

CLIMATE

I.) Heat Transfer Machine

A.) Sun--> Earth-->wind-->surface currents-->deep circulation

Earth is sphere composed of two coupled fluids, the atmosphere and the ocean

B.) Seasons--sunlight is spread over a larger area, some is refracted, atmosphere is a little thicker, --> less solar radiation at higher latitudes

C.) •cooler air sinks, hot air rises

would get a single cell with winds from the poles to the equator

II.) Coriolis Force

- result of earth spinning
- in Northern hemisphere, Coriolis force deflects moving objects to the right
- in Southern hemisphere, Coriolis force deflects moving objects to the left
- Force is proportional to velocity
- Force is function of latitude (zero at equator)
- think of a bullet being shot from equator to pole

III.) Winds

A.) Hadley Cells

unstable to have large cells, chaos theory

B.) NE trades, SE trades, Westerlies, polar Easterlies

- rain at equator where wet air rises to high altitudes--rain also at 60o
- dry at 30o where high altitude dry air descends--->deserts

C.) Sea Breezes

land heats up and cools more rapidly than the ocean

air moves from high pressure to low pressure

Night

land colder-->dry air descends over desert and pushes to ocean

Day—by afternoon, moist cool ocean air brings in fog

Land warmer-->air rises sucking marine air over land

results in marine layer (June Gloom)

D.) Monsoons

Winter

high pressure over cold land yields dry winds blowing out over ocean

Summer

low pressure sucks in wet oceanic air yielding wet monsoons

reversal of the Somali current

E.) Rain Shadow Effect

Cascades—high altitude air masses can't hold water→rain (dry in Eastern

WA)

IV.) Currents

A.) Gyres

These winds drive surface circulation in **gyres**--the North Pacific Gyre, etc There are also polar gyres, the Antarctic Circumpolar current is also a gyre

B.) The **equatorial currents** are driven by the converging winds and then diverges yielding upwelling
now some smaller wind-driven phenomena:

V.) Deep Circulation

Thermohaline circulation

deep circulation is driven by density differences--temperature and salinity affect density

Temperature

Salinity

Global Conveyor Belt

Ice Ages, Heat pump,

VI.) Biomes

A.) Controlling factors

- a. Rainfall
- b. Temperature
- c. Latitude
- d. Altitude
- e. Microclimates

B.) Deserts (very dry)

- a. Dry, <10 inches of rain—reduce evaporation, bloom after rain storm, deep roots,
- b. hot—reflect heat, nocturnal, slow

C.) Grasslands (low precipitation)

- a. Prairie, steppes,
- b. Savannahs
- c. Tundra—permafrost

D.) Forests (moderate to high rain)

Rain forests
Temperate forests
Competition for light, nutrient cycling

E.) Mountains

Timber line
Source of sediment, water,