Introduction to Atmospheric and Space Sciences
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Lecture - 30
Cloud Morphology

Hello dear students. So, today in our class we will try to understand the Cloud Morphology; which means to be able to identify or categorize various different types of clouds depending on their shape, their colour and their moisture content, ok. So, this is going to be a lecture about cloud classification; we always see at any given point of time, we see several different types or several different shapes of clouds.

So, we would always want to know , what is the physical mechanism which will result in the formation of these different types of clouds and how to identify which type of cloud will give you precipitation and how to identify which process will lead to the formation of which particular type of cloud.

And after all this, we should be able to name or we should be able to identify a particular type of a cloud with a given name. So, we will try to understand or we will try to classify the clouds and we will try to understand the basic naming mechanism of the clouds. So, this class is going to be about the cloud morphology.

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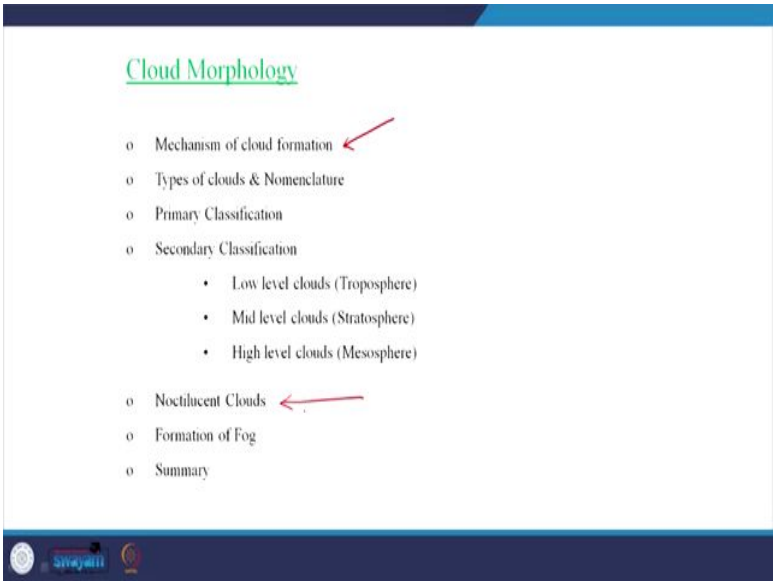

So, we will briefly touch upon the mechanism of cloud formation; how do the clouds form like, so what is the mechanism, which will lead to the formation of clouds, we have seen that in the discussions of atmospheric stability or in discussions of about humidity variables.

We have always understood that, whenever the saturation is reached within an air parcel and if the temperature is further decreased; it will lead towards the formation of a cloud or it will lead in the form of condensation and the collection of these tiny water droplets, very small water droplets is generally called as a cloud. We will try to see how many different types of clouds exist and how do we name them, what is the nomenclature of these various different types of clouds.

So, within this when you talk about classifying the clouds, there is what is called as primary classification and there is also a classification which is based on the heights which is also known as the secondary classification. Finally, we will try to understand what is the specific type of cloud which is not exactly in the interest of lower atmosphere; but in the interest of upper atmosphere which are called as the Noctilucent clouds.

Then we will also try to see the formation of fog which is near the surface of the earth, which also resembles a diffused cloud on the earth, right. So, let us see how we can achieve this goal of understanding cloud classification in this particular lecture, ok.

So, just to review the process of condensation; condensation is nothing, but when the temperature of the air parcel is decreased sufficiently that the existing moisture content becomes equal to the maximum amount of moisture content that can be held by the air parcel. Ultimately when you cross this limit, the air parcel will condense.

Now two things happen when it condenses, the tiny water droplets are formed on the cloud condensation nuclei. Second thing that will happen is due to the condensation, a latent heat is released into the air parcel into the system for example. And this latent heat is the reason why the saturated air parcels will cool more slowly when they rise vertically upwards. The idea of condensation is a very important concept in the fog and cloud formation let us say, in evaporation or in condensation things like that, right.

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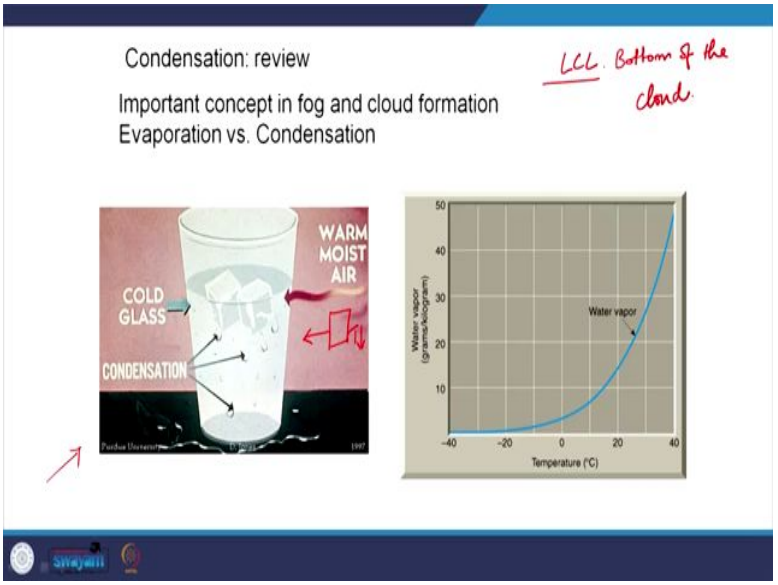

Now, let us say if you see this picture; what you see is on the right is that, with the amount of water vapor that can be held within a given air parcel without changing anything. You take an air parcel at a constant pressure at the same pressure; that means, given the volume of the air parcel being held constant by not varying the pressure outside, what you can see is that the amount of water vapor is always not a constant thing, I mean it will always vary with the temperature.

So, if you go on increasing the temperature, the air parcel seems to be having more tendency to accept more amount of water vapor into the air parcel. Now what happens if there is a water vapor? Then there is also something called as a vapor pressure; the pressure that is built up by the moisture on the surface of water or on the surface of ice. Let us say if you have ice in an air parcel, in an imaginary idea you have ice on the air parcel. So, there is a pressure that is exerted by the water molecules that are inside the gas that will exert pressure on the surface of this ice.

So, now this vapor pressure will not reach saturation at until a point; and when it reaches saturation what happens automatically, it will lead to condensation. So, the idea is the amount of water vapor that can be held in an air parcel depends directly on the temperature, right. That also means that if you want to reach saturation, you do not have to physically go on adding moisture; so vapor pressure inside the air parcel becomes equal to the saturation vapor pressure. What you can simply do is; you can decrease the temperature of the air parcel and

say, whatever the existing moisture content is the saturation moisture content in terms of mixing ratio, right.

So, this is an idea we have already discussed and what the basic idea was for the formation of clouds is that, how to decrease the temperature of air parcel. In the atmosphere naturally the temperature decreases as you go upwards.

So, when you take this air parcel vertically upwards, the temperature will decrease and there will be a height which is called as the lifting condensation level at which automatically condensation will happen and it will lead to the formation of clouds. So, we should always remember, that the lifting condensation level which is called as the LCL is the height at which the bottom of the cloud will exist, bottom of the cloud. So, this is the point where the clouds will start to form.

Now, there may be a possibility whether the cloud will develop vertically upwards above LCL, sometimes it will; and depending on the atmospheric stability sometimes the cloud will not develop vertically upwards, rather the cloud will be like a thin sheet of moisture or thin sheet of water droplets which is confined to a very narrow vertical growth, right.

Now, if you look at the picture on the left, what you see ; if you have a low temperature liquid in a container, that temperature inside this container is low. That means, when moist air comes in contact with this container or in comes in contact with this glass; what happens, immediately the temperature of this moist air is substantially reduced and as a result of this condensation happens.

And how do you see the condensation? The condensation you can see on the surface of this container in the form of tiny droplets of water; that means, the air which is hot or which is warm already has some moisture content in it, it has some moisture content in it. But it is not ready to condense, it is not ready to make a phase transition from the gas phase to the liquid phase. So, what you have to understand is; let us imagine if you have an air parcel here, that is moving towards the glass, right.

Now, if you have an air parcel here, the warm moist air, I mean the air is warm; that means, it has more ability to hold moisture that means there is already enough amount of moisture inside this air parcel. But since this amount of moisture is not enough to saturate this air parcel at the given temperature, so it is not ready to condense. But , when this air parcel

becomes close to this container or when it makes contact with the glass, suddenly this air parcels temperature is dropped.

So, whatever the moisture that was there, now is existing as a super saturation, supersaturated moist air. So, suddenly this temperature decreases and whatever the moisture that is there inside is thrown out by the means of condensation, right. So, this is a natural phenomenon which occurs at higher altitudes and leads in the formation of clouds, right.

Now, this is the basic review of the cloud formation mechanism. So, always remember the height at which you see the cloud bottom is technically called as the lifting condensation level; this is the height at which the existing amount of moisture in the air parcel becomes equal to the saturation vapor pressure or saturation level of moisture inside the air parcel, right. This is the basic idea that you should always remember about the formation of clouds, right.

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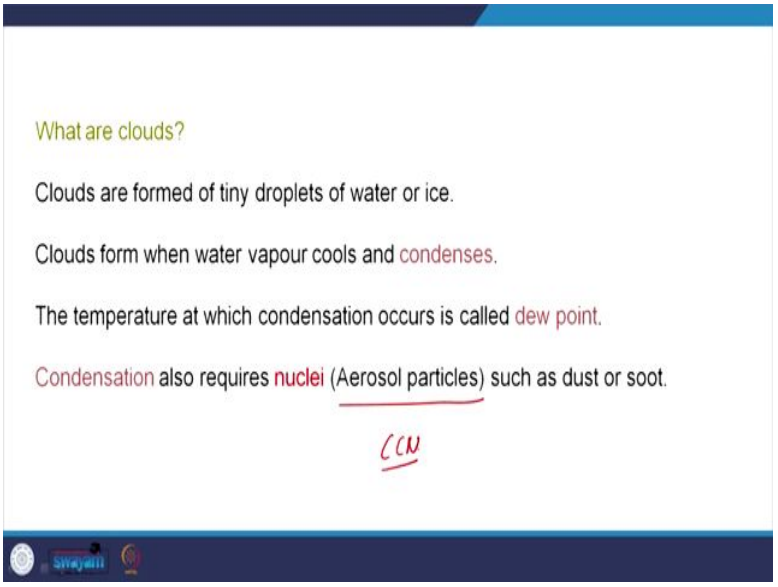

Now, so what are clouds? How do you define clouds? Clouds are formed by tiny droplets of water or ice. So, depending on the height of the cloud, the cloud can be made up of droplets of ice; if it is very high altitudes, the temperatures will be very very less, then the water vapor may actually freeze and form the tiny crystals of ice. And if the temp if the height is not so much; if it is like 10 kilometers or something, generally the content, the clouds are generally made up of tiny droplets of water and clouds form when water vapor cools and condenses, this is what we have been talking about for so many classes now.

Right the temperature at which cloud condensation occurs is called as the dew point. So, dew point is the temperature at which the relative humidity within the air parcel becomes equal to 100 percent. And most importantly, like in the last class while we were discussing the atmospheric stability; most importantly we should always remember for the formation of clouds, we always require what are called as the condensation nuclei, this condensation nuclei will act as platform to aid the condensation. So, these are the particles over which tiny droplets of water will be formed, right.

Now, there are again different types of condensation nuclei, I mean the few nuclei are hydrophobic in nature; that means their water, they do not attract water and few nuclei are very well easily dissolved in water. So, depending on the availability a suitable mechanism will always take place. So, most importantly for the formation of clouds, you always require water called as the cloud condensation nuclei, right.

So, many times the aerosol particles are the cloud condensation nuclei. So, these are very very small particles, typically in the sizes of let us say micrometers right; but these particles do exist in the atmosphere as they are suspended and these particles will be held by the moisture to form the cloud, right.

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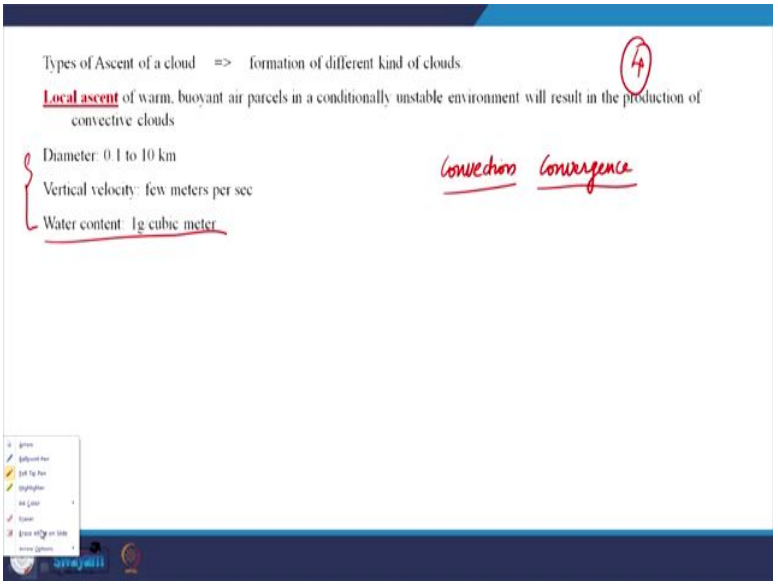

Now, then basically, so the type of ascent of a cloud I mean. So, we have discussed four different types of ascent of the cloud right. So, that four different mechanisms in which you can rise an air parcel from the surface to higher altitudes; your objective of rising it is to

decrease its temperature by which the parcel allows condensation, right. So, depending on which mechanism has taken place to be to lift this air parcel to a particular altitude; it will decide what kind of cloud is the end product of this vertical ascent, good.

Now, if the ascent is local. So, let us say local ascent of warm and buoyant air parcels is conditionally unstable environment, which will result in the production of convective clouds. So, we have seen that, unstable atmosphere is the one which makes an air parcel to move away from its original position; that means, the air parcel will never return back to its original position, right. So, what does it mean? It means that, unstable atmosphere adds the formation of clouds if the mechanism of uplift is convection of small air parcels from the surface.

So, typically the type of clouds that will result from convective ascent is varies in diameter from 0.1 to 10 kilometers. So, this is I mean, these are the type of clouds that will form. And the vertical velocity, so you have to remember these numbers; so typically convective clouds will form in the sizes of 0.1 to 10 kilometers. And vertical velocity; that means, the convection will give you a velocity of nearly few meters per second.

Now, in the earlier classes we also learnt that, the mechanism of convection is more pronounced than the convergence. So, we have seen that convergence of air along the surface of the earth will lead to vertical ascent; but we have seen that the convergence is not so effective when you put convection in place. So, convergence will not be able to produce huge clouds; whereas, convection will be able to produce huge mass of clouds. And typically the convective clouds will have a typical water content.

So, this is the water content which will again decide what could be the magnitude of precipitation that you can expect from a particular cloud; that means, the type of ascent will decide the size of the cloud, the vertical growth of the cloud and what is the total amount of moisture that can be expected to be present in the cloud, which also means that if this is the amount of precipitation that you can probably expect when the cloud goes through a particular process and results in the formation of precipitation, right.

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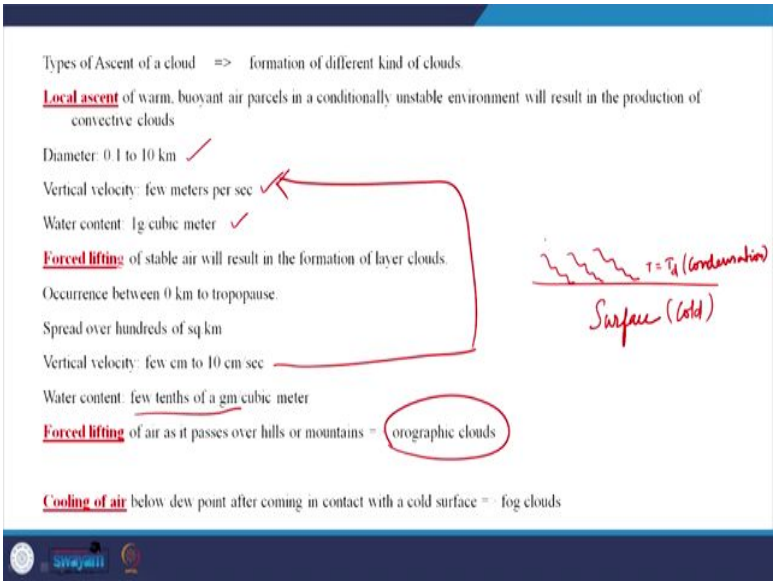

So, now, convective clouds form in the diameters of 0.1 to 10 kilometers and their vertical velocity is few meters per second when the ascent is happening and water content is typically 1 gram of water per cubic meter for per meter cube. Let us say if the force are lifting of air, how do you force the air to move if the air is warm if it will move by itself let us say in the process of convection.

But if you are making the cold air to move up, then it is called as a force lifting. How do you make it? Let us say if you have a topography which supports it to be moved vertically upwards across a hill or something, then this type of ascent will not result in very huge, let us say in very huge water contents; but it will result in the formation of layer clouds, I mean the vertical ascent, the vertical growth of these clouds will not be much, ok.

And this type of clouds occur anywhere from 0 to tropopause; that means, depending on the size of the vertical ascent that you have been able to create, these clouds can be found anywhere from 0 kilometers to almost up to tropopause. These type of clouds are spread over 100s of square kilometers.

The vertical is very very small, because we all should always remember the convection is the strongest method or mechanism by which clouds can form, right. And vertical velocity of the force lifting is nearly few centimeters to 10 centimeters per second. So, if you put this number against this number; let us say few meters per second, you will realize that the force of lifting is not so effective. Water content is always is also very very small; I mean the water

content is few 10s of a gram. So, in the convective lifting of the air parcel, the water content is 1 gram per cubic meter.

So, if you compare the force lifting water content, it is very very small; few 10ths of, so a layered cloud will contain few 10ths of the amount of moisture that will be seen in a convective cloud. so that is what I was talking about. Force lifting is something, when the air is cool which is not ready to move up; but if it encounters a hill or something, it has to move across the hill, as its wind velocity is in that particular direction, so it comes across a hill. So, it has to move across this hill and it reaches high altitude. As it reaches high altitude the temperature is anyway low, so it has to condense and form the convective cloud at the top of these mountains, right.

So, these clouds are generally called as the orographic clouds, ok. So, you have to remember these names the number of parameters such as diameters, scale of these clouds and all, right. So, cooling of air, so now, the basic idea is cooling of air below the dew point coming in contact with a cold surface, results in the formation of fog.

So, what do you mean? If the surface is very cold, during the winters when the surface becomes very very cold; now, the air that comes in contact with this surface will be cooled, right. So, when it is cooled automatically to a point; then if it reaches the dew point temperature, it will result in condensation.

And since this condensation is happening at the surface, you see fog, you see generally in the winters that you see fog that is near the surface of the earth which also hampers the visibility. So, the main reason is that, it is the same process; I mean the same process in the sense, here warm air that is originating from the earth is rising to higher altitudes and it is getting condensed at the let us say at 10 kilometers. There you see a volume of mass; I mean a huge volume of cloud droplets, you call it as cloud, right.

But if the same process happens, so the basic mechanism you require for condensation is to decrease the temperature. If the air which is not saturated comes in contact with the surface which is very very cold; so automatically it will reach saturation and it will lead towards the condensation. When condensation happens, you see droplets; you see tiny droplets, very very small droplets, right. So, in the winters one more thing happens; if winters there is a huge availability of aerosol particles near the surface is always there, due to the dust or soot or whatever it is.

Now, if the air comes in contact with this cold surface, it will lead to the condensation and form fog. So, the fog is also kind of not different from the cloud; but the only difference is that, you see fog on the surface, but you see cloud up in the sky, right. Now, so cloud names; I mean if you want to name a particular type of cloud; how do you name it, let us say what are the parameters which you should think of and this name should reflect mainly the shape of the cloud, the color of the cloud, and what is the amount of moisture that it contains, and the height.

So, any particular name that you put to a cloud; see at any given point of time you if you see randomly in the sky , you will realize that the there are various different types of clouds. So, depending on the season you will see that these clouds are specific to a particular season or you will also see that the clouds are specific to a particular altitude things like that, right.

Now, if there is a different difference in the shape of the clouds. So, whatever the name that you put for a particular type of cloud should be able to tell you; what is the shape of that particular cloud, what is the height at which you can see this cloud, and what is the amount of moisture that can be derived when this cloud forms rain, right.

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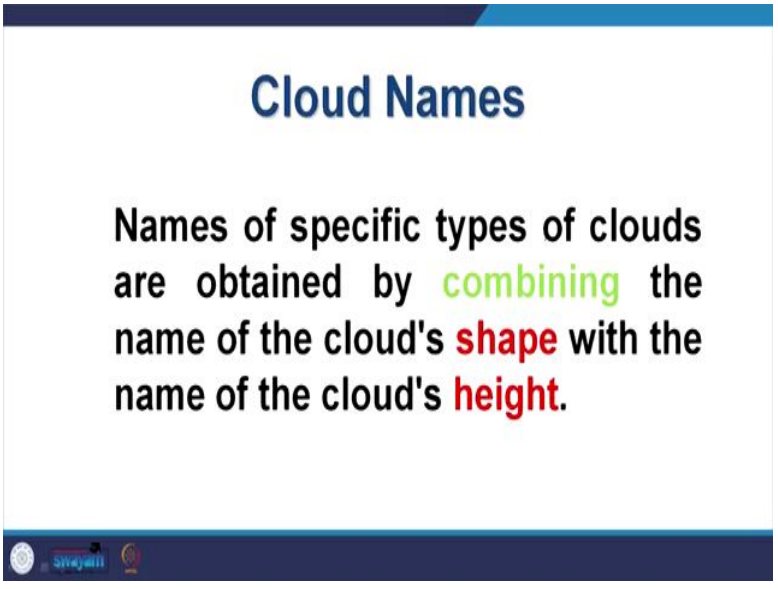

So, these are the main requisite conditions for naming the cloud. So, names of specific types of clouds are generally obtained by combining the name of the clouds shape with the name of the clouds height. So, essential information that is given in a clouds name is the shape of the cloud and height of the cloud, ok.

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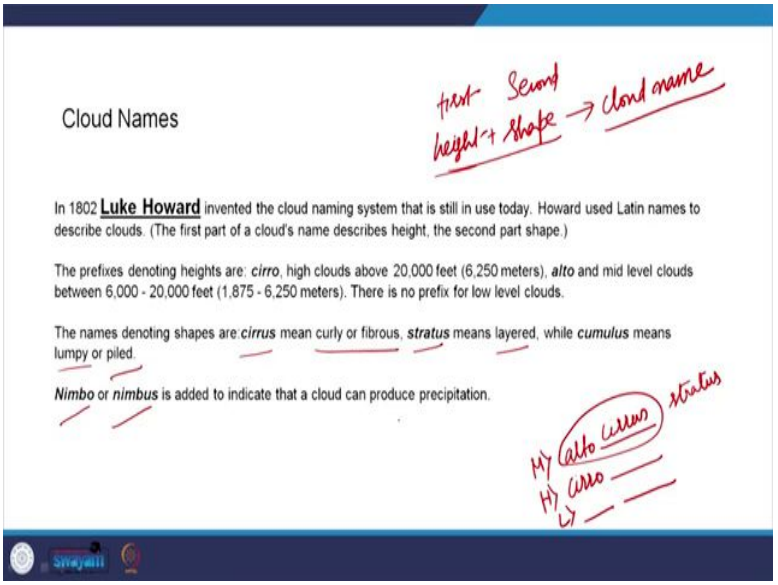

So, cloud names. So, looking at history let us say, we generally it was in 1802 that Luke Howard invented the cloud naming system that we still use today. Howard used Latin names to describe the clouds. So, this idea was Howard's idea; the first part of the clouds name describes the height. So, you always remember, the first part of the cloud always gives you the idea of height; and the second part of the cloud gives you the idea of shape.

So, for a particular shape, there is a particular name and for a particular height, there is a particular name. So, you combine these two things. So, cloud names are to be derived by combining the shape of the cloud and the height at which you can see this particular type of cloud. And the order is you put the height first and you put the shape next. So, the first part let us say you call the prefix; the first part is the height. So, height comes first and the second part is the shape. So, you put these two things together, then you will get a specific type or name of a cloud.

So, the prefixes denoting the heights. So, what are the heights? I mean heights generally varies from 0 to 10 kilometer, 0 to 15 kilometers; sometimes it varies from 0 to 50 kilometers, right. So, how do you put the height, I mean what is the number; which number correspond to which particular name.

So, the prefixes denoting heights are cirro; cirro means high clouds above 20,000 feet or 6,250 meters, that means 6.25 kilometers. Alto means mid-level clouds between 6,000 to 20,000 feet right, so and there is no prefix for the low cloud.

So, you, so once we go ahead into the discussions, the cloud names will appear without any prefix; I mean, so some cloud names which are low lying clouds, I mean low heights. So, you will not use the height information; but the mid level clouds are to be named as alto and the high level clouds are to be named as cirro and this is the first part, so there is always a second part. So, this is the alto is mid level clouds, this is high level clouds; and further low level clouds there is no such prefix, you only use the suffix, right. So, this is the main important thing, right.

So, the names denoting the shapes now are cirrus; cirrus means fibrous or let us say puffy kinds of clouds which are curly or fibrous type of clouds are called as cirrus. Stratus means layered, I mean you see layered clouds, you name them stratus; while cumulus means lumpy or piled, ok. Now here the most important thing is, let us say if I can put cirrus, alto cirrus; I will put one suffix here. What does this mean? A curly fibrous type of cloud that is to be seen in the mid altitudes which are approximately 6000 to 20000 feet is generally called as alto cirrus.

Generally let us say if you see a layered cloud in the middle mid altitudes, then you put it as alto stratus, right like that. So, you can combine these two heights and these three shapes together to form different types of clouds. So, the third most important thing that you should add to the cloud name is the amount of precipitation that it can produce. If it can produce sufficient amount of precipitation, you should add nimbo or nimbus. So, nimbo or nimbus are to be added before this; nimbo cirrus or nimbostratus like that, so nimbo comes before the shape, ok.

So, nimbo is added or nimbus is added. So, depending on the way the word pronounces, you can add nimbo or nimbus is added to indicate the cloud whether it can produce precipitation or not. So, we will see we will realize that some type of clouds will not reduce any precipitation, they would not precipitate. So, then there is no prefix of nimbo or nimbus to that particular type of cloud. So, what do we learn from this? So, I mean this discussion is very important in the sense; after a while the names are going to be very confusing. So, there will be a lot of names for different types of clouds, for different heights, for different shapes, for different levels of precipitation.

So, the basic thing that you should always remember is, the cloud names are derived by combining the shape and the height; whereas the height comes the first, which is the prefix

and the shape comes as the suffix. So, height can be classified into low lying clouds, mid altitude clouds, and high altitude clouds. The low lying clouds do not have a prefix, but the mid lying clouds have a prefix of alto, and the high lying clouds have a prefix of cirro, right.

Now, coming to the shape; if you see curly fibrous clouds, you name them with a suffix of cirro; if you see layered clouds, you name them with a suffix of stratus. And while if you see puffy clouds or lumpy clouds huge clouds, you name with a suffix of cumulus. Now of these various different types of clouds; it is not required that all of them can produce sufficient amount of precipitation, some of them may not be able to produce. So, just to differentiate, whatever the type of cloud that can produce precipitation is to be suffixed with is to be prefixed with nimbo or nimbus, ok.

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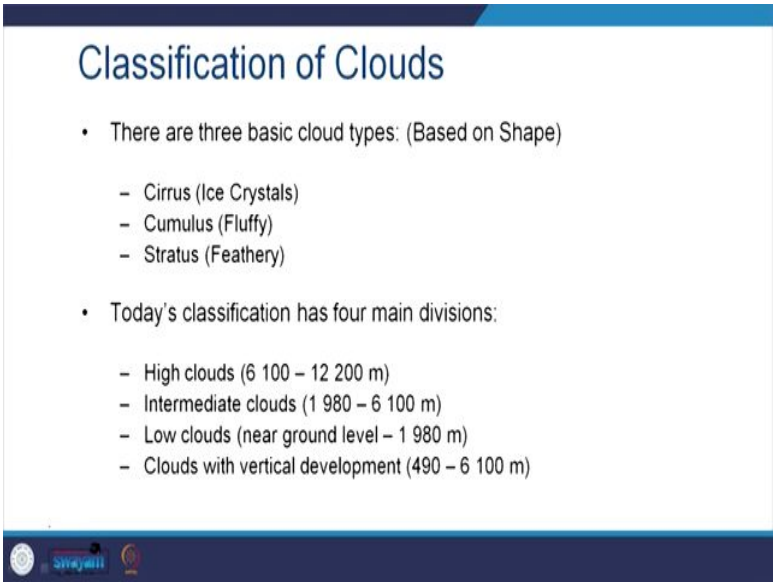

Now, let us move ahead and try to understand the basic types of clouds. So, there are three basic types of clouds based on the shape; cirrus, cumulus, stratus. Stratus is the layered, cumulus is the fluffy feathery kind of clouds, cirrus is the fibrous type of clouds, right. So, today's classification has four main divisions. So, high clouds 6100 to 12200 meters, these depending on the height of occurrence actually; intermediate clouds between 2 to 6.1 kilometers, so ending at the boundary of high clouds.

Low clouds near the ground to almost 2 kilometers, and clouds with vertical development, the cumulonimbus clouds that we call the most famous cloud; the clouds with vertical development nearly which will span all the altitudes,, so generally that cumulonimbus cloud

is considered the most magnificent cloud of all. And the this cloud starts to develop at 400 and or 500 meters and it will develop a single cloud spans across all the altitude ranges; it is not that this confined to a particular level, it is not confined like that. Rather a single type of cloud which is confined which is kind of grown into all altitude regions, ok. So, cloud classification is high, intermediate, low and full development vertically, right.

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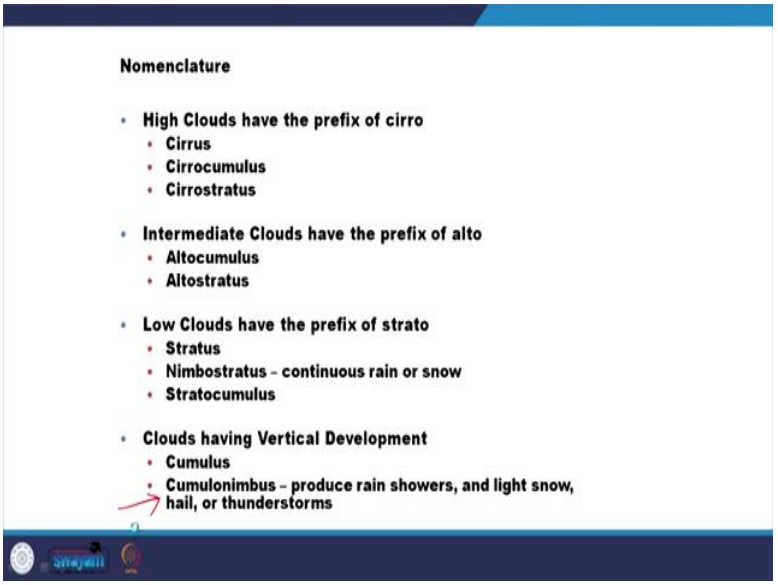

So, the nomenclature high clouds have a prefix of cirro, yes; intermediate clouds have a prefix of alto and low clouds which are layered have a prefix of strato and clouds with vertical development. So, generally this is the cloud type of cloud that you see most often when it is going to rain heavily is the cumulonimbus clouds, ok.

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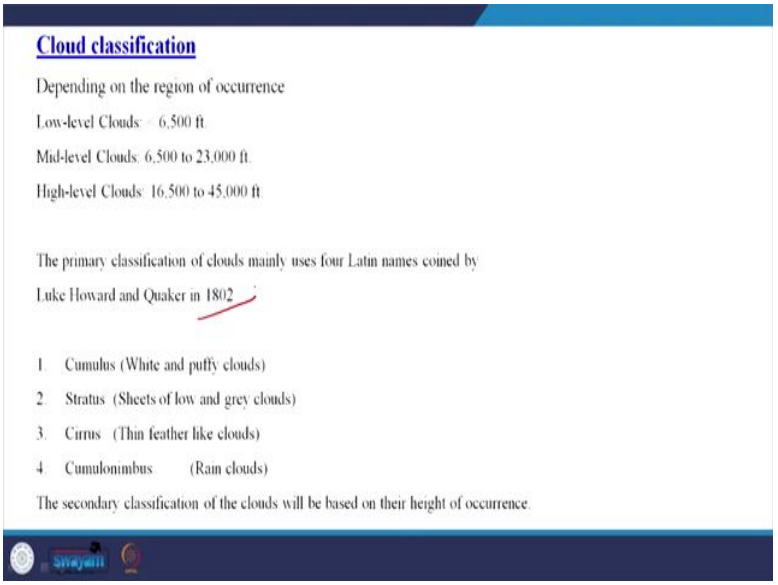

So, what we have to remember isin the units of feet you have low clouds below 6500 feet and mid-level clouds between 6500 to 23000 feet, high clouds between 16500 to 45000 feet. So, the classification is as per the naming system that has been developed in 1802,

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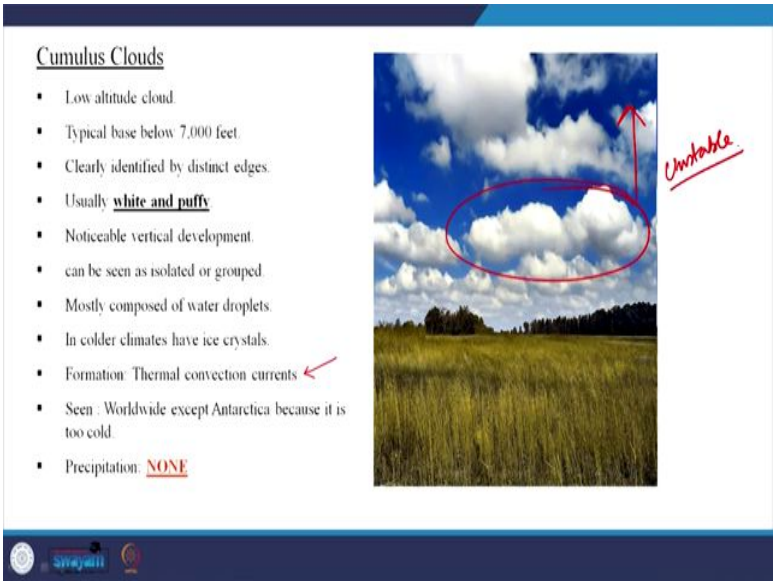

Now, let us look at each type of cloud by the shape let say for example; the cumulus cloud is a low altitude cloud. So, the typical base of this type of clouds will be at nearly 7000 feet and this cloud can easily be identified by distinct or clearly defined edges; usually the color of the cloud will be white and puffy and noticeable vertical development will be there. So, you will

see that the cloud is vertically developed, not a layered type of cloud and this type of cloud is mainly composed of tiny water droplets.

And in the colder climates; if it is in the polar regions, the same type of cloud will be made up of ice crystals. And the main process that will result in the formation of these clouds is the thermal convection currents. And where do you see these clouds? You see them everywhere worldwide, except Antarctica; because it is too cold out there. So, precipitation that can be expected out of this cloud will be none. So, this clouds will not precipitate.

So, cumulus cloud is generally a white puffy type of cloud that you see at nearly 7000 feet and you do not expect any precipitation, if you have this type of clouds in the sky on that particular day. A simple forecasting whether it is going to rain or not you can be able to say looking at the shape of the cloud.

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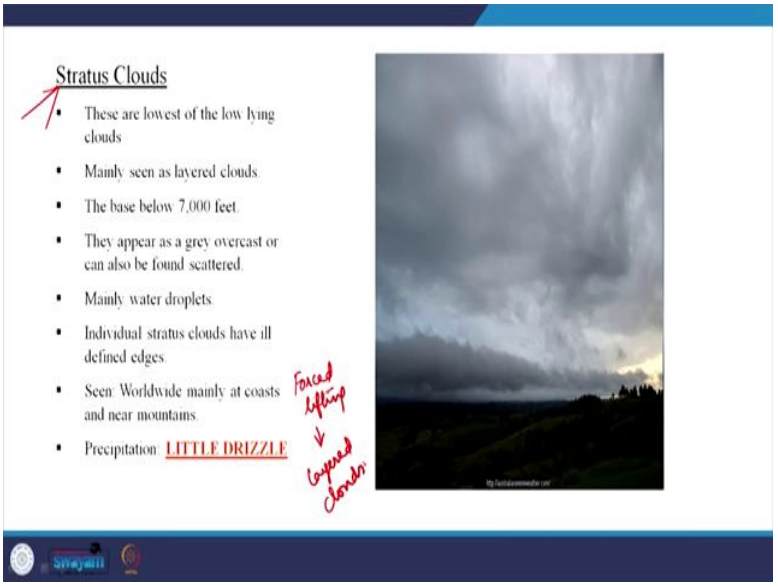

Stratus clouds, these are the lowest low lying clouds I mean these clouds are generally seen at very low altitudes; they are layered structures, like the name itself suggest that if these clouds are kind of layered structured clouds. The base of these clouds is typically below 7000 feet, they appear grey overcast. They generally appear as grey overcast or can also be found sometimes as scattered. So, you see that there is no distinct edges to these clouds, so that the cloud appears as a complete overcast.

So, you cannot find where the cloud is kind of beginning and what is the shape of this cloud, right. So, they are kind of layered development. So, they will have very very ill defined edges and you see these clouds worldwide, mainly at the coastal regions I mean.

So, near the mountains that means, forced lifting has been able to orographic clouds, forced lifting generally results in the form of layered clouds, right. And, I mean the amount of precipitation that you can expect from this type of clouds is the is very small; I mean you do not expect a lot of precipitation, you generally expect a little drizzle out of this particular type of cloud.

So, what have we learned, we have seen cumulus clouds which do contain water droplets; but they do not precipitate. Now we are seeing the stratus clouds, which are made up of ice crystals or let us say the water droplets; but you can expect a small amount of precipitation, the height of these stratus clouds is very very low, right.

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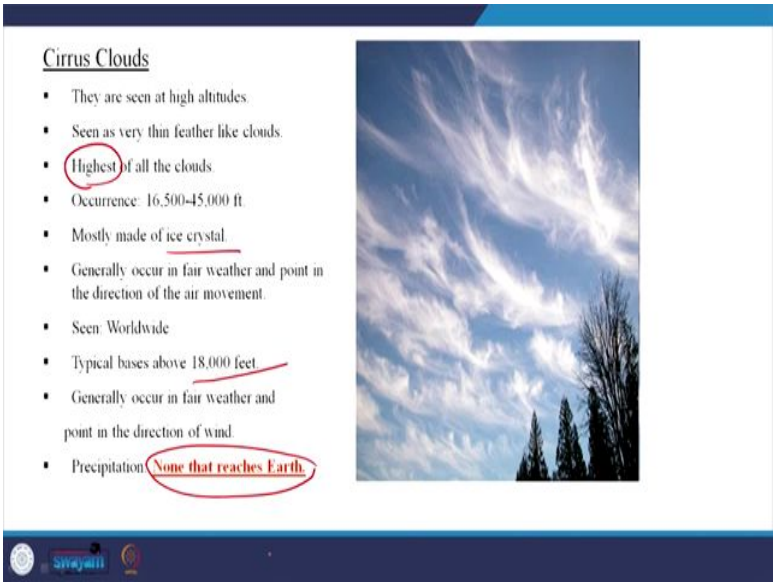

The cirrus clouds, so cirrus clouds are seen at very high altitudes like the name itself suggests. Now, we are dealing only with the height and the shape, right. They are seen at high altitudes, the cirrus clouds are seen at very high altitudes; they look thin feather like shapes and this type of clouds occur at the highest altitudes. They generally occur between 16500 feet to 45000 feet, it is very high altitude. And these crystals because they are at very high altitude are generally made up of the ice crystals, ok.they generally occur in fair weather and point in the direction of the air moment. So, when the weather is very clear, you see these

type of clouds and they always point in the direction in which the air is moving at that particular altitude. And you can see these type of clouds everywhere; that means, the occurrence is worldwide. The typical base itself is 18000 feet, so you must compare this with the numbers that we have seen in the last two different types of clouds, whose basis generally existed 6000 to 5000 feet.

The cirrus clouds are held very high altitudes, right. And they generally occur in fair weather and point at the direction of wind; and precipitation, so nothing that reaches the earth. Since these clouds are at very high altitude, no precipitation even if it results from these type these type of clouds will never reach the earth.

So, basically what we have learned is that, cumulus clouds are the ones with distinct edges, stratus clouds are the thin layered structure which appear like an overcast, and the cirrus clouds which you see only when the sky is very clear. You see them at very high altitudes, they are generally made up of ice crystals and no precipitation by whatsoever will reach the earth.

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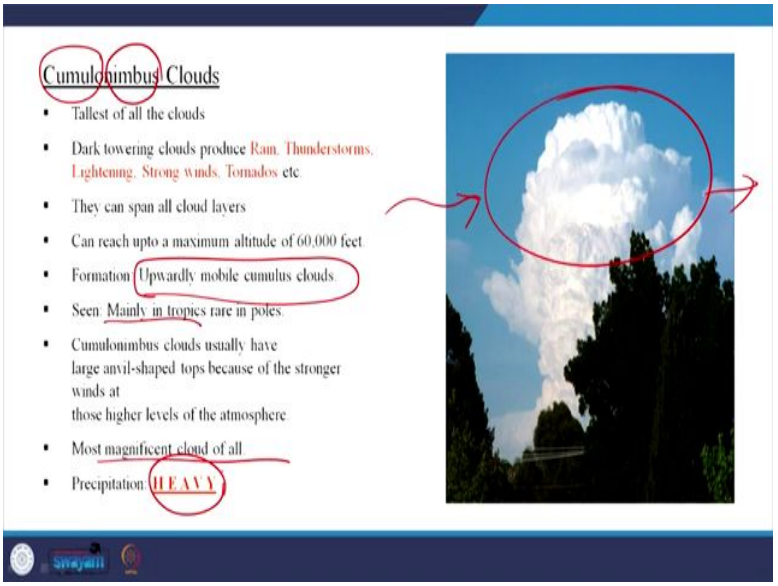

And most importantly now you see the cumulonimbus clouds. Now you see the cumulo is describing the shape of feather or puffy kind of a cloud and nimbus is , giving you an idea that this type of cloud will have a lot of moisture content and this can precipitate height. So, this cumulonimbus cloud is the tallest of all the clouds; that means you see them from a very low altitude to a very high altitude.

This dark towering clouds produce; they can produce everything as such rain, thunderstorms, lightning, strong winds, tornedos. So, they have the enough amount of force, they have the enough amount of moisture to produce all the climatic effects; they can span all the cloud layers.

So, we have seen that, they can span almost from 500 meters to up till let us say 6000 meters or 7000 meters. So, how do these clouds form is this is the most important point that you should always remember; the upward mobile cumulus cloud. So, what is cumulus cloud? We have just seen what is cumulus cloud; cumulus cloud is this one let us say this cloud, with a very clearly defined edges, a fluffy moisture content. If it this formation rises in height due to the unstable atmosphere; if the stability of the atmosphere helps this cloud to vertically develop, it will result in the formation of a cumulonimbus cloud.

Where do you see them? You see them in the tropics; but rare, main in the tropics because the convection is very strong in the tropics because of the large amount of heat that is received by the near the equatorial region, either sides of the equatorial region. So, because of that convection being very strong, it will result in the formation of this huge pile up of clouds.

Cumulonimbus clouds usually have large annual shape; shape at tops because of the stronger winds at those higher levels of atmosphere. So, you see that, you see this annual shape that you see here is because of the wind that is going in this direction. So, here, it diffuses the top of the cloud into the shape of an annual, ok.

And by this cloud is considered to be the most magnificent shape that you can see; when it is going to rain heavily, you generally see these type of clouds. And these clouds span the entire altitude range of the 3 or 4 defined ranges, it will span across all of them; and when you see these clouds the expected precipitation is going to be high or it is going to be heavy.

So, simple forecasting can be done if you see this type of cloud in the sky; you can just say that it is going to rain heavily, that is one, probably one advantage that you will get after learning about the various different types of clouds, right.

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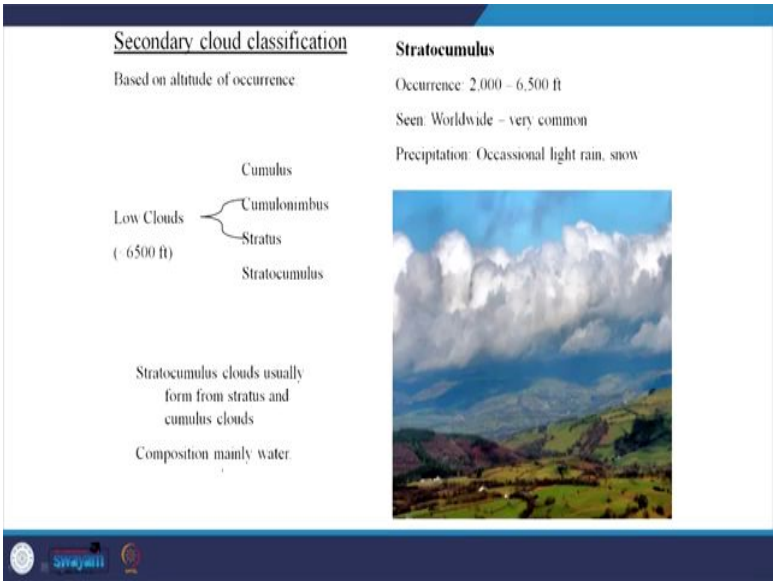

Now, we will look into the secondary classification; so just to summarize, so based on the classification, the shapes. So, we have seen what is a cumulus cloud, how it forms and what is a layered cloud and what is the high feather like cloud; and what will happen if a cumulus cloud grows vertically upwards and reaches very high altitude, you call it as the cumulonimbus cloud. So, we will learn something about the secondary classification in the subsequent lecture.