorbed solar  emitted IR (OLR)
Uneven heating drives vertical & horizontal movements of air.
Consider two columns of air, one warming and the other cooling.

The Atmosphere is Warmed from Below

Coriolis Effect

Apparent curvature in the direction of travel of a body moving over a spinning object.

For winds and ocean currents, it’s caused by latitudinal differences in the rotational speed of Earth.
Latitudinal differences in rotational speed

![Graphic showing latitudinal differences in rotational speed](image)

1 km = 0.6214 miles (1038 mph @ Equator)

Understanding the Coriolis Effect

What would happen if you try drawing a straight line on a spinning record?

![Diagram showing Coriolis effect](image)

Earth rotates out from under objects in motion over its surface creating a curved path for observers on the surface.

![Diagram showing motion deflection in different hemispheres](image)

Northern Hemisphere Southern Hemisphere
Understanding the Coriolis Effect via YouTube

Check out this video:
http://www.youtube.com/watch?v=mcPs_OdQOYU

Pattern of General Circulation

Depth (km)

Ocean Floor

Temp. Salinity (C, %o)
Ocean Gyres

Thermohaline Circulation
(A.K.A. The Meridional Overturning Circulation)

Warm, salty, shallow (~ 800 m)

Cold, salty, deep, nutrient rich

Water density drives downwelling
Coastal Upwelling in S. Hemisphere

Result of Ekman Drift

Net transport of water to the right of the wind in the N. Hemisphere & to the left of the wind in the S. Hemisphere.

Coastal Upwelling Linked to Productivity

Equatorial Upwelling Linked to Productivity