Remote Sensing Essentials
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Module No # 07
Lecture No # 34
Mosaicking, subsets, sub-sampling techniques and applications

Hello everyone and welcome to discussion on mosaicking subset subsampling techniques and their applications under this remote sensing essentials course. Sometimes you know we face a problems about you know mosaicking because your area of interest might be covered by 2, 3 scenes may be 4 or sometimes large area as to be covered and for that scenes have to be mosaicked.

So for a college we also say so that has to be made and the purpose here is to create a mosaic which does not have the schemes or create a scheme less mosaic. Generally it is a quite difficult but still there are techniques which are available in digital image processing and also in software's by which we can make mosaic of several scenes and data sets into 1 single image. So if we look the definition that basically it refers to the process of combining spatially over lapping images into a single data sets to produce a spatially continuous image based on an aggregation function.

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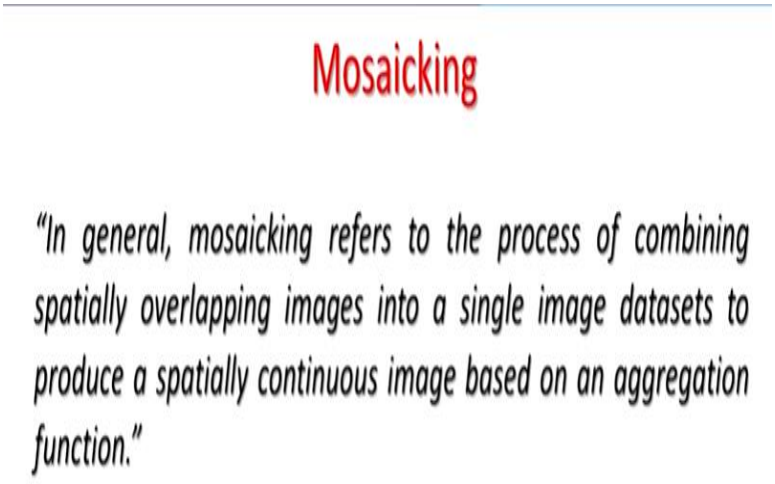

Now this spatially continuous image means here also that we need not to have a seen as far as possible. But sometimes too adjacent scenes may have different dates generally they are and if time gap is big between these two adjacent scenes then it becomes very difficult to remove the scene or the changes which are present in 2 different images. But nonetheless also merging some time word is also used.

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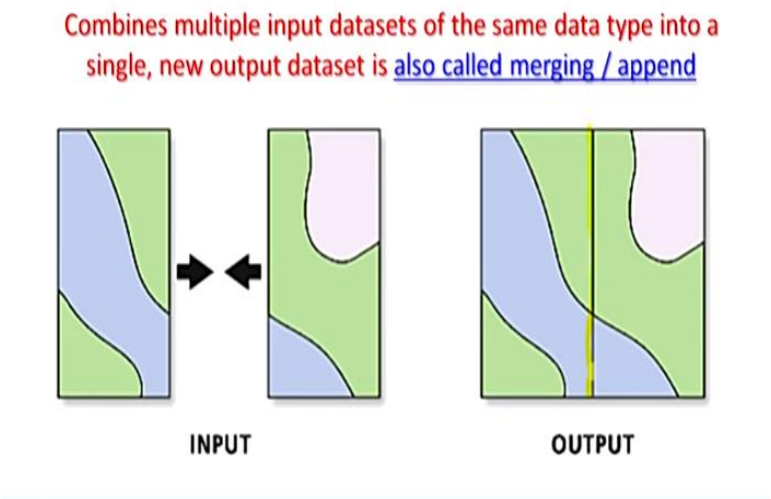

But merging or making mosaicking is bringing 2 adjacent scenes like in this figure it is shown here that 2 adjacent scenes are here and then output is created but output currently is having a scene whereas scene should not have been there. But anyway that scene can also be removed by certain techniques certain way and appended or a combined mosaic can be created.

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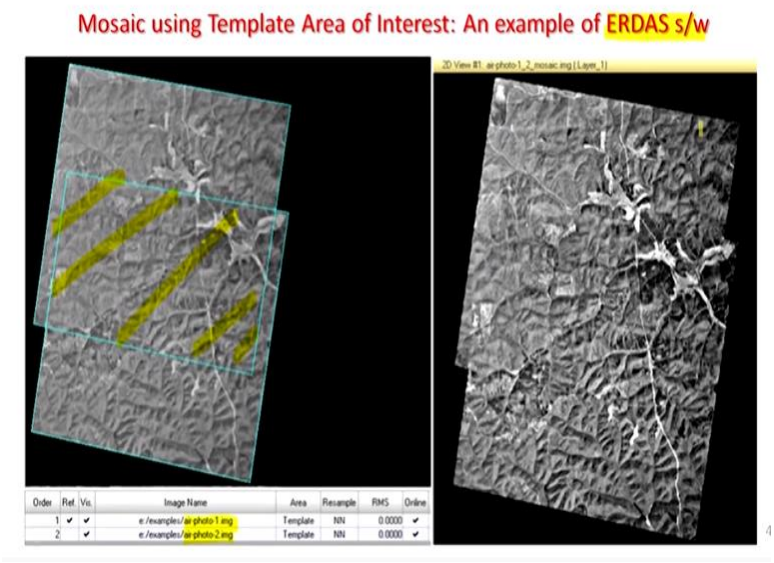

When we see the real images then we this is a mosaic which we can do in a commercial software which I have been discussing in demonstration also. 2 examples of mosaicking 2 scenes band 2 to simple band not colored one are shown here but color composites are also be mosaicked like this. So the common area which you are seeing is this one the common area now here during mosaicking it has to be declared that what should be done with the common area whether an average should be taken or whoever is having which ever you decide by or decided by the user like in this one the one which is in the bottom can have the you know the pixel values in that area which is the overlapping part.

And for example on the right side this is what we are seeing in mosaic and if we do not see the edges of this image then probably in this particular example this scene between 2 scenes cannot be identified. So this is a example of a good mosaic but these are basically the example is not exactly from satellite images but from aerial photographs 1 and even if they would have been satellite images but if they are one after another that is a you know in the same path that means they are representing the area of the same date then creating mosaic is not difficult or especially seamless mosaic.

But when 2 different orbits images are there and time difference is there then making seamless mosaic becomes little difficult but there are ways to minimize that scene and we can have such example.

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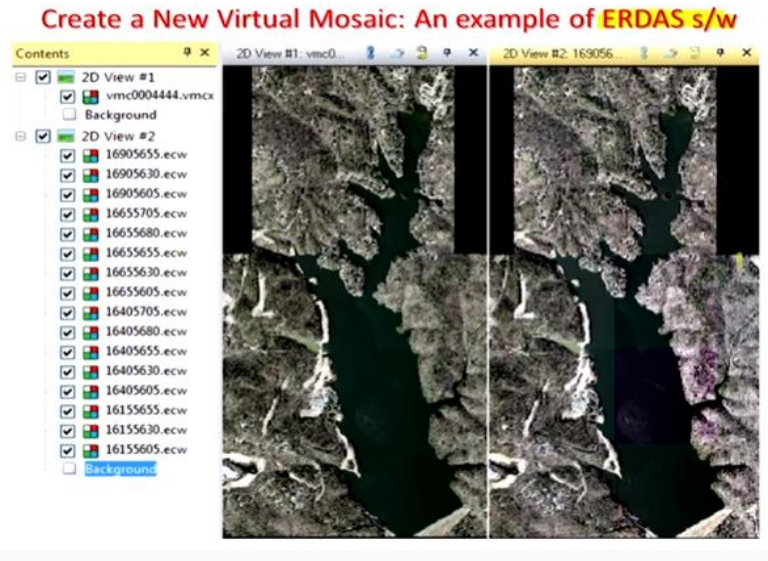

Like here again this is from same commercial software and various images have been taken here and seamless mosaic is what you see on the right side. So lot of scenes are here but their scenes have been minimized except that were the margins are there edges of one scene an other is there then it is it becomes very difficult to remove that one. And otherwise it is possible to create a seamless mosaic.

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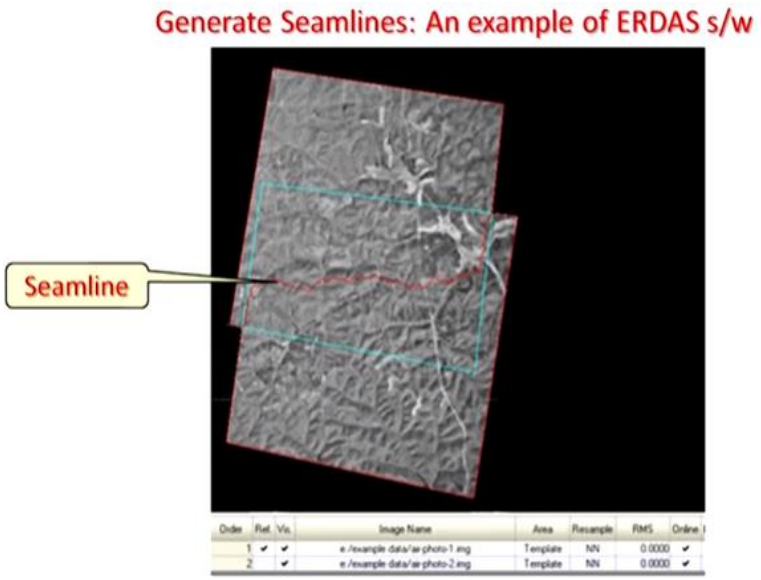

The example which earlier we have taken about this the seam and the seam can it is necessary that seam should always be a straight line seam can also be arbitrary line like here and then mosaic can also be created.

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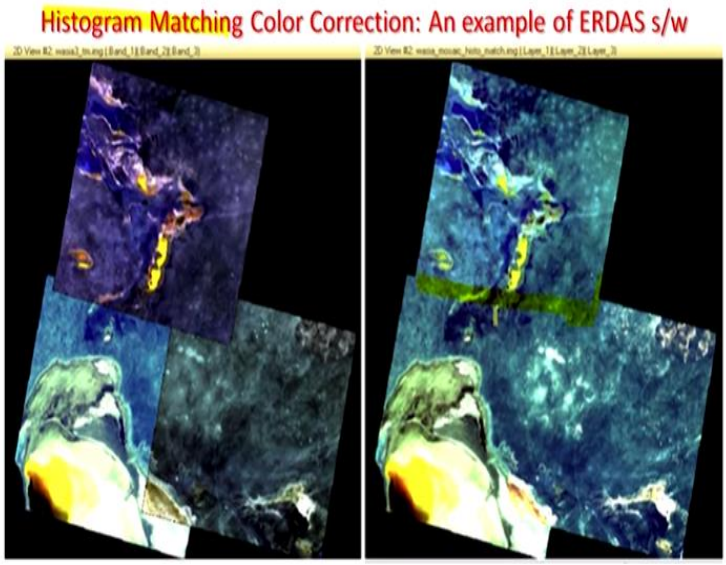

Here is the perhaps the best example here of taking or creating mosaic of 2 adjacent scenes which are having different spectral characteristics that means because they are belong to 2 different dates now how it can be done so the technique here is the matching the histogram and that is why when we started discussing digital image processing of satellite data. We started with the histogram becomes very important in almost all processing of remote sensing data.

So here the histograms of all these 3 scenes which are having different characteristics spectral characteristics have been combined by histogram matching technique and then you do not see any seam in between like here you do not see any seam here seam is completely gone. So in that way this mosaic can be created. Here the example of 3 but there may be 30 scenes the only thing the output image would be of very large size in terms of computer memories so one has to take care about that part as we are moving towards higher and higher spatial resolution.

And therefore our the data requirements or the handle data handling requirements is becoming very big and therefore one has to take care about the size. Otherwise it is possible to create a seamless mosaic of various scenes.

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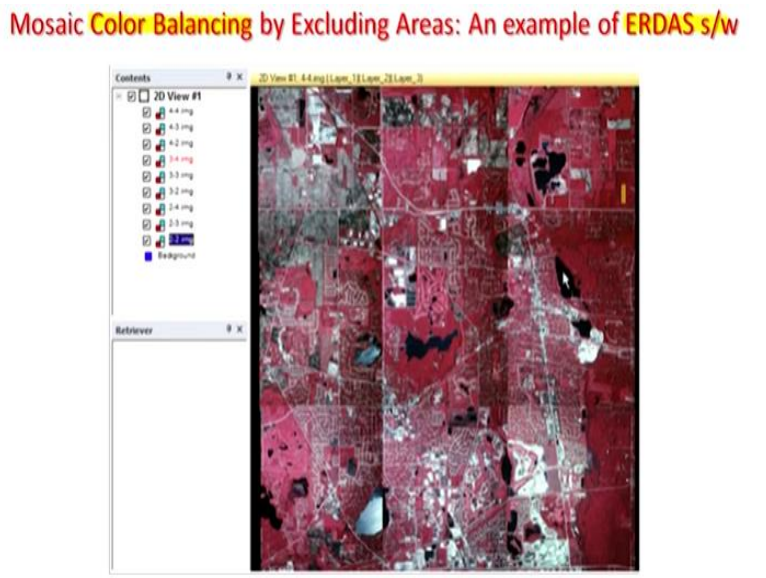

But more examples here is rather than matching histogram here is the example of color balancing by excluding areas that means the common areas have been excluded and what we find that of corrse mosaic has been created again using the same commercial software but sometimes on the edges you are seeing it is a showing some darkness.

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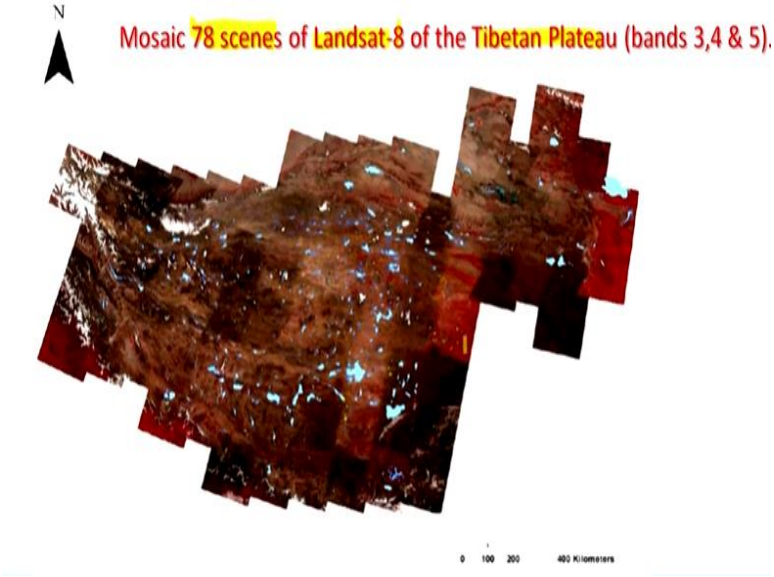

So probably that part becomes difficult to remove nonetheless you know it is always try to achieve less you know it is always try to achieve the best possible output through different mosaicking techniques. Now and this is the example from Tibetan Plateau and these are the you know of land sat 8 data having 78 scenes and what we are seeing if you do not see the edges the

boundary then in between probably it is very difficult to find a scene because it has been created in such a manner that the scene does not become obvious.

Nonetheless let us some places because of the time difference between different images you see here and the seams are also visible otherwise it is quiet good product. So whether it is a 2 scenes, 10 scenes, 30 scenes or in this example 78 scenes mosaics can be created as far is possible the best seamless mosaic. However the see this is a land sat 8 and there are 3 bands it would be a many gigabyte mosaic would be there. So one as to handle that much of the data otherwise technically it is possible to create a scene of 100 of scenes together.

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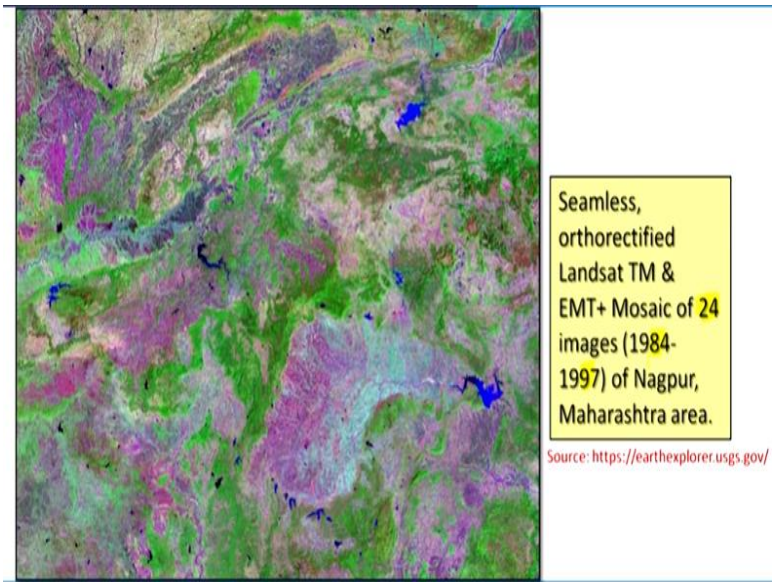

One of the best example of seamless mosaic and the ortho-rectified image which is available for the globe. And it has like in this one there are 24 images of between 1984 to 1997 of central India around north pole has been mosaicked see the time difference it is more than about 13 years time difference is there nonetheless is this is a complete seamless mosaic of 24 scenes and no where you see any scene between these images which are the 24 images. So it is possible which are the 24 images so it is possible to create seamless mosaic and one can cover is area of interest through such products.

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Now one of the best examples of seamless mosaic of entire group which we see through Google earth as you can see here also. Though once you start assuming it then what happens is individual scenes start appearing and of coarse their seams also but at this scales or even further (()) (12:07) scale to an extent we do not see a seam at all. But when individual seam boundary start appearing then because of the time difference between adjacent seams if it is large or the season difference is there then definitely we observe the seams even in the Google earth.

There might be time different their might be difference in the spatial resolution as well and that is why the seams are available as seams are scene otherwise we can have a completely seamless data and this is one of the examples of (()) (12:47) global scale. Now another important step which we have to take many times with the satellite data or in digital image processing is to create a subset of an image that means extracting our own area of interest in this example that the image we have been seeing of Nagpur area which is land set TM and ETM 24 scene same image is here.

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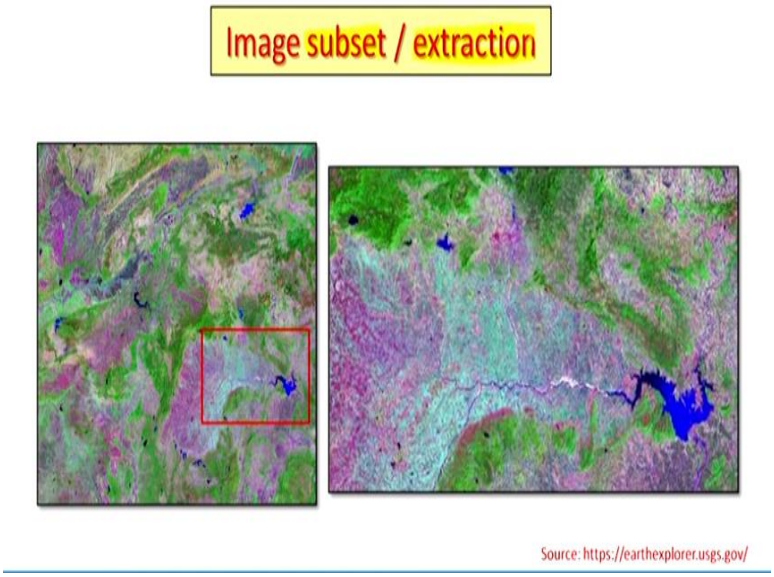

But this part of that image has been extracted a subset has been created and this is what you are seeing here on the right side so because my area of interest may fall within this one within this red box or red rectangle and I need not to have in my hard disk or in database the entire mosaic which is obviously very large data set. So then it is possible to either create a subset or extract the data or the sub scene from big mosaic or big scene also. So many times we need to do such a steps to first of all to reduce the unnecessary processing in during the digital image processing and though this somewhere in the back of system we make it the scene full mosaic but for further processing along with the other data sets we may create a subset.

And creating subset is not difficult at all in this examples subset has been created using a rectangle but an arbitrary line like a subset of water set sub set of political boundary and district level or state level can also be created without much problem. So only thing you require a polygon boundary like here one polygon boundary has been chosen that is rectangle red rectangle is shown and one can have some other boundaries but it has to be a polygon and then extraction is possible creating a subset of an image is easily possible.

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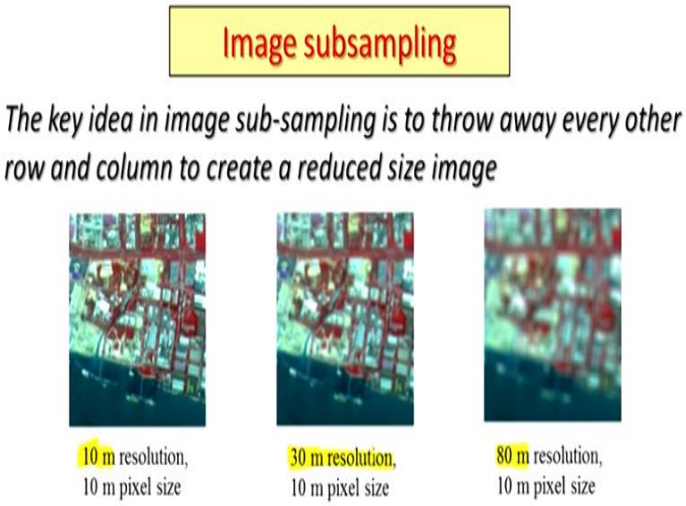

Now the third topic of this discussion is about image subsampling you know it is not possible reverse is not possible what I mean here is that if I am having you know coarse resolution remote sensing data once it has been acquired say at 80 meter resolution then it is not possible by any compute techniques or based on AIU or other techniques to create an image at say 10 meter resolution. But the reverse is possible reverse means subsampling can be done and we can create a image at a image which has been acquired by sensor 10 meter spatial resolution can be subset or can be subsampled to 80 meter resolution as shown here.

So the basically the idea of subsampling of a image subsampling is to basically reduce the number of pixels from an image that is throw away every other row and column to create a reduced size image. Sometimes in some applications because when we are using multiple datasets all datasets may not have the same spatial resolution. So we may decide that some data set which is having the high spatial resolution should be reduce to that particular resolution say we decide 80 meter resolution.

So 10 meter input image has to be reduced to 80 meter but reverse as has I said 80 meter resolution image cannot be improved to 10 meter resolution. So subsampling is definitely possible and this is done sometimes in some spatial circumstances such steps are taken in digital image processing to reduce. So the reduction is by you know the reducing the number of pixels both in both direction that is in row and column and creating a subsampling image as example here that in we can using 10 meter spatial resolution image.

First it may be reduced to 30 meter resolution only 10 meter this is let me remind you this is not data compression. Data compression is different thing though when we reduce the spatial resolution of this image like in this example definitely there will be less space requirement for 80 meter resolution as compared to 10 meter and may be just 1 eighth of original image. So suppose the original image was of 8 megabyte then this 80 meter resolution image may be may require only 1 megabyte of image however this is not all a compression techniques.

Compression techniques are different and we will have a completely separated treatment and discussion over compression techniques of satellite images. But here it is subsampling so this brings to the end of this brief discussion about 3 things one is about mosaicking of images many images multiple images starting 2 to 200 it is possible and also creating an subset of images and also finally we discuss about subsampling these are mosaicking is very common technique digital image processing.

As I already mentioned that because of several times our area of interest may fall in 2, 3, 10, 15 see it depends what resolution images you are using and what kind of how big the your area of interest is. So one has to be very careful while making mosaics sometimes also we are having already mosaics available we want to create a subset a small area because my area of interest may be smaller then those techniques also applicable.

So subset is a basically you can call as a reverse technique of mosaicking and lastly we have discussed about the some sampling technique. There is another word which is used in digital image processing which we discussed during geo-referencing which is called resampling. So one should not get confuse with resampling. Resampling is done to find out the new pixel value in a target grid that is the last step of geo-referencing but sub-sampling is completely different. So one should not get confuse about these words so subsampling is different resampling is different. So this brings to the end of this discussion thank you very much.