

Atms-100: exam iii review sheet

Business



ATMS-100: EXAM III REVIEW SHEET The exam will be 80 questions, multiple choice. You may use a calculator, however, CELL PHONE USE IS PROHIBITED.

Please bring a #2 pencil. Study aids: This sheet, lecture notes, textbook.

Learn and be able to apply concepts; do NOT simply memorize facts.

Questions? Come to office hours, ask your TA, post to the discussion board on Compass. FROM BEFORE: ? _What is the difference between satellites and radar? 1. Satellites: View clouds from space a.

Radar: View precipitation from ground ? _How is wind direction defined? 1.

Wind Direction: Direction FROM which the wind is blowing a. i. e. A north wind blows from the north (toward the south) b. Stick on weather map identifies wind direction ? _How do winds blow about high and low pressure systems in the Northern Hemisphere? 1.

Low pressure: counter-clockwise and inward (air converges and rises leading to clouds, rain) a. High pressure: Clockwise and outward (sinking air leads to clear skies) ? _What is pressure and how does it change with height? 1.

Pressure: Force/Area; molecules in given area a. it always DECREASES with height _What is an inversion? 1. Inversion: Layer in which the temperature increases with height ? _What is latent heat? 1.

Latent heat: The energy absorbed or released during a phase change a. "Hidden" energy · _What is advection? a. Advection: Transfer of heat (or moisture) through horizontal movements of air ? _What is saturation? What mathematical relationships are true at saturation? 1. Saturation: an atmospheric condition where level of water vapor is the maximum possible at the existing temp and pressure; equal rates of evaporation and

condensation a. Air is not a "sponge"- air is NOT so "full of water" that there is no room for anything else; molecules very far apart b.

Most of an air molecule is empty space ? _What is relative humidity? How can it be changed? 1. Relative Humidity: ratio of water vapor in air that is required for saturation a. Does NOT indicate actual amount of water vapor in air i. Higher RH does NOT necessarily mean there is more moisture in air ii. *****Higher RH MEANS air is closer to saturation***** b. At saturation, RH = 100% (VP= SVP) c.

$RH = (VP/SVP) \times 100\%$ d. Increase RH: 1) Add moisture to air (increase VP) or cool air (decrease SVP) ? _What is dewpoint? Why is it useful? 1. Dewpoint: as we cool air, temp at which saturation occurs; when surface cools below that temp dew (condensation) is created; frost forms if surface cools below freezing a. Can saturate air in two ways i. Add water to air (keep temp constant) ii.

Cool air (keep moisture content constant) b. *****Higher dewpoint temp ALWAYS means more moisture in the air***** iii. Warmer air ALWAYS contains more moisture at saturation than does cold air c. Dewpoint is ALWAYS less than or equal to the temp iv. Takes units of temp (oF, oC) d.

As dewpoint increases, vapor pressure increases e. On most days, can get a first-guess forecast of overnight temp by looking at afternoon dewpoint 2. Best way to compare atmospheric moisture concentrations between two locations??????? Whichever location has higher dewpoint ? _How do clouds form? 1. As air rises, it expands and cools a. Amount of water vapor in air does not change as air rises b.

Relative humidity increases c. Air eventually rises high enough (cools enough) to become saturated (RH= 100%) 2. Clouds are made of billions of microscopic water droplets or ice crystals d. Water droplets attach onto condensation nuclei and condense 3. Condensation nuclei: dust, ash, smoke, pollution, salt, plankton, etc.

HYDROPHILIC attract water e. Important because water droplets REQUIRE surfaces on which to condense ? _How do you read a station model? ? _Know the locations of the 50 US states, oceans, and the Rocky and Appalachian Mountains. ? _What is a constant pressure surface? * Uniform surface temperature and pressure; parallel to constant height surfaces ? How are low and high heights related to temperature and weather? * High Heights * Warm air below pressure surface * Analogous to high pressure on constant height surface * Remember: " A high is a high" * Low Heights * Cold air below pressure surface * Analogous to low pressure on constant pressure surface * Remember: " A low is a low" ? _How do you identify ridges and troughs? * A ridge is an area of higher heights or pressures * A trough is an area of lower heights or pressures ? _What is the pressure gradient force? In what direction does it act? $PG = \frac{\text{change in pressure}}{\text{distance}}$ * Tightly-packed isobars (elevation changes rapidly over small distance) - strong pressure gradient * Widely-spaced isobars - weak pressure gradient * Longer arrows = stronger PGF * PGF directed from higher to lower pressure (or higher heights to lower heights on constant pressure surface) * Acts perpendicular to isobars (or heights contours) * Air wants to go from where there is more air (high pressure) to less air (low pressure) * PGF causes wind to blow ? _How does the pressure gradient force influence the wind speed?

Stronger PGF yields stronger winds * Tightly-packed isobars (elevation changes rapidly over small distance) - strong pressure gradient * Widely-spaced isobars - weak pressure gradient ? _What is a cyclone? An anticyclone? * Cyclone: Low pressure systems * NH: Counter-clockwise flow * SH: Clockwise flow * Anti-cyclone: High pressure systems * NH: CW flow * SH: CCW flow ? _How do you determine the surface wind direction from isobars? * NH: * Lows: Winds spiral inward, ccw rotation * Highs: Winds spiral outward, cw rotation * SH: Lows: winds spiral inward, cw rotation * Highs: winds spiral outward, ccw rotation * Surface winds ALWAYS cross isobars at an angle from high to low pressure *Temp gradients stronger in winter (stronger height gradients and stronger winds during winter) ? _What is convergence? Divergence? * Convergence: Bringing together of air molecules * Increases pressure; add molecules * Divergence: Disperses air molecules * Decreases pressure; lose molecules ? _How are convergence and divergence related to the development of surface highs and lows? Air converges at surface lows, but aloft air diverges (DIV > CONV) * Air diverges at surface highs, but aloft air converges (CONV > DIV) * Must have things going on aloft to sustain low and high pressures ? _Why is vertical motion important? ? _What is a jet stream? Where are jet streams found? What causes jet streams? ? _What is an air mass? * Large body of air with similar temperature and moisture concentrations * Horizontal ONLY * Air masses form over flat, homogenous regions of earth's surface * Air acquires the characteristics of the underlying surface How are they classified? Based on moisture and temperature * First letter refers to moisture always lower-case * m = maritime : moist (water) * c = continental : dry (land) * Second letter refers to temperature always upper-case * T = tropical (hot) * P = polar

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(cold) * A = arctic (frigid) ? _What is a front? * Boundaries between air masses of different densities * Warm air less dense than cold air * Moist air less dense than dry air * Temp gradients found on cold side of fronts ? _How are fronts represented on weather maps? In notes. ? _What is a dryline? * Separate mT air (to east) from cT air (to west) Can trigger strong thunderstorms * Only change in dewpoint * Has warm air on both sides ? _What is a mid-latitude cyclone? * Aka extratropical cyclone (means not of the tropics) * Area of low pressure (surface low) * Center of cyclone is center of low * Lifetime: several days to a week+ * Scale: Hundreds to 1000+ miles across ? _Where is warm air and cold air found with respect to a surface low? * Warm air is to the east/SE * Cold air is north and west and SW ? _How do mid-latitude cyclones influence the weather? * Provide precipitation to many regions of the world Produce much of the severe weather across North America * Cause thunderstorms, tornadoes, blizzards, ice storms, widespread rain and snow LECTURE #17: ? _What is the Gulf Stream? * Warm currents east of continents ? _What is the thermocline? * Rapid temperature decrease with depth a few hundred meters below surface * Transition from warm water to cold water ? _How does oceanic temperature vary with depth? * Warmest ocean water near surface * Temp decreases with height * Deep ocean waters only a few degrees above freezing ? _What is upwelling? How does it affect oceanic temperature? * Vertical transport of deep ocean waters upward Results in cooler surface water temps * Typically seen along west coast of continents - results in cooler summers along west coast ? _What is ENSO? El Nino? La Nina? ENSO - Normal Conditions * El Nino Southern Oscillation * Upwells in East Pacific * See easterly trade winds across equatorial Pacific * As winds push water from east to west, water is

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warmed by sunlight * Warmer water to west; cooler water to east * Higher sea level, deeper layer of warm water to west * Surface low pressure near Indonesia -West (clouds/rain); high pressure near South America -East * Warm, moist air rises over Western South Pacific Ocean Near Australia and Indonesia * Clouds, heavy precipitation * Air sinks near west coast of South America * Clear skies, little precipitation * Driest place on earth; Atacama Desert, Chile El Nino increased wind shear * Warmer than average water in the Pacific off South America * Walker Circulation reverses (westerly winds) * Lower pressures and clouds and precipitation are now in Eastern Pacific while higher pressures are in Western Pacific * Pressure gradient weakens across equatorial Pacific * Easterly winds weaken * Warm water flows eastward across Pacific Reaches max at Christmas aka " boy child" refers to Christ Child * May last for many months, affects large area, occurs every 2-7 years * Event ends as surface pressure field returns to normal * Vary in length and duration La Nina * Cooler than average water in the Pacific off South America ? _How do the phases of ENSO affect the weather in the eastern Pacific? The western Pacific? El Nino * Water temps may be 6F (11C) warmer than normal in Eastern Pacific * Warm water is nutrient poor (no upwelling) * Dead fish, dead birds Dry weather in western Pacific, wet weather in eastern Pacific * Tropical cyclones (hurricanes/typhoons) * Increase in eastern/central Pacific (but weaker hurricanes) * Decrease in western Pacific and all of Atlantic La Nina * Easterly trade winds become stronger than normal * Get increased upwelling along coast of South America * Colder than normal water * Better fishing conditions * Dry weather * Wet in western Pacific * Walker Circulation intensifies * Stronger pressure gradient causes intensification of WC. Leads to more upwelling along west coast of

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Peru and cooler waters along the equator

LECTURE #18: ? _What is the difference between a hurricane and a typhoon? * They're the same just different names because they occur in different regions of the world ? _What is a typical hurricane track in the Atlantic Ocean? * Western then North * Move East at mid-lats due to large-scale weather patterns * Large-scale weather patterns steer hurricanes ? _What are the names and relative intensities of tropical cyclones in the Atlantic Ocean? * Tropical disturbance/Tropical wave - Cluster of showers and thunderstorms * Slightly lower pressure * Tropical waves also known as African Easterly Waves

Tropical Depression - Winds less than 39 mph (34 knots) * Even lower pressure * More organized thunderstorms * Tropical Storm - Tropical cyclone with winds between 40 and 73 mph (34-64 knots) * Hurricane - Strong tropical cyclone with winds greater than 74 mph (65 knots) and eyewall development * MAX sustained winds for all of these (NOT average!) ? _When are hurricanes most likely? Why? * September * Reason being ocean temps are warm from summer ? _What ingredients are required for hurricane formation? Why are these ingredients necessary? * Sea-surface temps (SSTs) greater than 26. C (80 F) * Hurricanes get their energy from warm ocean waters * Warm water adds heat and moisture to lower troposphere * Put air on top of warm water air warms and rises * Aids thunderstorm development * Deep layer of warm water in upper ocean * Must be deep enough because hurricanes stir up the ocean as they move across it * Large waves mix warm surface water with cold deeper water * Ocean temp decreases with depth * Thunderstorms have strong winds which mix water of ocean want to mix warm only so need DEEP layer * Cluster of thunderstorms Usually in the form of tropical disturbance or wave (big swirl of clouds air is rising) * ***Moist air

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in mid-troposphere * Clouds like air to be saturated Put dry air in clouds and all the little water droplets that make up cloud will evaporate * Clouds form condensation releases latent heat, which lowers surface pressure which means STRONGER hurricane! * Weak wind shear (<15 kts) * Latitude poleward of 5 degrees * Coriolis force is zero at equator (no hurricanes at equator) * Allows system to rotate without CF the system cannot spin/rotate * ***NEED Coriolis Force ? _What is the ITCZ? Intertropical Convergence Zone * Belt of thunderstorms (found near equator) * Form where the NE and SE Trade winds meet and converge ? _What is a tropical wave? * Isobars look like wave (causes convergence and divergence) * Cluster of thunderstorms ? _What is vertical wind shear? How does it affect hurricanes? * The change in wind direction or wind speed with height * Strong vertical wind shear is usually associated with strong winds aloft * Strong vertical wind shear is BAD for hurricanes * Rips them apart * Favorable for thunderstorms, tornadoes, mid-latitude cyclones ? _How do hurricanes intensify? Thunderstorms form near center of developing storm * Thunderstorms = RISING AIR * Air diverges aloft from thunderstorms * Divergence aloft creates low pressure at surface * At surface, air flows counter-clockwise and inward toward center of low * As air moves over warm ocean, heat and moisture transferred from ocean to air * More heat/moisture rising means stronger thunderstorms, more divergence aloft, and lower pressure at center * Lower pressure means stronger PGF and stronger winds, and more heat/moisture transfer from sea * Feedback Mechanism*** ? _What can cause a hurricane to dissipate? Strong vertical wind shear * Rips storm apart (slants hurricane moving the divergence aloft so its no longer directly above the surface low) * Moves over land * Ocean is source of heat and moisture taking hurricane away from energy source *

Mountains rip storm apart (rip circulation of lower section of hurricane apart)

* Moves over cold water * Loses source of heat and moisture * Remains stationary for too long * Upwelling of cold water weakens storm ? _What is the eye of a hurricane? The eye wall? What are the weather conditions in each? * Eye * Center * Lowest pressure * Calm and clear (weak winds) Warm * Eyewall * Strongest pressure gradient * Strongest winds * Heaviest rain * Worst weather * Spiral bands * Outer portion of the storm * Higher air pressure * Winds get weaker the farther they move from the eyewall

LECTURE #19: ? _How are the left and right sides of a hurricane defined? * If you're moving with the hurricane, your right is the hurricane's right * Winds are strongest on RIGHT side of circulation b/c speed of storm and wind speeds are additive * Storm motion and winds are in same direction * They are in opposite directions on LEFT side of the storm * Subtract * Weaker winds _What are the main hazards associated with hurricanes? * Strong winds * Storm surge * Inland flooding * Tornadoes ? _How does storm motion affect the winds around a hurricane? * Storm moving toward north at 25 kts * Wind speed = 100 kts * Winds on east side = 125 kts (100+25) * Winds on west side = 75 kts (100-25) ? _What is the Saffir-Simpson scale? Please do NOT memorize the table.

* Categorizes hurricanes: determined by maximum sustained wind speed ? _What is storm surge? Where is it most intense? How is it created? * Storm surge = a rise in the sea level due to a tropical cyclone (waves on top of waves) * Reasons: Winds pile up water against coast * Low pressure allows sea level to rise * There is less force pressing down on the ocean surface * Storm surge is most intense in the right-front quadrant of a hurricane *

KNOW Diagram * Pressure is weight of atmosphere above you * Lower pressure means less weight of atmosphere pushing downward * This allows ocean to bulge upward beneath region of low pressure ? _How did Hurricane Katrina flood New Orleans? * Storm surge funneled into Lake Pontchartrain Lake levels rise * Northerly winds directed lake waters into New Orleans Water came into New Orleans from NORTH * Levees overtopped and city flooded * New Orleans sits below sea level ? _Where are tornadoes most prevalent with respect to the eye of a hurricane? * Tornadoes most common to right of eye * Spiral bands LECTURE #20: ? _What is the difference between forced and buoyant ascent? * Forced - air doesn't want to rise its forced to (by things like mountains) * Buoyant - Air rises on its own (warmer than air around it) ? _How does temperature affect air density? * Warm air is less dense (lighter) ? _How does the temperature of air change as it rises and sinks? Why? * Air temp decreases as it rises, as it sinks it warms * Pressure decreases with height so as air rises air molecules become more spread out (not as condensed) and therefore do not run into each other as much leading to cooler temps * When air sinks, pressure increases meaning it compresses the air molecules so there are more collisions which increases temp ? _Know how to read and interpret a sounding. (Lab #2) * When rising parcel temp (smooth) is to RIGHT of temp line (zigzag), parcel is WARMER than environment and will continue to RISE * UNSTABLE!!! When rising parcel temp (smooth) is to LEFT of temp line (zigzag), rising parcel is COOLER than environment and will begin to SINK * STABLE!!! ? _What are the dry and moist adiabatic lapse rates? Why are they different? Be able to do basic calculations with them. * Dry adiabatic lapse rate - Rate at which a rising unsaturated (T ; Td) air parcel cools * 10 C/km, Constant * Moist adiabatic <https://assignbuster.com/atms-100-exam-iii-review-sheet/>

lapse rate - Rate at which a rising saturated ($T = T_d$) air parcel cools * 6 C/km, Variable * Different b/c as saturated air rises, it cools Water vapor must condense out of air parcel to keep RH 100% * Condensation releases latent heat, offsetting some cooling due to ascent * SMOOTH line ? _What is the environmental lapse rate? How is it measured? * Rate of decrease of environmental temperature with height * Says nothing about how temp of rising or sinking air parcel changes! * Related to slope of temp line * Zigzag line ? _Be able to define and identify the following from a sounding: LCL, LFC, EL, CAPE, CIN. * Lifting Condensation Level (LCL) - Level at which a rising surface air parcel becomes saturated * Changes from dry to moist adiabatic lapse rate Look for inflection in parcel temp * Level of Free Convection (LFC) - Level at which a rising surface air parcel becomes positively buoyant (warmer than its environment) * Equilibrium Level (EL) - Level at which a rising surface air parcel is no longer positively buoyant (typically found near tropopause) * Parcel crosses back to the left of environmental temp line (zigzag line) * Convective Available Potential Energy (CAPE) - Area between parcel temp and environmental temp when parcel is warmer than environment * Between LFC and EL * Big CAPE = Big Storm (if storm forms) Rising air parcel warmer than environment * Convective Inhibition (CIN) - Area between parcel temp and environmental temp when parcel is cooler than environment * Below LFC * Want small, or zero if possible (for storms to form) * Rising air parcel cooler than environment ? _How is the lifted index calculated? Why is it useful? (also see Lab #13) * Lifted Index (LI) - lift parcel from surface to 500 mb * How? Follow parcel temp line to 500 mb * Subtract parcel temp at 500 mb from environmental temp at 500 mb * $LI = T_{env} - T_{parcel}$ Negative LI means rising air parcel warmer than environment and <https://assignbuster.com/atms-100-exam-iii-review-sheet/>

thunderstorms possible * Positive LI means thunderstorms not likely ? _How can the atmosphere be stabilized? Destabilized? * Stabilized * Warm air aloft * Warm air aloft * Warm air advection * Cool surface * Nocturnal cooling * Cold air advection * Most stable around sunrise * Destabilized * Cool air aloft * Cold air advection * Warm the surface * Solar heating * Warm air advection * Most unstable around afternoon ? _Under what conditions are thunderstorms most likely? (Also see Lab #13) * Atmosphere is unstable CAPE large * CIN small or zero * LI negative * Most likely in late afternoon/early evening hours LECTURE #21: ? _What is a thunderstorm? * A tall, vertically developed cloud that produces lightning and thunder * Can't have lightning without thunder! * Usually produce heavy precipitation * Clouds = CUMULONIMBUS * Informally called “ thunderheads” ? _What is required for all thunderstorms to form? * Instability * Air rises due to buoyancy * Rising warm and humid air is fuel for thunderstorms ? _What mechanisms can trigger thunderstorms? How? What can make air rise? * Fronts or drylines some type of air mass boundary * Cold front (cool dense air) forces warm (moist) air upward * Sea breezes (or lake breezes) * Cool sea water causes cool air * Land has warm air above it from solar heating * Cool sea water forces warm air aboveground upward * Outflow boundaries (gust fronts) * Contain cool air that forces warm air surrounding it upwards * Mountains * Atmosphere heats from ground up. Air over mountain warmer than air around it and so it rises ? _What is a severe thunderstorm? Contains ANY of the following: * Wind gusts at the surface greater than 50 kts (57.5 mph) * Hail with diameter greater than 1.00 inch (2.54 cm) * Roughly quarter-sized * Tornado ? _What are the stages of thunderstorm

development? * Cumulus Stage - Developing * Warm air rises, and cools. Water vapor condenses and forms a cloud * Rising air called UPDRAFT * Air rises due to buoyancy * ***Cannot have a thunderstorm without an updraft! *** * As cloud gets deeper, precipitation particles begin to form * Mature Stage - Thunderstorm most intense Updraft may eventually reach tropopause * Tropopause is very stable- acts as lid on storm * Air diverges outward when it reaches tropopause, forms ANVIL CLOUD * Top of updraft may penetrate into stratosphere called overshooting top * Precipitation particles grow, become heavy, begin to fall into updraft * Falling precipitation drags air downward with it * Some rain evaporates, cooling air even more * When air is cooler than its surroundings, it sinks DOWNDRAFT * Precipitation is required to form a downdraft * OUTFLOW When cold downdraft reaches ground, it spreads out * Forms POOL of COLD air beneath storm * Known as COLD POOL or OUTFLOW * Boundary between cold outflow and warm inflow called GUST FRONT or OUTFLOW BOUNDARY between cold pool and warm air * This is why temp drops and winds increase just before a thunderstorm begins * Also, why it is cooler just after thunderstorm * Convergence at outflow boundary may trigger new storms * Dissipation Stage - Dies * Rain falls into updraft * Cools updraft, drags rising air downward Updraft weakens, replaced by downdraft * Surging outflow cuts off supply of warm, moist, unstable air * Needed to feed updraft * Updraft dissipates * Thunderstorm dominated by downdrafts and precipitation * Thunderstorm quickly dissipates * Orphan Anvil clouds ? _What best discriminates between ordinary and severe thunderstorm environments? * Wind shear (stronger = more severe) ? _Why do ordinary thunderstorms only last for about an hour? * Little wind shear causes downdraft to occur much more quickly which kills

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thunderstorm LECTURE #22: _What is a downburst? A microburst? What causes them? * Downburst - Strong downdraft that comes in contact with the ground * Sinking air must be colder than air around it * Microbursts - Smaller (and often more intense) downbursts (smaller spatially) * Rain drags air downward with it * Rain falls into unsaturated air and evaporates * This cools the air * Cold air sinks * Can sink as fast as 40-50 mph * Straight-line winds often result after downburst hits the ground? _What are straight-line winds? How do they form? * Intense winds blowing in the same direction Winds in a tornado rotate * Often result from downbursts or microbursts * Can reach 100 mph? _How can one determine if damage was caused by straight-line winds or a tornado? * All of the debris falls in the same direction? _What is an MCS? What are the primary severe weather threats from one? * Mesoscale Convective System - Large complex of thunderstorms convection transferring heat and moisture upwards * Can cover an entire state * Produce a lot of rainfall * Important for agricultural Midwest * Hazards include flooding, straight-line winds, occasional weak tornado? What are the two components of MCS structure as seen by radar? * Small thunderstorms to larger patch (gust fronts merge) * Convective Zone: line of thunderstorms just behind gust front * Heavy rain, strong gusty winds * Stratiform region * Large area of light to moderate rain found behind convective zone? _Why is vertical wind shear important to MCS maintenance? * Prevents (restrains) gust front from moving too far in front of updrafts * Shear also generates more lift at gust front - leads to more intense system * Better chance of developing new thunderstorms Also without shear, rain would fall into updraft? _What is the rear-inflow jet? How does it form? * Front-to-rear - Warm moist air in front of storm is forced up (by gust front) and moves from <https://assignbuster.com/atms-100-exam-iii-review-sheet/>

front to rear of system * Forms precipitation * Rain falls into cool dry air near rear of system * Evaporation cools air * Descends, eventually reaching surface * Called rear inflow jet jet of air that enters rear of MCS ? _What is a shelf cloud? Where can one be found? How does it form? * Warm air lifted at gust front forms shelf cloud _What is a bow echo? A squall line? A derecho? * Bow echo - thunderstorms form shape of bow * Known for producing prolific wind damage * Derecho - especially intense bow echo * Squall line - a line of severe thunderstorms that can form along or ahead of a cold front LECTURE

#23: ? _What is the charge separation in a typical thunderstorm? *

Lightning ? _Why is there a charge separation in thunderstorms? * Ice

particles of different sizes collide in cloud and transfer electrical charges *

Like dragging socks across carpet LARGE ice particles become NEGATIVELY

charged, fall downward * SMALL ice particles become POSITIVELY charged

and stay higher in the cloud * Each collision transfer small charge but occurs

billions of times adds up to a large charge (lightning) * Negative charge at

bottom of cloud positive charges on ground gather on ground under cloud ?

_What are the three types of lightning? * Cloud-to-ground what we're used to

seeing but makes up only 20% of lightning strokes * Cloud-to-cloud * Intra-

cloud cloud strikes itself ? _What is sheet lightning? " Heat lightning? " * See

lightning from long distance especially at night Light can be scattered by

clouds and rain, resulting in sheet lightning * Entire sky appears to light up

(cloud-to-cloud lightning between clouds scatter light) * May not hear

thunder because it is so far away * Sometimes, this is mispronounced as "

heat lightning" because it most frequently occurs on hot/humid nights ?

_How does a lightning strike occur? * Stepped leader - lightning finger pokes

out (moves down 100, 000 mph) * Reaches ground * Return stroke - lights

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up entire bolt (10, 000, 000 mph) * Dart Leader – follows path of least resistance (why lightning may appear to light up 4 or 5 times) ? What is the relationship between lightning and thunder? * Lightning heats air around it, causing the air to expand violently, forming a sound wave * Temperature can reach 30, 000 C (54, 000 F) * About six times hotter than surface of sun * We hear this sound as thunder ? _What are the safest places to be during a lightning storm? What places should be avoided? * Safest: get indoors or a car * AVOID: Open fields, trees, metal objects, water * DON'T: take a shower, use a corded phone or anything that plugs into the wall ? _What is hail? How is it formed? Hail: Frozen precipitation that falls from thunderstorms * Large hail requires strong updrafts, and hence supercell thunderstorms * Hail formation: Step 1 – Supercooled water droplets and ice crystals form at high altitudes ($T < -15\text{ C}$) in updraft * Step 2 – Ice particles fall through supercooled water and grow into graupel (soft ice) particles 1-5 mm in size; largest concentration of graupel particles are near periphery of updraft * Step 3 – A few graupel particles (hail embryos) are swept back into updraft from the side * Step 4 – Hail embryo is suspended in updraft and grows rapidly via accretion of supercooled water * Step 5 – Hailstone moves out of updraft region and rapidly falls to earth ? _How do hailstones acquire layers? Hardness of hailstones varies Largest hail falls closest to updraft * Suspended in updraft goes through different parts either growing by dry or wet growth * Wet growth = CLEAR ICE * Dry growth = CLOUDY ICE ? _What are the three main types of floods and the dangers from each? * Flash floods * Occur rapidly, typically without little warning * Localized, short duration floods * Generally less than 6 hours * Usually caused by slow-moving thunderstorms * Can result in many injuries and fatalities * Hard to warn

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because don't know where storm will occur * Widespread floods * Cover large areas * Due to widespread heavy rains over several days or snowmelt * Able to forecast days in advance * Fewer casualties, much greater damage * Coastal floods ? _Why is it dangerous to drive through flood waters? A lot of flood-related fatalities occur in automobiles * A car can be swept away by fast moving water that is 2 feet deep * YOU can be swept away by fast moving water that is 6 inches deep LECTURE #24: ? _What weather conditions are favorable for the formation of supercell thunderstorms? * Vertical wind shear Supercells will not rotate without it! * Low-level jet * Strong winds from South around 850 mb * Provides low-level shear * Jet stream aloft * Westerly flow * Instability * Trigger * Front, dryline or outflow boundary * Trough in jet stream to west (upper-level divergence) ? _What is a supercell? * Long-lived, rotating thunderstorm cells Can last for hours * Often isolated * Always rotate * Strongest (and most rare) type of thunderstorm * Almost always severe * Produce most hail golf ball sized and larger * Produce nearly all violent tornadoes ? _Why are supercells able to persist for hours while ordinary thunderstorms do not? * Precipitation falls downwind of updraft updraft is rain free! * Heaviest precipitation falls adjacent to updraft ? _What is a mesocyclone? * Persistent rotating updraft ? _How do supercells acquire rotation? * Horizontal due to vertical wind shear * Updraft tilts this rotation vertical ? _What is a wall cloud? * Lowered cloud beneath the updraft base Rotating wall cloud indicates that a tornado may form ? _What are mammatus clouds? * Sometimes seen hanging from the anvil of thunderstorms ? _What is the RFD? How is it visually manifested? Why? * Forward-Flank Downdraft (FFD) - can contain heavy rain, strong winds, and large hail visibility limited * Rear-Flank Downdraft (RFD) -

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appears as a clear slot near updraft base (sinking air means clear skies) *

Area in between where precipitation is being brought around tornado and where the hook echo forms ? _What is an HP supercell? An LP supercell? In which type of supercell are tornadoes most likely? * HP = High-precipitation supercells Significant precipitation near updraft * LP = Low-precipitation supercells * Little precipitation everywhere * Normally doesn't have hook echo * In a classic supercell tornadoes are most likely to occur LECTURE #25: ? _What is a tornado? * A violently rotating column of air in contact with the ground * Typically visible as a funnel cloud * Occurs in all 50 states but not very likely on East or West coasts ? _What defines when a tornado has " touched down? " * See dust or debris swirl ? _How do tornadoes acquire their rotation? * Horizontal winds from vertical wind shear are tilted vertically by updraft ? _What is meant by tilting and stretching? Easterly winds at surface and westerly winds aloft (forms tube of air) * Updraft causes tube to tilt * First part of tube is moving into storm faster stretching it out * Stretches as it tilts into storm ? _What is a hook echo? How does it form? * Dry air being brought in at South and precipitation being brought around towards SW cause hook echo * Left/right side nomenclature * May see hook echo on right-rear flank of storm * Indicative of rotation * Often associated with tornadoes * Precipitation particles rotate around mesocyclone ? _Where in a supercell are tornadoes most likely? * Wall cloud ? _What is a multiple vortex tornado? Less intense tornadoes have rising air in center, but central downdraft can form in strong tornadoes * Downdraft in center breaks circulation into smaller vortices * Wind field is complex: Must add tornado motion, rotation of tornado, and rotation of suction vortices * One house may be destroyed, while house next door is not * Smaller vortices rotate around <https://assignbuster.com/atms-100-exam-iii-review-sheet/>

center of tornado ? _What are landspouts and waterspouts? How do they differ from supercell tornadoes? * Circulation at surface stretched by updraft

- * No downdraft or supercell required
- * Non-supercell tornadoes
- * Usually occur in ordinary thunderstorms or MCSs, but still rare
- * Usually less intense than supercell tornadoes, but still dangerous ?

What is the Enhanced Fujita Scale? On what is it based? Please do NOT memorize the table. * Measures intensity of tornadoes

- * Intensity determined by damage
- * Depends on quality of construction
- * Did tornado hit anything?
- * Enhanced Fujita (EF) Scale corrected for quality of construction
- * Original Fujita (F) scale was not ?

_Which types of tornadoes are the most deadly? Why? * F5/EF5 ? _How can radar be used to detect tornadoes? * Storm spotter - Can see tornado! * Tornadoes tough to see at night, in rain, and in forested or hilly areas * Doppler radar is able to detect rotation within thunderstorm radar views precipitation from the ground ? What is the safest place to be during a tornado? * Go to interior room on lowest floor of a sturdy structure * Basements preferred * If one is not available, use a closet or bathroom * Stay AWAY from windows * Protect yourself from flying debris if possible ?

_What places should be avoided during a tornado * Cars * Mobile homes * Highway overpasses * Large rooms like Lowe's, Walmart

Tornado Stats: *

There is an average of 1000 tornadoes reported in the United States each year * On average, 56 people are killed, and 975 people are injured by tornadoes each year * Most tornadoes are short lived * Last only for a minute or two * Some can last for up to an hour