So far we have looked basically at the structure of the atmosphere; temperature changes as one ascends in it. We have also looked at temperature changes in different parts of the world on daily seasonal and annual bases.

We have looked at the water content of the air (humidity) and the different ways it can be calculated from "vapor pressure" through different kinds of "humidity" (absolute, specific, mixing ratio and relative along with the idea of the dew point.

We have looked at the way temperature and volume and density are related.

No we look at the way that air masses move as they rise and how clouds form.

The slide presentation looks at adiabatic rates of temperature change – changes in temperature without adding or losing heat – but which are caused by expansion and contraction.

There are four lapse rates – or rates of change that occur with altitude. These are

(a) **The environmental lapse rate**. This is the rate of change one encounters in the atmosphere as one goes higher up in altitude. For example, as a person climbs a mountain the temperature becomes colder the further up one travels. Although this rate changes regularly, we usually use as an average

ENVIRONMENTAL LAPSE RATE = 6.5^{0}C per 1000 meters (3.6^{0}F for every 1000 feet) rise in altitude

(b) The dry adiabatic rate. This is the rate at which an unsaturated packet of air cools (as a result of expansion) as it rises.

DRY ADIABATIC RATE = 10^{0}C per 1000 meters (5.5^{0}F per 1000 feet) rise in elevation

(c) The moist adiabatic lapse rate. The moist adiabatic lapse rate is the rate and which a saturated parcel of air cools (as a result of expansion as it rises. Unlike the dry adiabatic rate it is not "fixed", but is always less than the Dry Adiabatic Lapse Rate. It is not uncommon to use, as an example:

MOIST ADIABATIC LAPSE RATE = 6^{0}C per 1000 meters (3.3^{0}F per

1000 feet) rise in elevation

THE DEW POINT LAPSE RATE. The dew point lapse rate is the rate at which the dew point falls for every 1000 meters

DEW POINT LAPSE RATE = 2^{O}C per 1000 meters

ATMOSPHERIC STABILITY

Atmospheric stability if defined on whether or not a lifted parcel of air will continue to rise or will return to the ground. This is determined by the way in which the three lapse rate occur relative to one another

If the dry and moist adiabatic lapse rates change more rapidly than the environmental lapse rate, then the air is stable.

If the dry and moist adiabatic lapse rates change more slowly than the environmental lapse rate, then the air is absolutely unstable.

If the dry adiabatic lapse rate changes more rapidly than the environmental lapse rate, and the moist asiabatic lapse rate changes more slowly, then the air is conditionally unstable.

Air is lifted by one of 4 processes:

Orographic lifting

Frontal lifting.

Convective lifting

Radiational lifting

As air rises, it cools at either the dry or moist adiabatic lapse rate. At some point the air cools to the dew point leading to cloud formation and possible precipitation (if it reaches the ground it is precipitation, if not it is called. "virga."

Clouds are found at different altitudes and are classified in terms of the heights and shapes. Those which are associated with heavy rain occur with the more "nimubus"