Atmospheric Circulation Affects Climate

Tropical Hadley Cells

Subsolar point & Intertropical convergence zone

For a given amount of air:
- Draw temperature vs. saturation vapor pressure
- What is the saturation vapor pressure?
- What is the dew point temperature?
- What is the relative humidity?
The subsolar point moves

A moving subsolar point can affect climatic pattern in the tropics.

Which graph of monthly rainfall corresponds to Rio de Janeiro?

A  B  C
The ITCZ moves with the subsolar line. 
*But often lags behind – especially over the ocean*

[Map image]

Thought Question
If the angle between the orbital plane of the Earth around the Sun and the plane formed by the Earth’s equator were to decrease (currently it’s 23.5°), what effect would this have on the seasons in the N. Hemisphere?

If the angle were 0°, when would an equinox occur?
A. Air rises & cools (moist adiabatic cooling @ 6°C/km)
B. As air cools it reaches its saturation vapor density - then it rains.
Where might these mountains be found?

A) 40° N latitude
B) 10° N latitude
C) 45° S latitude
D) Both A & C

Orographic Effect in WV

Pickens
Randolph Co. 63°/yr

Morefield
Hardy Co. 25°/yr

Strausbaugh & Core 1970
Ocean Circulation Can Affect:

- Regional climate.
- The price of fish.

Large bodies of water heat up and cool down more slowly than land.
The Day After Tomorrow?

“The notion that a collapse of the thermohaline circulation may trigger a mini ice age is a myth.”

Wallace Broecker 2006

Effects of ocean currents on climate

El Nino
(about every 3-5 years)
Normal

http://www.pmel.noaa.gov/toga-tao/el-nino/nino-home.html
Economic Impacts Attributed to 1982-1983 El Nino

http://www.atmos.washington.edu/gcg/RTN/Figures/RTN22.html

Peruvian Anchovy Fishery

Estimated sustainable yield
Fishing starts
World leader in 1971

20% of world fishery
Low catch for ~ 20 years  
Has improved but still sensitive