PHSC 3033: Meteorology

Clouds
Cloud Type Portraits

- **High Clouds**
  - Cirrostratus
  - Halo around sun
  - Cirrocumulus (mackerel sky)
  - Altocumulus

- **Middle Clouds**
  - Altostratus (sun dimly visible)

- **Low Clouds**
  - Nimbostratus
  - Stratus
  - Steady precipitation
  - Stratocumulus
  - Cumulus
  - Showery precipitation

- **Clouds with Vertical Development**
  - Anvil top

- Heights:
  - 23,000 ft
  - 6500 ft
  - 7000 m
Stratus

Strata: (Latin) layers.

Stratocumulus
Stratus Clouds

Stratus clouds are uniform gray clouds that usually cover the entire sky. They form from very weak, upward vertical air currents causing condensation. Stratus clouds also form when a layer of air is cooled from below to its dew point temperature and water vapor condenses into liquid droplets. Remember fog? Stratus clouds look like a layer of fog that never reaches the ground. In fact, fog that "lifts" off the ground forms a layer of low stratus clouds. Precipitation rarely falls from true stratus clouds since the upward vertical motion needed for precipitation is very weak, but light mist and drizzle can sometimes accompany stratus clouds.

- Cirrostratus
- Altostratus
- Nimbostratus
- Stratocumulus
Cirrostratus: These sheet-like, thin clouds form above 18,000 feet. Cirrostratus clouds are so thin that the sun and moon can be seen clearly through the clouds forming halos. Thick cirrostratus clouds give the sky a bright white appearance and often signal rain or snow within 24 hours, especially if they are followed by mid-level clouds.
Altostratus

Altostratus: These gray or bluish-gray clouds form between 6,000 and 20,000 feet. Altostratus clouds cover the entire sky over an area that usually extends over hundreds of square kilometers. The sun may be visible under thinner sections of the cloud. Altostratus clouds usually form ahead of a storm producing widespread and mostly continuous precipitation. Altostratus clouds do not allow enough sunlight to break through the cloud to form any shadows on the ground.
Altostratus
Nimbostratus

NIMBUS: precipitation producer

Nimbostratus: These dark gray clouds usually form below 6,000 feet and are almost always associated with continuous light to moderate precipitation. Precipitation with a nimbostratus cloud is never the heavy, showery type and often can last for several hours to more than a day. Sun & moon are not visible through a layer of nimbostratus clouds.
Nimbostratus

These clouds usually form in a stable atmosphere where warm, moist air is overrunning colder air at the surface over a relatively large area. Associated with warm fronts. Visibility is often very poor below nimbostratus clouds as fog and fast-moving, ragged clouds, known as scud or stratus fractus clouds, form in the precipitation-cooled air below the cloud.
Stratocumulus

Stratocumulus: These low, lumpy cloud layers form below 6,000 feet and can appear in rows, patches or as rounded masses with blue sky in between the cloud elements. The color of stratocumulus clouds can range from white to dark gray. Precipitation rarely falls from stratocumulus clouds. The individual cloud elements form where the air is rising while the blue sky in between the cloud elements indicates sinking air.
Stratocumulus
Cirrus Types

Cirrus (Latin) curl or filament.

The most common variation of high-level clouds, cirrus are thin, whispy clouds composed of ice crystals. These ice crystals come from the freezing of supercooled water droplets, and usually exist at heights above 18,000 feet where the temperatures are typically below -38 degrees Celsius. Cirrus generally occur in fair weather and move across the sky, indicating the direction of the prevailing winds at their elevation.
Cirrus Clouds

Cirrus-types are observed in a variety of shapes and sizes, ranging from the "finger-like" appearance of cirrus "fall-streaks" or "mares-tails", commonly seen during pleasant weather conditions, to a uniform texture which can be the first sign of an approaching warm front.

Cirrus clouds above Arkansas Tech. Arkansas Nuclear One Cooling Tower (a.k.a. the cloud machine) producing steam fog.
Cirrocumulus

Cirrocumulus: These clouds form above 18,000 feet and appear as small, rounded white puffs that are isolated or in long thin rows. When the white puffs are in rows, they give the cloud a rippling appearance that distinguishes it from cirrus clouds. Cirrocumulus clouds rarely cover the entire sky.
Cirrocumulus

The individual cloud elements that reflect the red or yellow light of a setting sun make this one of the most beautiful of all clouds. The small ripples in a cirrocumulus cloud resemble the scales of a fish, which earned the nickname "mackerel sky". They also look like sheep wool.
Contrails

A contrail, also known as a condensation trail, is a cirrus-like trail of condensed vapor that is produced by jet aircraft flying at high altitudes. (Steam Fog)
Noctilucent clouds are caused by high cirrus-like clouds which are illuminated after sunset or before sunrise when the sun is physically well below the local horizon.
Cumulus

Cumul: (Latin) Heap. Described as having a cauliflower/popcorn look. Cumulus clouds form as water vapor condenses in strong, upward air currents above the earth's surface. These clouds usually have flat bases and lumpy tops. Cumulus clouds are usually very isolated with large areas of blue sky in between the clouds. Most cumulus clouds form below 6,000 feet and are relatively thin and associated with fair weather.
Altocumulus

These clouds form between 6,000 and 20,000 feet and appear as gray, puffy blobs, sometimes rolled out in parallel waves or bands. One part of the cloud is usually darker than the rest, which helps distinguish this cloud from the higher cirrocumulus clouds.

Altocumulus clouds that look like "little castles" in the sky indicate rising air at the cloud level. The appearance of these clouds on a warm, humid summer morning are often followed by afternoon thunderstorms.
Altocumulus
Unsettled Cumulus Clouds

When the atmosphere becomes unstable and very strong, upward air currents form, cumulus clouds can grow into cumulus congestus, or towering cumulus. If the atmosphere is unstable enough, cumulonimbus clouds, better known as thunderstorms, form. Cumulus congestus and cumulonimbus clouds can tower from below 6,000 feet to greater than 50,000 feet.
Thunderstorms

The Cumulonimbus Cloud can exist as a single towering cloud, or can even develop into a line of such towers, also known as a "squall line". Fueled by vigorous convection, which leads to strong vertical updrafts, sometimes in excess 50 (mi/hr), these clouds can climb vertically in the atmosphere to an altitude of 39,000 ft (12,000 m) or higher.

Some cumulonimbus clouds, which may initially appear as harmless floating puffs of cotton, can quickly develop into powerful and potentially fatal thunderstorms known as supercells.
Supercell Cumulus

A cumulonimbus can grow to such heights that it actually reaches the tropopause. At this height, high winds will flatten the top of the cloud out into an anvil-like shape. Cumulonimbus clouds are associated with heavy rain, snow, hail, lightning, and tornadoes.
Mammatus

The mammatus clouds are pouch-like structures and are a rare example of clouds developing as a result of sinking motion. They form underneath a thunderstorm where cooler air sinks into warmer air below the storm cloud. Mammatus clouds look threatening, but actually signal the weakening of a thunderstorm.
Lenticular

Lenticular clouds are associated with the uplift of air, usually in association with mountain peaks or other rapid ascent.
Lenticular Formation
Orographic Uplift

Orographic clouds are associated with uplift much like lenticular clouds. They can sometimes form waves “downstream” of the mountains.
Wind Shear

Kelvin-Helmholtz or Billow clouds formed by wind shear and air layers of differing temperatures.
Kelvin-Helmholtz

The kelvin-helmholtz clouds are formed between two layers of air, with different densities, traveling at different speeds. Therefore, if a warm, less dense layer exists over a layer of colder, denser air, and the wind shear across the two layers is strong enough, eddies will develop along the boundary.
Clouds on the Web

http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/cld/cldtyp/home.rxml

http://www.windows.ucar.edu/cgi-bin/tour.cgi?link=/earth/Atmosphere/clouds/cloud_types.html

http://vortex.plymouth.edu/cloudboutique/