**Chapter 7 - Precipitation**

**Solute Effect** - Makes it harder to evaporate a droplet when the condensation nuclei dissolves into the water, forming a solute. Because of the solute effect, a droplet containing an impurity (such as salt) can be in equilibrium when the RH is <100%

**Curvature Effect** - Causes water to evaporate easier from a small droplet due to the droplet’s high degree of curvature. Larger droplets are not as curved, so this affects mostly small droplets. To keep small droplets from evaporating the air has to be supersaturated (over 100% RH) to keep the water in liquid form.

**Collision-Coalescence** - The merging of liquid cloud droplets by collision is called coalescence. Large droplets fall faster than small droplets and have a larger terminal velocity because of their surface area to weight ratio.

Ice Crystal Bergeron Process - Occurs in the middle and high latitudes where there are cold clouds (that go above freezing). Ice crystals grow at the expense of surrounding water droplets.

**‘Supercooled’ Droplets** - Liquid water droplets that exist at temperatures below freezing. At temperatures below -40C, only ice crystals exist in a cloud, and the region of the cloud is called glaciated.

**Accretion** - When ice crystals collide with supercooled droplets, the droplets can freeze and stick to the ice. The process of ice crystals growing from collision with liquid droplets is called accretion.

**Aggregation** - When ice crystals collide and stick to each other it is called aggregation. This is how snowflakes are formed.

**Cloud Seeding** - Preferably the upper part of the clouds should be supercooled for the ice-crystal Bergeron process to allow cloud particles to grow. Dry ice or silver iodide. High cirrus clouds can drop ice that can seed other clouds below it, such as the nimbostratus.

**Rain** - A falling drop of liquid water must have a diameter greater than or equal to 0.5mm.

**Drizzle** - Water droplets falling uniformly with smaller diameter are considered drizzle.

**Rain Shower** - When updrafts holding suspended drops changes to a downdraft, and the drops fall suddenly to the ground.

**Virga** - If raindrops evaporate before they reach the ground, the hanging stream of precipitation.

**Fall Streaks** - When ice crystals or snow fall from high cirrus clouds, similar to virga. Sublimate

**Snow Flurries** - Light snow intermittently falling from developing cumulus clouds is in the form of flurries.

**Snow Squall** - A more intense snow shower.

**Blizzard** - The combination of drifting and blowing snow after snow has ended is called a ground blizzard. A true blizzard is a weather condition characterized by low temperatures and strong winds bearing large amounts of fine, dry, powdery particles of snow, which can reduce visibility to only a few meters.

**Freezing Rain** - If the raindrops do not completely freeze as they fall, they reach the ground as supercooled liquid drops. When they strike a cold object, they spread out and freeze immediately.

**Snow** - A light, fluffy covering of snow protects sensitive plants from damaging low temperatures, by preventing the ground from freezing. Good insulator and poor heat conductor. 10” = 1”

**Sleet** - When a falling snowflake begins to melt in warmer air, then falls through subfreezing surface air and refreezes into ice it becomes a tiny ice pellet called sleet. Generally these ice pellets are transparent or translucent, with diameters of 5mm or less. They bounce at the ground and make a tapping sound against windows or metal.

**Snow Grains** - Small, opaque grains of ice; solid equivalent of drizzle. They are fairly flat and elongated, with diameters less than 1mm. Upon striking a surface they do not bounce or shatter.

**Graupel** - Ice particle accumulation with rime. It is opaque (a white color) because of tiny air bubbles that scatter light and give it low density. Also called ‘soft hail’.

**Snow Pellets** - A form of grapple. Larger than snow grains. White, opaque grains of ice, with diameters less than 5mm. They are similar to snow grains, except they are brittle, crunchy, and bounce on a surface. They fall as showers from cumulus congestus.

**Hail** - Can form from grapple, particles, frozen raindrops, even insects, that can act as an embryo in intense thunderstorms, growing through accretion as it continues to be pushed up by an updraft. The embryo attracts supercooled droplets (accretion) and forms into big hailstones in cumulonimbus clouds with lots of updrafts.

**Chapter 8 – Air Pressure & Winds**

**Pressure Gradient Force** - The horizontal difference in temperature creates a horizontal difference in pressure. This establishes a force, called the pressure gradient force that makes the air move from higher pressure to lower pressure horizontally.

**Ideal Gas Law** - The ideal gas law states that air temperature, pressure, and density are all related. **Pressure** = Temp \* Density \* Constant. .0035 (mph^2) or 13.02 (x) surface area

**Barometer** - Instrument that detects and measures pressure changes.

**Mercury Barometer** - Column filled with mercury that rises to balance the weight of air above a dish filled with mercury. Torricelli

**Aneroid Barometer** - Uses no fluid. The cell expands or contracts with pressure changes.

Isobars - Lines connecting points of equal pressure on a map/chart.

**Sea-Level Pressure Chart** - A map with pressure reported at a constant elevation (sea-level) with isobars drawn between changing pressures. All of the pressure readings are adjusted to the same elevation.

**Anticyclone** – H on a map. In the U.S., cyclones can be called mid-latitude cyclonic storms

**Northern Hemisphere** - Winds blow clockwise and outward from the center of the highs and counterclockwise and inward towards the center of the lows.

**Southern Hemisphere** - Windows blow counterclockwise and outward from the center of highs, and clockwise and inward from the center of lows.

**Upper Level Isobaric Charts** - Shows a constant pressure surface (i.e. 500mb) at varying heights. Troughs represent lows and ridges represent highs.

**Surface Map vs. Upper Level Map** - A surface weather map has a constant height (sea level) and varying pressures. An upper level, or isobaric, map has a constant pressure, with varying heights.

**Pressure Gradient** - Difference In Pressure / Distance

**Corilois Force** - The Coriolis Force causes the wind to deflect due to the earth’s rotation. Reaches a maximum at the poles and is zero at the equator. The stronger the wind and the higher the latitude, the greater the deflection. Only influences wind direction and NOT wind speed.

**Centripetal Force** - An inward directed force that keeps winds moving in a circular path. Centripetal force is only important when wind is strong and blows in a tight curve (small radius) as in tornadoes and hurricanes

Chapter 9 – Wind: Small Scale and Local Systems

**Microscale** - Smallest scale of motion. Eddies - rotors

**Mesoscale** - Circulation of a city scale, middle scale (Few km - 100km)

**Macroscale** - Synoptic and global together (very large scale)

**Sea and Land Breeze (Mesoscale)** - Uneven heating of land and water. Sea breezes can run into each other and form a sea breeze convergence zone

**Sea Breeze** - Blows at the surface from the sea towards the land. Day: land hot, water cold = sea breeze.

**Land Breeze** - A surface breeze that flows from the land towards the water. Night: Water hot, land cold = land breeze.

**Valley Breeze** - On mountain slopes, warm air rises during the day creating a valley breeze (upslope wind)

**Mountain Breeze** - During the night, nocturnal sinking of cool air creates a mountain breeze (downslope wind)

**Chinook Winds** - Warm, dry downslope wind descending on the leeward side of the Rocky Mountains. Associated with a sharp rise in temperature and a sharp drop in relative humidity on the leeward side. Opposite of katabatic winds

**Haboob** - Cold downdrafts in thunderstorms lift the sand or dust into a huge cloud. This is common in the African Sudan and Southern Arizona region.

**Dust Devil** - Rotating vortex on clear, hot days over a dry surface. The sun heats a surface, the hot surface becomes unstable, convection makes the hot air rise, and winds deflect the flow, rotating the air. This is also common on Mars.

**Winter Monsoon (Dry Season)** - Winds moves air from land to water, causing a dry season on land.

**Summer Monsoon (Wet Season)** - Wind flow reverses and wind moves air from water to land, bringing moisture to the land and a wet season.

**Onshore** - Wind blowing from water onto land

**Offshore** - Wind blowing from land onto water

**Wind Measurement Devices** - Wind Vane, Pressure Plate Anemometer, Cup Anemometer, Aerovane (Wind Vane + Anemometer), Rawinsonde, & Wind soundings