Lecture 8:

Sediment:

-What are Marine Sediments?

-Eroded rock particles and fragments

-Transported to ocean

-Deposit by settling through water column

-Oceanographers decipher earth history through studying sediment

- Basically the soil of the ocean

-Holds information about primary productivity

-Weathering

-Breakdown of rocks and minerals through interaction with the planets atmosphere

-Physical Weathering

-Weathering through direct contact

-Ice, Heat, Water, Animals, Pressure, Plants

-As you go from few large particles to many small particles the surface area increases

-Chemical Weathering

-Changes the rocks chemical state

-Soil Ph, Temperature, Precipitation, Sediment Ph

-As plants respire it produces Carbonic acid which erodes and weathers the rock and soil around it

-Increases in temperature🡪increase respiration🡪 increase chemical weathering

-Congruent Weathering🡪 Results in only dissolved ions

-Limestone weathering

-Increase in CO2 🡪 increase in chemical weathering

-Incongruent Weathering🡪 Results in newly made clay materials and dissolved ions

-Rock+water+CO2🡪 Ions + Clay

-Grain size

*-300mm-2mm= Gravel*

*-2mm-1/8mm= Sand*

*-1/16 mm- 1/300 mm= Silt*

-Larger Particles found in high energy environments while Small Particles are found in low energy environments

-Deep sea is low energy and has small particles (silt and clay)

-Beaches are high energy and have large particles (sand)

-Marine sediment classification

-Where they come from

-Terrigenous or Lithogenous (from the land)

-Mostly at continental margins

-Coarser sediment at shore

-Eroded rock fragments from land

-Reflect the composition of rock

-Agents of transportation

-Water

-Watersheds deposit sediment into the ocean

-Wind (aolian)

-Dust clouds get picked up and moved into the ocean

-Ice

-Picks things up on land and melts and releases it into the ocean

-Gravity (turbidity currents)

-“Underwater landslides” large quantities of materials sliding off of the continental shelf into deep ocean

-Biogenous (from organisms)

-Hard remains of once living organisms

-Shells, bones, teeth

-Microscopic or macroscopic

-“Biogenous ooze”: 30% or more sediment is Biogenous

-Calcium Carbonate (calcite)

-Coccolithophres (algae)

-Calcium Carbonate Ooze

-Silica

-Diatoms (algae)

-Photosynthetic

-Radiolarians (protozoans)

- Siliceous ooze

Lecture 9 (continued from lecture 8):

-Contributing factors:

-Productivity: Number of organisms in surface water above ocean floor

-Hot spot on the surface

-Destruction: skeletal remains dissolve in seawater at depth

-Dilution: deposition of other sediments decreases percentages of biogenous sediments.

-Carbonate Deposits

-Stomatilites

-Fine layer of carbonate

-Warm shallow areas, high salinity

-Lived billions of years ago

-CCD: Calcite Compensation Depth

-Calcite dissolves readily after a point but to cold water and pressure

-Sediment Accumulation and Sea Floor Spreading

-Mid-Ocean ridges are above the CCD so calcite can build up and then Siliceous Ooze or Abyssal Clay covers it and protects in.

-Hydrogenous (from the environment)

-Chemical reactions occurring in the ocean

-Hydrothermal vents produce mineral precipitate

-Manganese nodules

-Phosphates

-Carbonates

-Cosmogenous

-Space Dust!!

-Very small amounts of sediment

-Volcanogenous

-Comes from volcanic ash that lands in watersheds or the ocean after an eruption

-Layering of different kinds of sediment tell a story about the history of that area of sediment. Well preserved

-Sediments are important for petroleum

-Petroleum often comes from diatoms under pressure for a long long time.

-Gas Hydrates: resemble ice but burn when lit

Lecture 10:

-Atmosphere:

-78.1% Nitrogen gas

-20.9% Oxygen

-Greenhouse Gases

-CO2 is a Greenhouse gas

-Increases every year

-They are important to keeping the earth warm by trapping solar radiation but too much is a bad thing

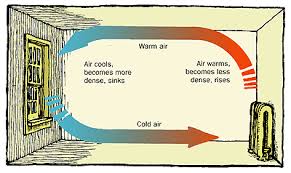
-Seasons

-The tilt of the earth causes seasons because during orbit and rotation the distance a specific part of the planet moves closer and farther away from the sun.

-Uneven solar heating effects wind patterns and atmospheric reflection

-Albedo, White surfaces reflect solar radiation really well and cools areas. Black surfaces absorb solar radiation and heats an area.

-Positive feedback loop of arctic sea ice melting losing albedo and warming water and melting sea ice

-Convection Cells

-Water does the same as air.

-Hot air holds more water vapor (low pressure system). Cold air releases water vapor (high pressure system).

-Coriolis Effect

-Attempts to understand how things that are not connected to the surface of the earth move in a rotating planet.

-Causes moving objects to follow curved paths

-To the right on the Northern Hemisphere, to the left on the southern hemisphere

-Changes at different latitudes

-Convection Cells:

-Hadley Cells: 0-30˚

-Ferrel Cells: 30-60˚

-Polar Cells: 60-90˚

Lecture 11:

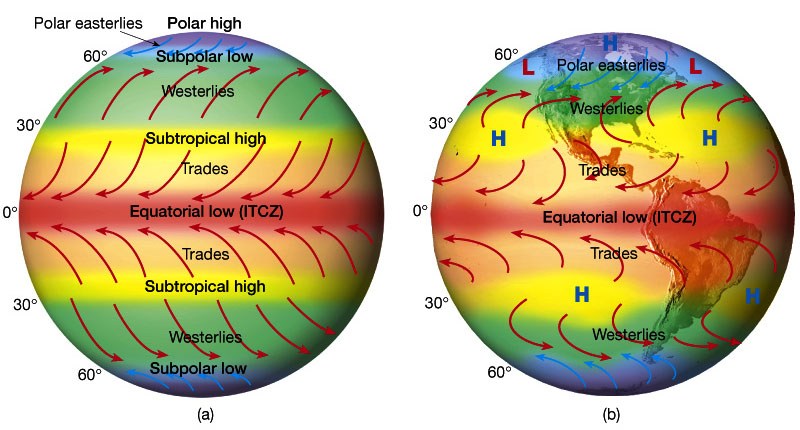
-Wind blows from high to low pressure

-Weather is the day-to-day state of the atmosphere with short-term variation

-Climate is defines as the statistical weather information that describes the variation of weather at a given place usually within a 30-year span of time.

-Idealized three cell model

-Over simplification because it doesn’t account for many other factors…



-Polar fronts at low pressure

-Wet climate with cloudy sky

-Horse latitudes at high pressure

-Dry climate with clear sky

-Inter tropical conversion zone (ITCZ) at equator

-Bands of clouds

-Shifts seasonally and moves other cells with it

-Flows: change depending on the hemisphere (for this class think northern hemisphere)

-Cyclonic flow

-Moves counterclockwise around at the northern hemisphere and clockwise at the southern hemisphere

-Anticyclonic flow

-Moves clockwise at the northern hemisphere and counterclockwise at the southern hemisphere

-Sea and Land Breeze

-Differential solar heating is due to different heat capacities of land and water

-Sea breeze: Sea🡪Land

-Land breeze: Land🡪Sea

-Storms and air masses

-Storms: Disturbances with strong winds and precipitation

-Air Masses: Large volumes of air with distinct properties

-Land air masses are dry

-Marine air masses are wet

-Fronts: boundaries between air masses

-Warm Front: contact where warm air masses moves to colder area

-Cold Front: contact where cold air masses move to warm area

-Jet-stream: narrow, fast moving, easterly air flow

-Tropical Cyclones (Hurricanes)

-Large rotating masses of low pressure

-Strong winds with torrential rain

-Defined by maximum sustained wind speed

-Tropical Depression (less than 61km/hour)

-Tropical Storm (61-120 km/hour)

-Hurricane (more than 120 km/hour)

-Saffir-Simpson scale 1(slow)-5(fast)

-Has nothing to do with how much damage may occur, some of the most hazardous and deadly hurricanes have been categorized not as a 5 because their speed wasn’t as fast but a the flooding and storm surge were enough to cause lots of damage.

-Also called Typhoons (North Pacific) and Cy

clones (Indian Ocean)

-Requires: Warm ocean water, Warm wet air, the Coriolis effect

-Storm surge: Increase in shoreline sea level

-Really hard to find pattern of Hurricanes

-Hurricane Katrina:

-Cat 3

-Costliest and deadliest U.S. Hurricane

-Flooded New Orleans

-Mix of precipitation and Storm Surge

Lecture 12:

*-Winds get named for the direction from which they come*

*-Currents get named for the direction in which they flow*

-Ocean Currents

-Importance

-Transports 20% of latitudinal heat

-Equator to poles

-Transports nutrients and organisms

-Influences weather and climate

-Influences commerce

-Wind driven: Mainly moves water horizontally

-Active down to 1km

-Surface Currents

-10% of Ocean currents

-Develop because of the friction between wind and the surface of the water

-2% of wind energy is transferred to the ocean surface

-100 knot wind will create 2 knot current

-A Gyre is any large system of rotating ocean currents particularly those involved with large wind movements

-5 Subtropical Gyres

-North Atlantic

-South Atlantic

-Indian Ocean

-North Pacific

-South Pacific

-Warm currents go from warmer areas to colder areas (carry warmer water to colder water

-Cold currents go from colder areas to warmer areas (carry colder water to warmer water

-Western boundary currents

-Narrow, deep, fast moves warm water to the poles

-Gulf Stream and Kuroshio Current

-“Western” because they are on the western side of the gyre

-Eastern Boundry Currents

-Wide, shallow, slow moving cold water from the poles to the equator

-California Current, Canary Current

-Density or gravity driven moves water vertically

-Mixes water masses

-Because of the difference in density of hot vs. cold water

-How can we measure currents

-Satellites

-Buoys

-Rubber ducky’s

-Upwelling!!!!

-Brings nutrient rich water up to the surface from the bottom of the ocean

-Major regions

-California, Peru, Canary, Benguela, Somalia, Equatorial

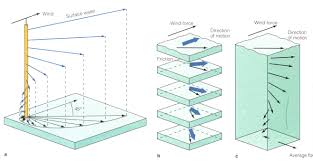
-Ekman Spiral

-Describes how wind affects water, the speed and direction of flow of surface waters and various depths

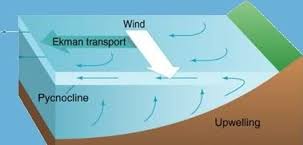
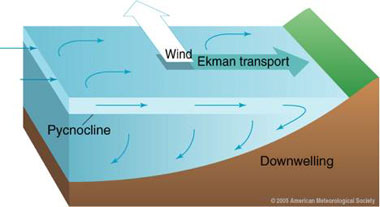
-Coriolis effect causes things to shift slightly to the right

-Each water layer affects the layer under it

-Net movement is 90˚ from the wind



-This is the process that causes upwelling and downwelling



-Eddy

-A circular movement of water formed along the edge of a permanent current

-In an average year 10-15 rings are formed

-Warm Core Ring

-Rotates Clockwise

-Found on the landward side of the currents

-Cold Core rings

-Rotate Counter Clockwise

-Form on the ocean side of the currents

-Curtis Ebbesmyer

-A shipment of Rubber Duckies was shipwrecked off the coast of china and released the Duckies

-Currents moved them and deposited them as it went

-Scientists tracked them and within 15 years they were found all around the globe