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APES notes: atmosphere, weather

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see also frog book 15.1 and 6.1

Three ways heat energy moves:

Radiation: no medium needed, e.g. light

Conduction: contact

Convection: matter in motion

Summary:

Solar **radiation** passes through the atmosphere

Radiation hits the earth surface, **conducts** to air

Hot air rises, (**convection**) cooler air comes in to take its place

Tilt of the earth: Basis for seasons : tilt away=winter

equinox=equal night, solstice=extremes

Equator is hottest, so greatest convection there

Three cells based on convection, cause winds

Hadley, Ferrel, Polar

Ocean currents follow the winds, clockwise in N hemisphere

Cells converge at rainy spots, diverge at deserts

Why? Clouds lift at convection spots, cooling them = rain

Dry air dropping from space = warm, dry air (deserts)

Layers: spheres bottom to top

tropo: at the surface, where all weather happens, conduction to air from surface, convection to other layers, albedo is how much energy it reflects (albus=white)

strato: higher, drier air, cooler, air travel is here, also ozone layer (stops UV)

meso: middle

thermo: hot, charged particles, also ionosphere, bounces radio waves

exo: outer

magneto; even further, deflects solar wind, protects surface (none on Mars)

Air stuff:

compress air and it heats

uncompress air (e.g. altitude) it cools

warmer air holds more water

cooler air holds less water

humidity measures how much water in how much air

relative humidity: compared to how much it can hold at that temp

absolute humidity: total amount of water

dew point: temp where water condenses

rising air condenses (rain) “adiabatic cooling” rain carries the heat away

falling air heats (deserts) “adiabatic heating” absorbs energy from the surroudings

rain shadows=dry areas after mountains

saturated 100% RH air is fog, then rain or snow

Cells:

ITCZ: at the equator, inter-tropical-convergence-zone

Hadley cell: equator to 30°N or 30°S

Ferrel cell: 30-60°

Polar cell: 60-90°

since earth is spinning, as air flows south, it also falls a bit west=tradewinds

if air flows north, it also flows a bit east=westerlies (weather describes wind from source direction)

this change of direction creates the coriolis effect

Hurricanes are low pressure systems, rising air creates a counter-clockwise flow (L on the weather maps)

High pressure systems create clockwise flow (H on the weather map)

Oceans:

winds carry surface water along, so N hemisphere has clockwise currents (cool water off CA coast)

a special current from Greenland melt flows to Hawaii, called the thermo (heat) haline (salt) current.

ENSO is a big deal: normally winds carry water off-shore of chile, bringing up food from the deep ocean (happy fisherpeeps).

El Niño reverses this, so sad fisherpeeps

La nada is no flow at all