Cloud Formation and Classification

Cloud Formation

- clouds form when air above the surface cools below the dew point

- condensation nuclei - small particles in the atmosphere around which water droplets can form
  - examples: sea salt and dust
  - when millions of these droplets collect - clouds form

- other methods of cloud formation
  - orographic lifting - clouds form when warm air is forced to rise over a mountain
  - when two air masses of different temperatures meet
how rapidly a mass of air cools determines its stability-the ability of an air mass to resist rising
- air can be unstable if it is cooler than the earth’s surface beneath it

- when water vapor in the atmosphere condenses heat energy is released
- this energy is stored energy known as latent heat
- when latent heat is released the surrounding air is warmed

Types of Clouds
- clouds are classified based on height and shape

Families of Clouds
- **high clouds**-cirro (prefix) above 6000m
- **middle clouds**-alto (prefix) between 2000m & 6000m
- **low clouds**-strato (prefix) below 2000m
- **vertically developed clouds**-cumulus clouds that grow through the middle altitude as towering cumulus cloud-can form an anvil head and become a cumulonimbus cloud-associated with thunderstorms

- shape of clouds
  - **cirrus**-wispy stringy clouds
  - **cumulus**-puffy lumpy looking clouds
  - **stratus**-featureless sheets of clouds
  - **nimbus**-low gray rain clouds
A: stratocumulus
B: cirrus
C: altocumulus
D: cumulonimbus
E: cirrocumulus
F: nimbostratus

Cool Clouds
<table>
<thead>
<tr>
<th>NAME</th>
<th>HEIGHT</th>
<th>DESCRIPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>stratus</td>
<td>0-1500ft</td>
<td>Whitish, grey layer, often covering hills.</td>
<td>May give drizzle.</td>
</tr>
<tr>
<td>cumulonimbus</td>
<td>1500-6500ft</td>
<td>Huge towers of heavy dense clouds. The tops are flat, usually spreading.</td>
<td>Often bring showers and thunder.</td>
</tr>
<tr>
<td>cumulus</td>
<td>1500-6500ft</td>
<td>Detached dense clouds with sharp outlines and rising domes, mounds or towers.</td>
<td>Associated with sunny weather and scattered showers.</td>
</tr>
<tr>
<td>stratocumulus</td>
<td>1500-6500ft</td>
<td>Grey or white rolling patches or sheets.</td>
<td>Bring dull weather, sometimes with drizzle.</td>
</tr>
<tr>
<td>nimbostratus</td>
<td>3000-10000ft</td>
<td>Dark grey cloud layer, usually diffused by rain or snow.</td>
<td>Ragged patches of stratus may occur below the layer.</td>
</tr>
<tr>
<td>altostratus</td>
<td>3000-10000ft</td>
<td>Flat, thick blue-grey sheet.</td>
<td>Indicates rain or snow if associated with cirrostratus.</td>
</tr>
<tr>
<td>altocumulus</td>
<td>6500-23000ft</td>
<td>White or grey rounded clouds, usually break up leaving good weather.</td>
<td></td>
</tr>
<tr>
<td>cirrostratus</td>
<td>16500-45000ft</td>
<td>A transparent milky veil which can be fibrous or smooth.</td>
<td>Indicates rain later.</td>
</tr>
<tr>
<td>cirrocumulus</td>
<td>16500-45000ft</td>
<td>Thin rippled sheets of rounded clouds.</td>
<td>Form on the edge of unsettled weather.</td>
</tr>
<tr>
<td>cirrus</td>
<td>16500-45000ft</td>
<td>Fibrous or hairlike clouds with a silky sheen.</td>
<td>An indication of bad weather to follow with strong winds at the cloud level.</td>
</tr>
</tbody>
</table>

**Precipitation**

- when cloud droplets collide— they join together and get bigger. This is known as **coalescence**; the process continues until the water droplets are too heavy to stay in the cloud.

- these water droplets fall to earth as **precipitation**— includes both solids & liquids:
  - **rain**
  - **sleet** (rain falling through a layer of freezing air near the ground)
  - **snow** (most common form of solid precipitation)
  - **hail** (lump of ice)

![Water molecules](image1.png)

Water molecules are electrically attracted to the sodium ions, Na⁺, and the chlorine ions, Cl⁻, in the salt crystal. Additional water molecules are attracted to the sodium ions, and the droplet gets bigger.

![Water droplet](image2.png)

The water molecules, and salt, form a droplet. Additional water molecules are attracted to the sodium ions, and the droplet gets bigger.
Checkpoint: What must be present for a cloud to form?

Checkpoint: What is the prefix for the highest altitude clouds?
Checkpoint: What is the prefix for mid-level clouds?