Photogeology In Terrain Evaluation (Part – 1)
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Lecture – 08
Sensors, Cameras and Panchromatic Data

Welcome back, now in this lecture we will briefly talk about cameras, mainly film we already discussed in the previous one of the lectures, where we talked about the normal film and the panchromatic film.

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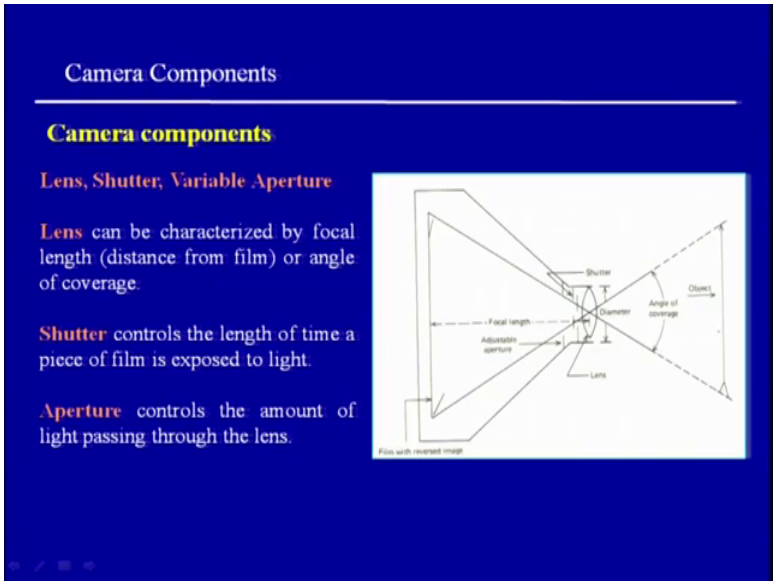

So, let us look at the few basic things about the cameras. So, in general if you look at the camera component, then we have the Lens, Shutter and Aperture this plays an important role. So, here we are having click the lens here which has been shown and depending on the diameter, and all that in the previous lecture we were talking about the whether it is in wide angle or narrow.

So, this will depend on that and of course the focal length this is important here, now the lens can be categorized by focal length that is the distance from the film or angle of coverage, but how much angle it is going to cover, whether it is going to be wide or it is going to cover a very narrow area. So, that is the important part and now a days, if you look at we are having the lenses, which we have with the different combinations.

So, even in the same lens we will have this, I am talking about the simple SLR camera. So, we have an lens which can have either it is wide angle or it is a narrow angle, you can have in the same lens again.

So, what we call zoom or you can narrow it down to cover the wider angles for the wider area, Second is the shutter that controls the length of time a piece of film is exposed to light. So, how much shed that is what we call the shutter speed so it will open for a given time and it will close. So, it will capture the image and this basically, we use suppose you have to take a picture which is having a darker background or an in the object is in dark, then you expose the film for longer time span. So, you have the shutter speed will be very low, but if you are having and V the exposure is in light or the object is in light, then you expose the film for very short period, Otherwise here the data which you are going to capture will be over exposed.

So, it will appear more or less white type, then comes the aperture that controls the amount of light passing through the lens actually. So, again one is the lens that is what is the lens focal length and the diameter of the lens will that is an important part, Second is the shutter speed how much time you want to give for the exposure, and third is the amount of light passing through that window that is known as the aperture.

So, if you are having small aperture and then the shutter speed will also, will play an important role in taking the photographs. So, previously this all we used to do manually using SLR cameras. So, we used to set up the shutter speed and aperture depending on that what type of photography we are doing.

So, during the evenings we used to open up the aperture, and then shutter speed was also be used to low down the shutter speed and then the what I was using the word that is zoom or wide you can use and the lengths depending on the area of coverage, How much area you want to cover.

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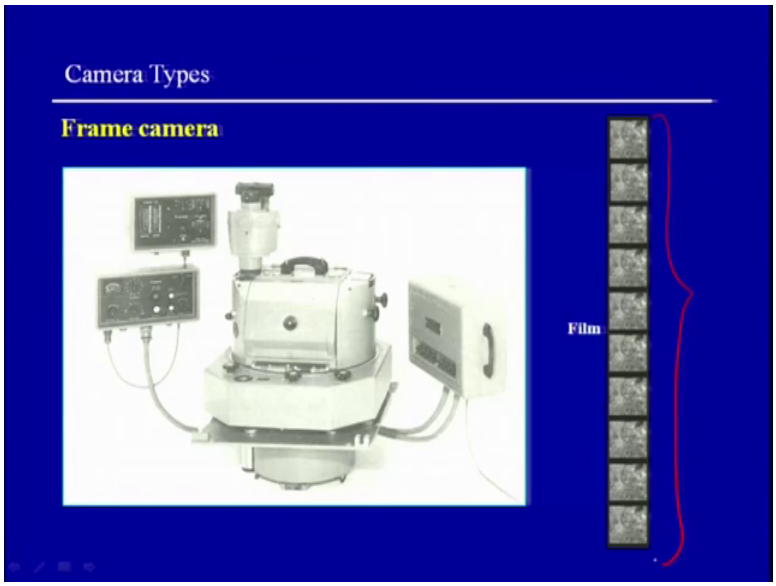

These are few cameras like frame camera, which will give you the photographs taken which are shown here. So, these are the photographs which are obtained from the frame cameras.

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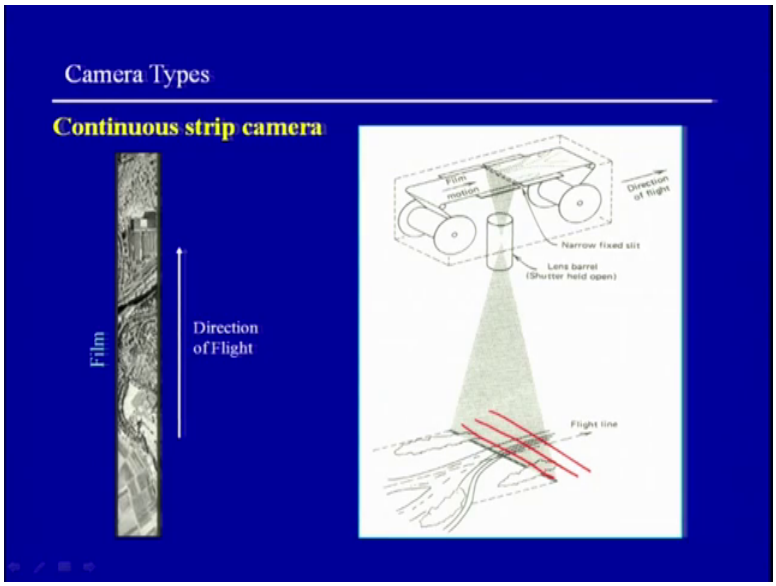

Then you are having Continuous strip photography, which has been shown here this is your camera mounted and you have the direction of the flight, which has been shown here also, and it will keep collecting the picture like this. So, this is one strip then you

will have another one here, then you will have 3rd one here, then you have 4th one here and this will have an overlap, if you want to have the these stereo images.

But, further to have the better coverage and in terms of viewing the terrain, there are 2 cameras which have been used mounted on the same aircraft, which takes the forward and africa pictures appear, that I will show you in the next slide.

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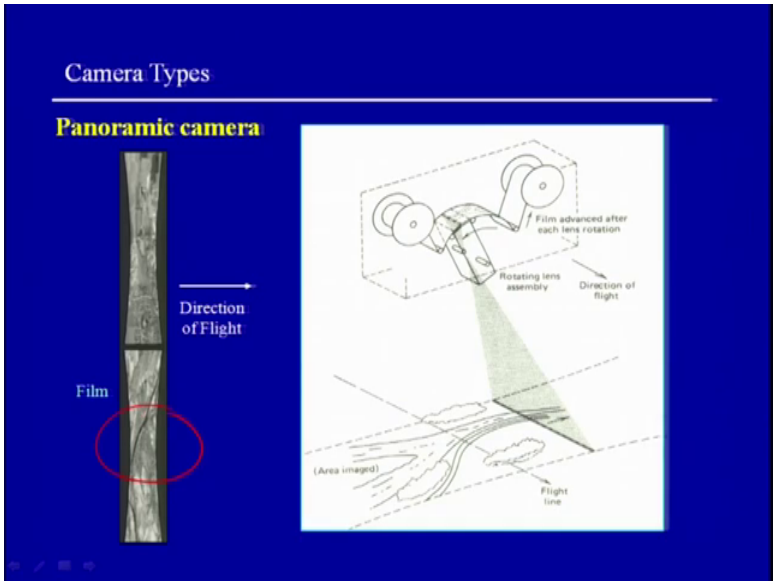

So, this is again we are looking at if you this was almost vertical and this is a panorama. So, panoramic cameras will have some disadvantage in the terms that it will cover of course, a very wide area, but we will have distortion in the center.

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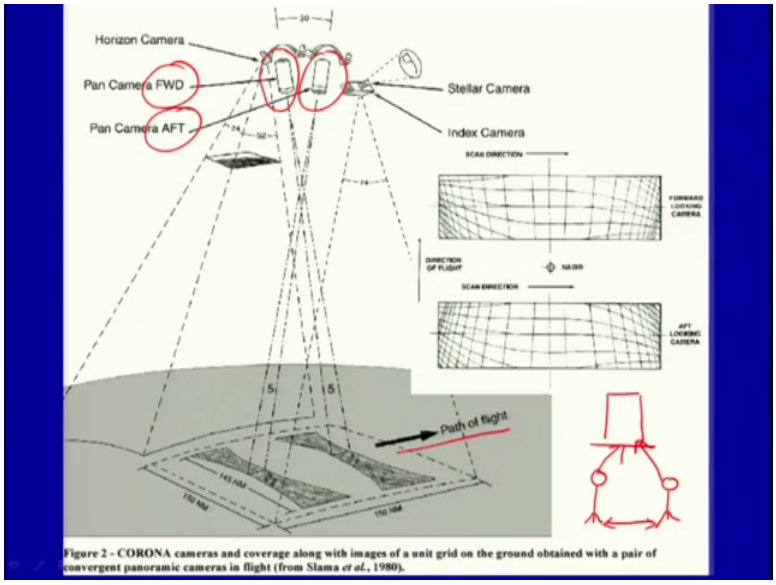

Figure 2 - CORONA cameras and coverage along with images of a unit grid on the ground obtained with a pair of convergent panoramic cameras in flight (from Slama *et al.*, 1980).

So, this is one disadvantage of the panoramic camera, this is what I was talking about now, this you can also refer one of our research paper published in current science long back, and that is the surah at all you can download from the website of current science and try to read it. This will help you in understanding that what exactly we are talking about the data collected by satellite of corona images mainly. So, the corona cameras where been used, and if this figure shows the coverage of the images, how it has been taken.

Now, in this there are two cameras mounted, and if you are having this line of flight and you have the two cameras mounted here, one and this is another one. So, the forward camera will take this photograph, and as the flight moves the after camera will also keep taking the photograph of the same area from different angle, but this will have some distortion, because these are all the images are taken as in panoramic images.

So, mostly in an aerial photographs, we call that there is a series of forward and after photographs taken by the forward camera and the after camera. So, 13 same terrain is been photographed by 2 different cameras mounted on the same aircraft from different angle. So, if you want to do the similar stereographic photography using, SLR camera you can do that for example, it is very simple if you have an for example an object here, I am just putting in a building here. So, you can take the photograph from here viewing this one move on either side, you take from here or here move almost by say 5 feet or 6 feets, and then station yourself and take the photograph again. This will help you in

viewing the terrain in 3 dimension. This you can practice we using the simple SLR camera.

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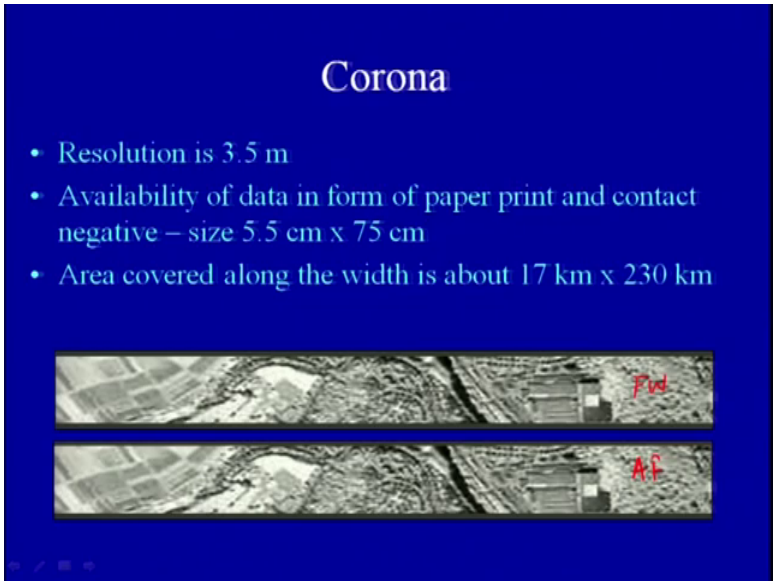

So, this is what the data will be obtained in form of a long strips of corona satellite data. So, these are all photographs not the images and this was collected by us spy satellite, and later maybe in 1999 this was declassified and it was available to the users and this mission that is the Corona mission by us spy satellite started way back in 60s and it lasted almost for up to 1976 or 1974. So, this information is available you can buy from internet because these are all high-resolution satellite photos, which are available of most of the portion of the world today.

And that resolution is almost like 3.5-meter availability of the data in form of paper print and contact negative sizes almost like 5.5 centimeter by 75 centimeter, and then area covered along the width is around 17 kilometers and along the length is almost like 230 kilometers. So, very large area has been covered and if you get in film then you can enlarge it and now a days, they provide this information in digital form so you can put it all this a data on your computer need to rectify, because there will be slight distortion in the center as well as on the either side, but if you just want to use to identify the terrain or understanding the terrain you can use directly.

So, one will be your forward image, and another will be your after image. So, both you can use to view the terrain in 3 dimension you need to also understand that what is the

line of flight. So, that you can do based on the conjugate points and all that and then try to look at the terrain, whether you are using you look viewing the terrain and a positive or a negative this thing I am talking of positive you will see of course, the hills are like you modulating and the valleys are deepen, but in terms of the negative image if you get, then you need like valleys will be propped up and the hills will be you will see and they are like the depressed. So, that is that will give you a negative image

So, need to change the place of the photographs either. So, you either you put right or left depending on that what the terrain or the image you are getting either it is negative or positive you can do that actually.

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This is the image begins the Corona photograph of Chandigarh city, which was taken way back if I am not wrong in 1964.

So now, why we are using this photographs in particularly for our interpretations that at during this period in particularly in India it was the area was not. So, populated and now if you look at the high resolution stereo photographs, you have carter set 1 and 2 you can compare this and try to identify that what is the pattern of land use, which changed over the time in the region.

But for us, it was important to identify the landforms and in particularly the land forms, which are unmodified or there is no anthropogenic effect of on the land form. So, if land

forms are altered it is difficult for us to evaluate the terrain. So, for us this old photographs which are taken in 60s and 70s are very important and extremely important for understanding the terrain.

Now, in this photograph again I will just very quickly explain, that we have some portions are shown darker there is again the shade of greys. So, we have a different shades in grey which are been appearing on the photograph depending on the reflectance. So, we have this whole area if we classify then this whole area is your settlement and as we know that Chandigarh is a well-planned city. So, this what you see different sectors here, you are having this roads and different sectors here as well as the construction of what you see civil structures maybe.

Then in terms of the terrain, if you look at then we have these streams or the rivers which are flowing on either side of the Chandigarh city, this here we can also pick up the roads and the rail tracks here, now this area in the recent photograph if you look at this is completely occupied this is what is the area known as Panchkula.

Then coming to other part there is a water body here this is an Sukhna lake, and then we have the small streams which are coming in Depouching into this lake, then the darker part we have the sub Himalayas the Shivalik hills and with an very sharp boundary, which I am drawing here now this boundary is what we call the plate boundary between the Eurasian plate and Indian plate and this is termed as the Himalayan frontal thrust in this counter we will talk in the next part the importance of this (Refer Time: 16:44) lines and the jumpology of array areas and all that.

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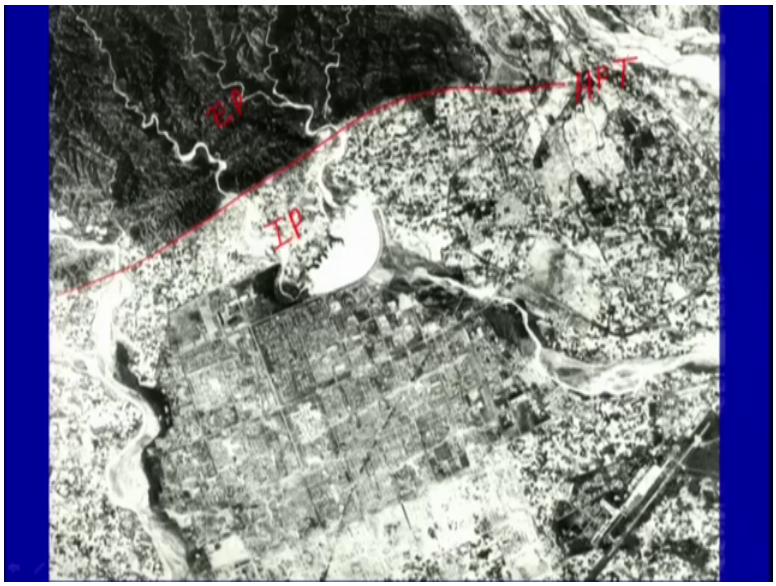

But in short you can easily make out the different landforms or you can interpret the different landforms provided, you have the understanding of the terrain that is in terms of the geomorphology the morphology of the terrain you should know about that, how the rivers looks like what are the landforms within the river valley what does this indicate etc.

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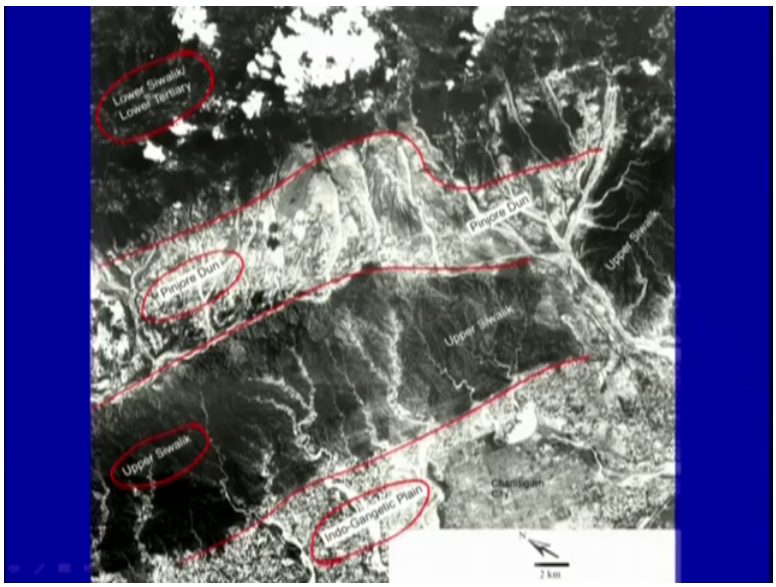

This is further classification of that, where we have mosaic more strips of Corona photographs and we have classified the landforms or the area on a very regional scale.

So, this what we are having the indo Gangetic plain here and this is the boundary between the Himalayas. So, Himalayas starts from here actually so you can easily make out that there is a drastic variation in the tones between the 2 areas.

So, tonal variation is extremely important, then we have this hill range ray ends up here and we have another hill range which is over here, but in between this we are having a brighter areas which are very much similar to the Indo Gangetic plain. So, again this area is your flat terrain whereas, this area is the hilly terrain. So, classification if you look at what has been done here. So, the plain areas you are here having in the southern side is your indo dune is the is the valley between the two mountain or two hill ranges similar like what we have Dehradun this is (Refer Time: 19:00) dune, and then we are having the lower Shivaliks or lower tertiary hill ranges.

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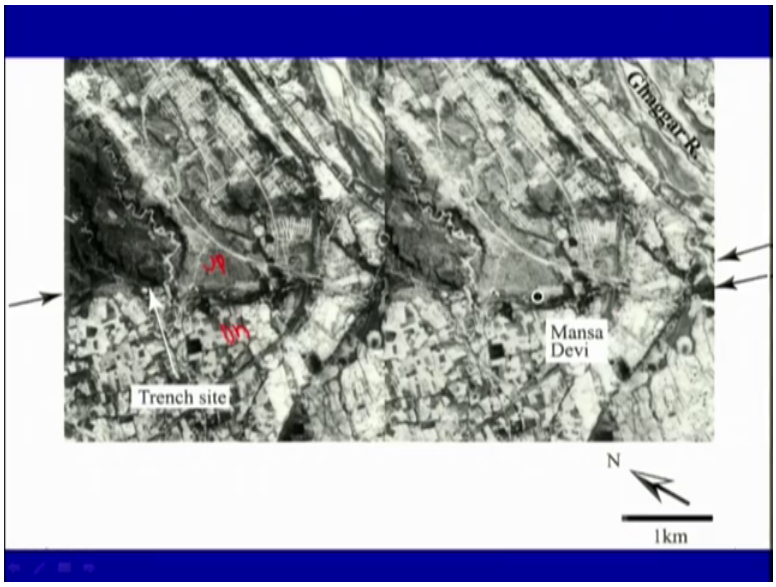

This is just to show you that slowly we will be moving to this exercise, where we are going to use 2 photographs taken from different cameras at different angle to view the terrain in 3 dimension. So, this is these are the 2 photographs taken by the Corona satellite of the same area and even you can match the area, as I will point out here this is the rail track or the road here, which is been seen here exactly and this point if you look the landform is marked here.

So, this is one is after the one is forward photograph. So, based on the viewing these 2 photographs in stereoscope or by naked eye you will be able to generate 3-dimensional

image of this terrain actually. So, right now if both the photographs you see a very flat area with slight indication here of darker tone, these are all the incised valleys or the river has cut this. So, these are the riverbanks, but the depth perception you will only be able to see when you see 2 images that is forward and after and try to generate the 3-dimensional view of the terrain.

Here for example, you are able to see this is also same this is also same here of course, there is some tonal variation, but if you look at this area in 3 dimension then you will be able to understand that this is an elevated portion, and this is the portion which is flat down here. So, this is side is up this is down, but in in 2D you will not be able to judge except, you will be able to mark some boundary between the 2 based on the tonal variations, but rest other information you will not be able to gather or your interpretation will be incomplete, if you are looking the terrain in 2 dimension and most of the time we very high resolution satellite image and try to identify the landforms based on their tonal variation and we mark the contacts.

So, for example, if you mark this you will be able to say something like that this is something like this or here, but you will not be able to and even in case of the roads you will be able to easily mark here without any problem, but he you would not be able to put this in terms of the depth perception you would not be able to mark that which side is up which side is down. So, this is the beauty of what you are going to learn using stereographic images.

So, let us move to the another topic, which is the important part of this course. So, we will continue with the stereography or stereoscopy what do you mean by stereoscopy in the next lecture.

Thank you so much.