

Fundamentals of synoptic meteorology
Lecture 7

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Cloud Formations



When the temperature in the Earth's atmosphere drops below the condensation temperature, water vapor condenses or freezes out; the numerous water droplets and/or ice crystals make up clouds.

CONDENSATION

Sunlight causes water to evaporate into the atmosphere

This air containing the water vapor is heated at the surface of the earth and rises.

As the air rises, it cools and the water vapor condenses on some form of particulate matter such as dust, ash, or smoke to form clouds.

The particulate matter are called **Condensation Nuclei**.



So, what is a cloud?

It is a thick mass of suspended water drops or ice crystals.

Importance of Clouds

What do clouds tell us?

The presence of clouds in the sky is one type of signal to meteorologists that there will be changes in the weather.

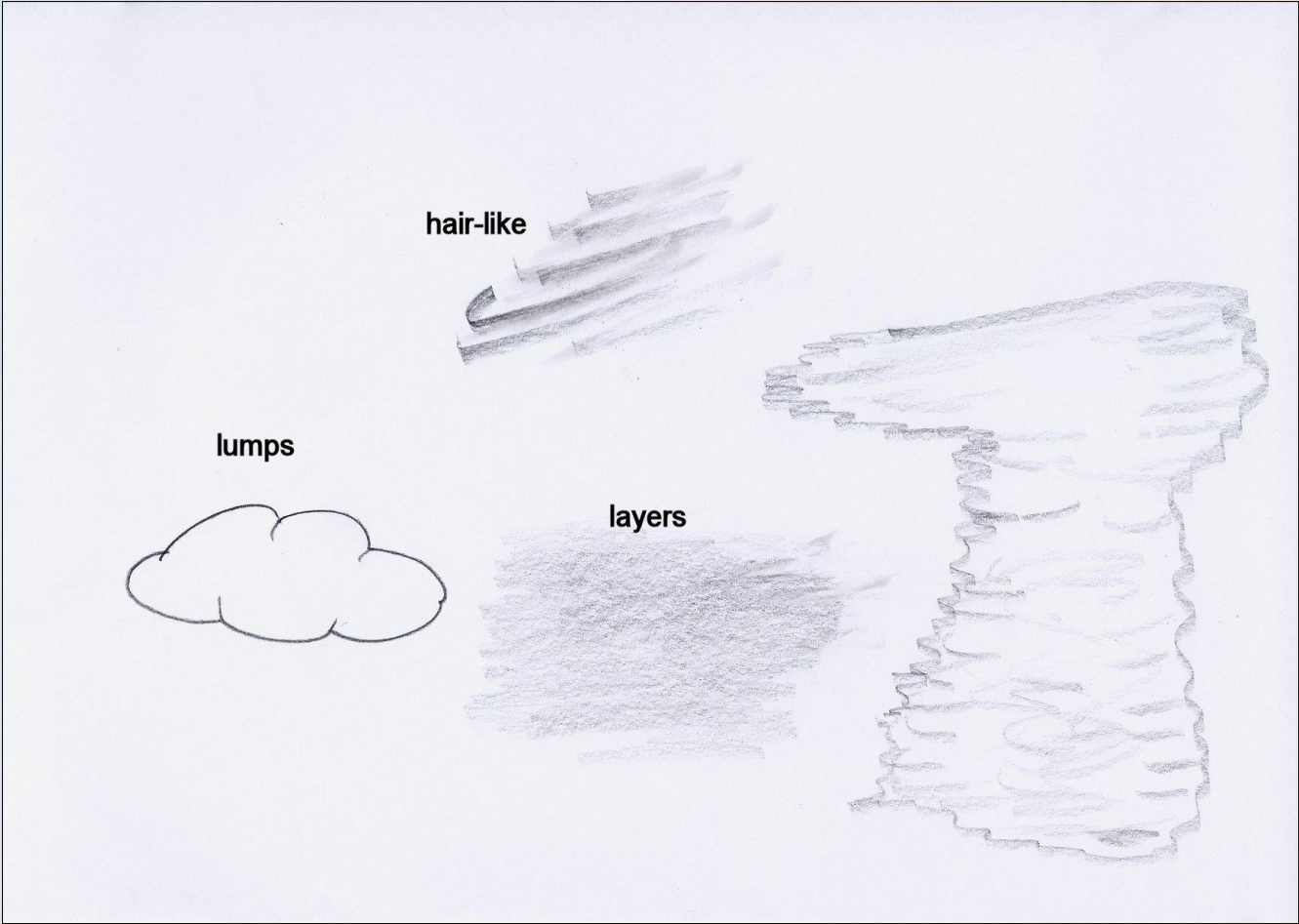
Predicting the weather requires the understanding of the different types of clouds

Identifying Clouds

To better communicate and understand the many cloud forms in the sky, meteorologists identify clouds based on five basic cloud characteristics:

1. The altitude at which they occur
2. Color
3. Density
4. Shape
5. Degree of cover

From this information, we can identify three basic cloud types and seven other common cloud types.



Cloud Type by Form

Clouds can be classified by some simple, but **subjective**, criteria that also provides information on the atmospheric conditions

One form of classification is based on appearance or form.

Using these characteristics you can identify the three basic cloud types:

Cirrus: fibrous or hair-like

stratus

Nimbus: rain-bearing

cirrus

cumulus

Stratus: a horizontal sheet or layer

Cumulus: a heap or pile

Stratus Clouds

Stratus clouds are thin, sheet-like clouds.

They are layered with some rippling, and cover large portions of the sky.

They are frequently gray and thick.

Stratus clouds are formed when air is forced up slowly.



Cirrus Clouds



Cirrus clouds are thin, white clouds with a feathery appearance.

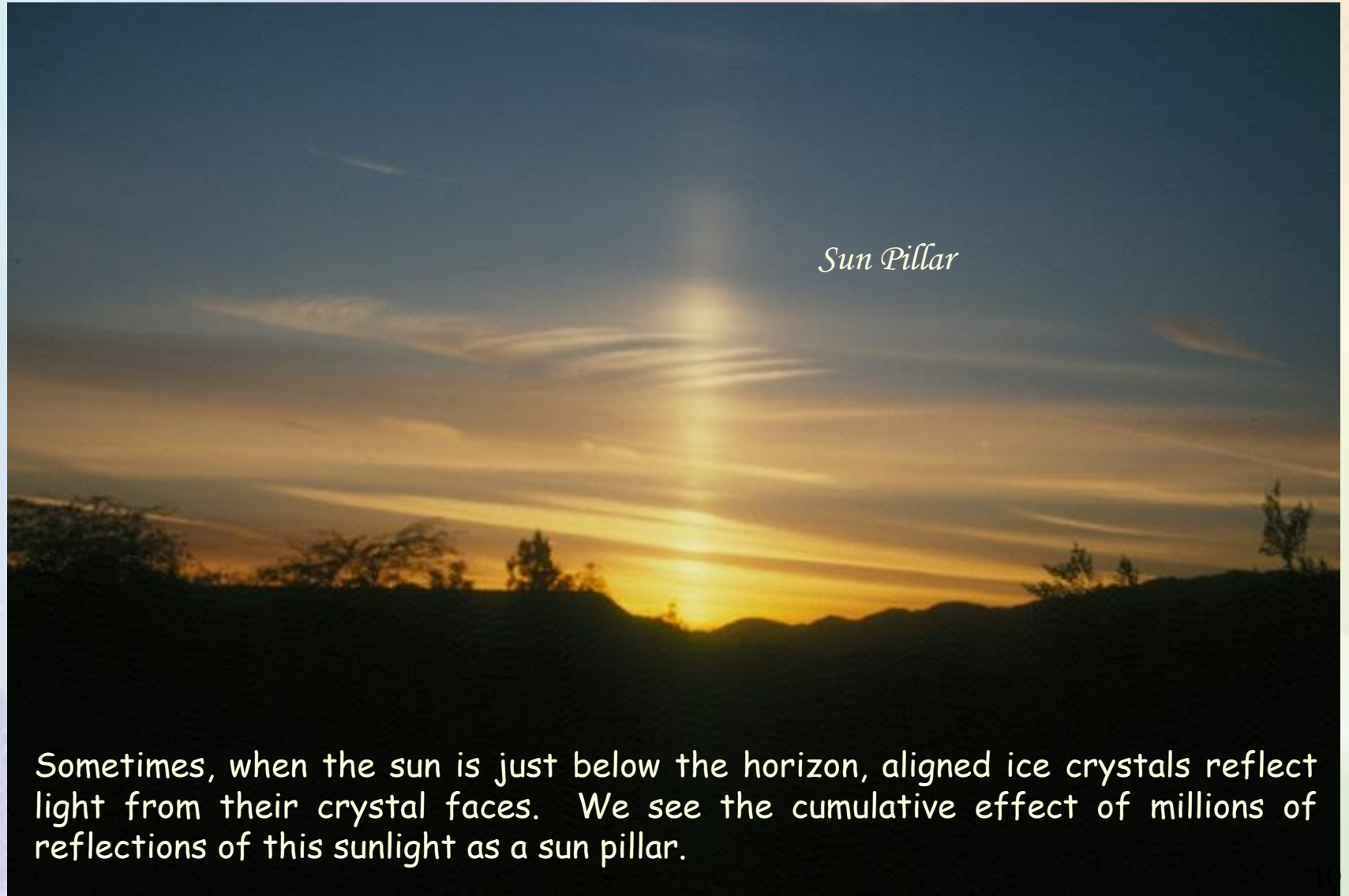
They are the highest of all clouds

Cirrus clouds are formed by ice crystals.

They generally occur in fair weather and point in the direction of air movement at their elevation.

Cirrus clouds are usually the first sign of an approaching storm.

Cirrus Cloud Phenomenon



Sun Pillar

Sometimes, when the sun is just below the horizon, aligned ice crystals reflect light from their crystal faces. We see the cumulative effect of millions of reflections of this sunlight as a sun pillar.

Cumulus Clouds

Cumulus clouds are flat-based, billowing clouds with vertical doming.

Often the top of cumulus clouds have a "cauliflower-like" appearance.

Cumulus clouds are most prominent during the summer months.

Cumulus or fluffy clouds form when air is forced up rapidly and therefore rises higher.



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Cloud Type by Altitude

Clouds can also be classified based on their altitude

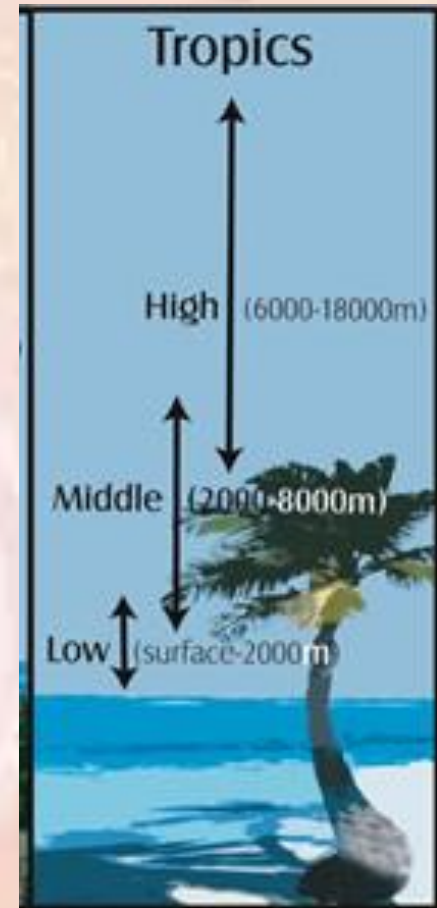
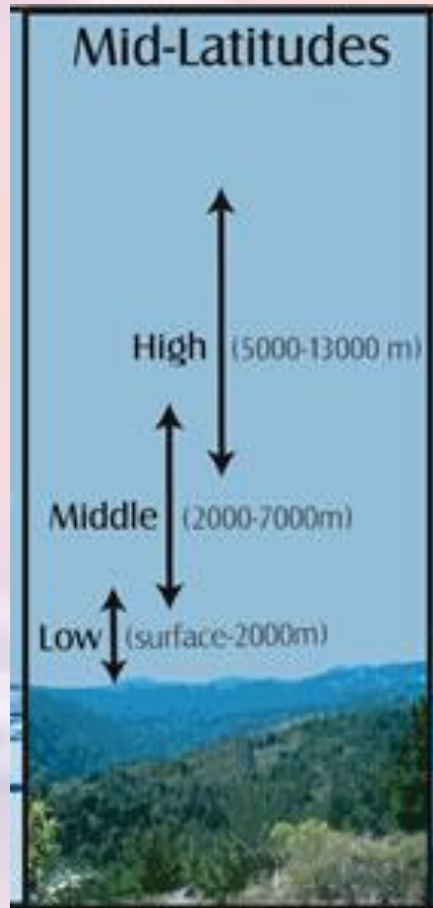
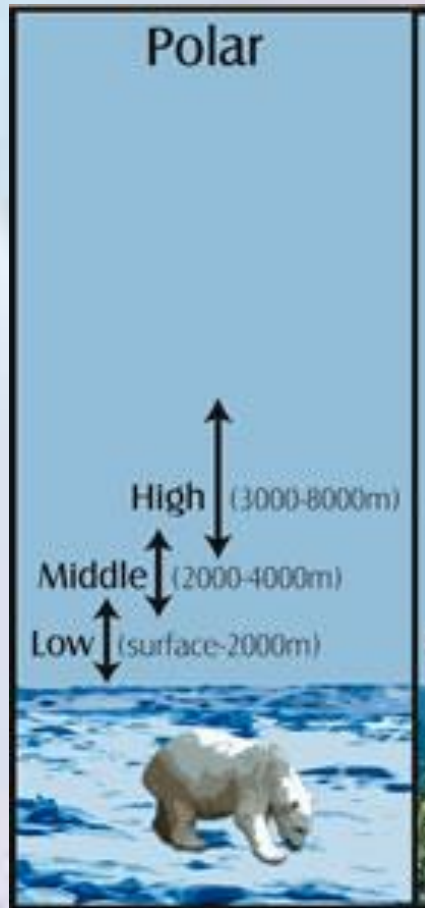
There are three categories of cloud heights:

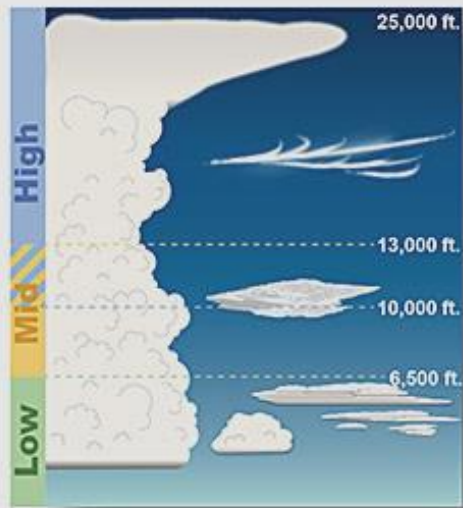
High Clouds = Cirrus

Middle Clouds = Alto

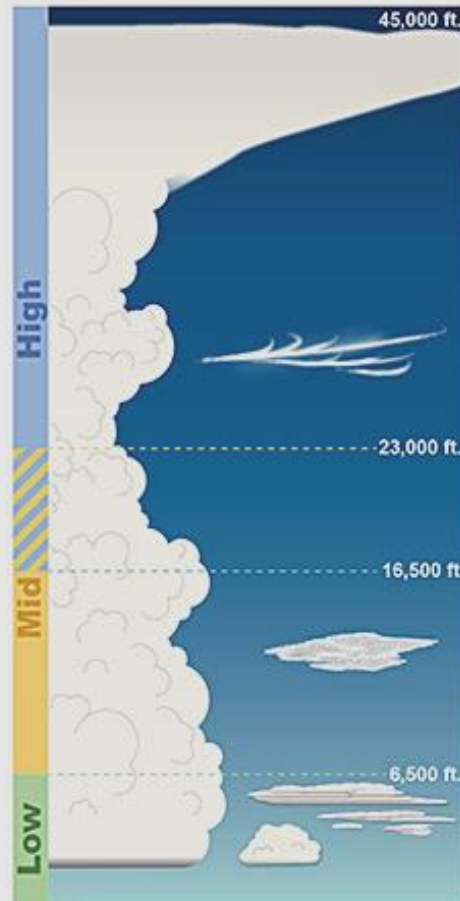
Low Clouds = Stratus

Cloud Type by Altitude

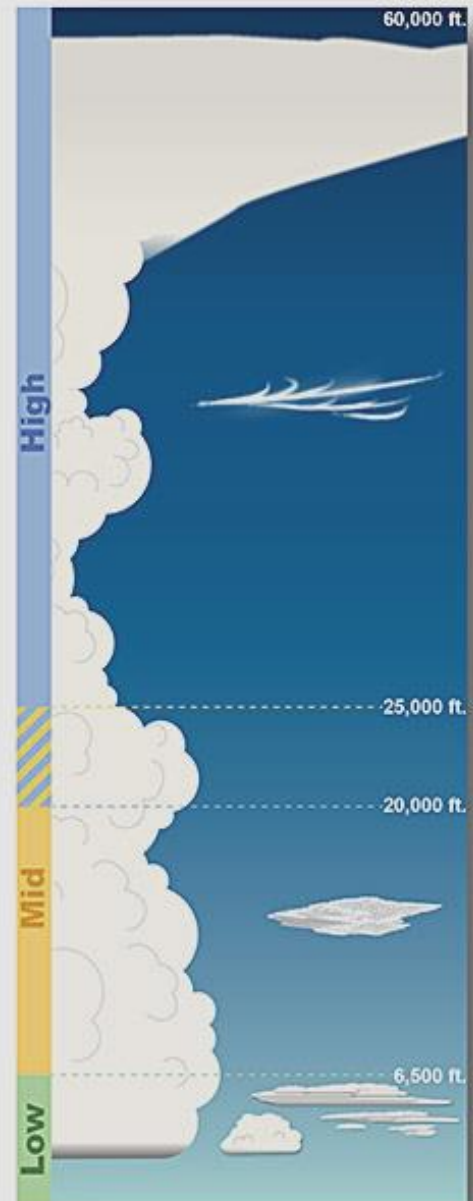




Polar Regions



Temperate Regions



Tropical Regions

Cirro

High clouds: 5-13km

Cold: less than 25 °C & made up of ice crystals

Cirrostratus: high, wispy clouds. They give the sky a milky white appearance.



Cirrocumulus: delicate clouds appearing in bands or ripples across the sky. They are one of the least common of the cloud types.

Alto

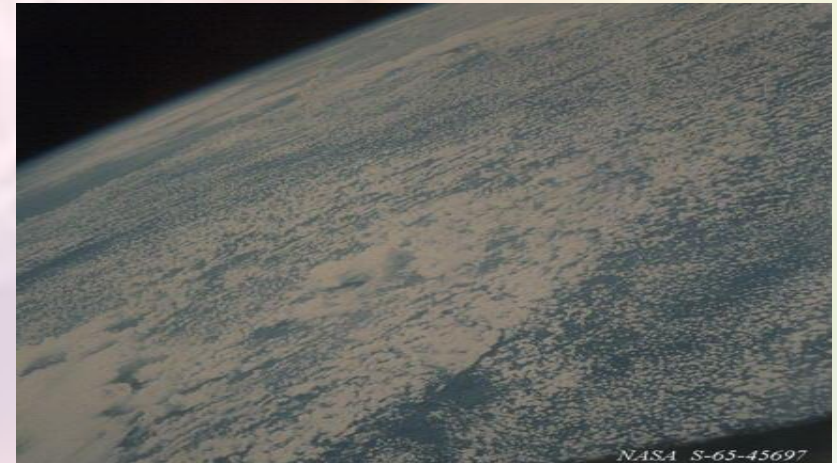
These clouds usually form from the gradual lifting of air in advance of a cold front.

Middle level clouds: 2-7 km

0-25 °C & composed of both water and ice crystals

The presence of altocumulus clouds on a warm and humid summer morning is commonly followed by thunderstorms later in the day.

Altostratus: thin, layered clouds that are blue-gray or whitish in color and often cover large portions of the sky. They are thinner if formed at higher altitudes but are heavier and more dense if closer to the ground.



* *Picture of altocumulus clouds taken by satellite*
Altocumulus: oval or elliptical in shape, and can have gray undersides. They often have a "cottonball-like" appearance.



Strato

Low level clouds: 0 - 2 km
Greater than 5°C & composed of water



Stratus: Dense, uniform dark gray layers.



Stratocumulus: groups of dense, puffy clouds that cover the sky in dark heavy masses, long and gray. They often form in bands across the sky.

Cloud Types

cirrus

cirrocumulus

cirrostratus

HIGH



Cumulonimbus



altocumulus

altostratus

MIDDLE



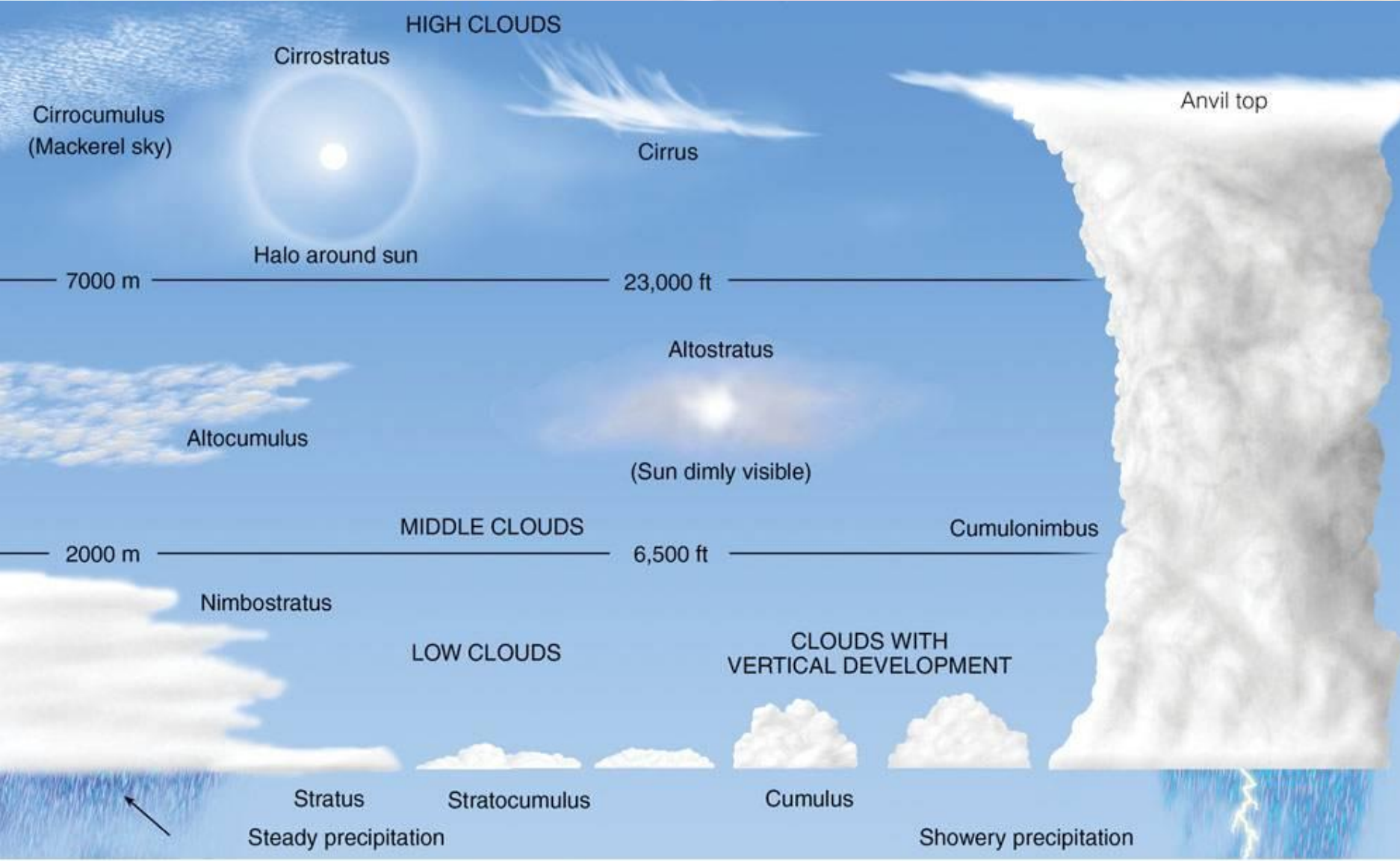
**Cumulus
(fair weather)**

**Cumulus
(with development)**

Stratus

LOW





Thanks

For your

Attention



Chronicle / Frederic Larson