Structural Geology
Professor Santanu Misra
Department of Earth Sciences
Indian Institute of Technology, Kanpur
Lab Session_ Stereonet 5
Fold Geometry from Pole Data of Two Limbs

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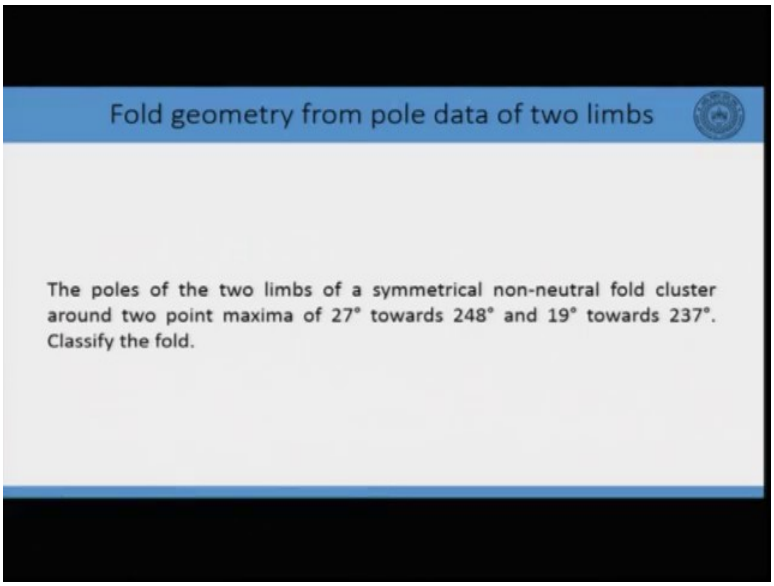

Hello everyone. So I will continue the problems on stereographic projections as Sakib has already started. So the first problem that I will deal with, Is the determining fold geometry when the pole data of two limbs is given. The pole data clusters around two maxima which is given in the problem. So one pole data plunges 27 degree towards 248 degree and the other pole data plunges 19 degree towards (27) 37 degree. So these two pole data are poles of the limb of a symmetrical non-neutral fold. So we will try to get the orientation of the fold attributes using plotting these two poles in the stereonet. So we will get started with the stereonet.

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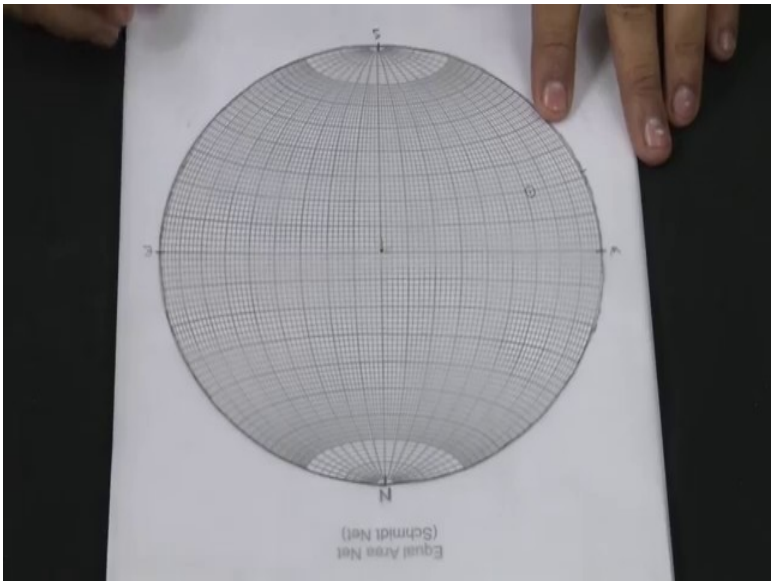

So we will first plot the first pole, so the first pole is 27 degree towards 248 degree so we will first determine the 248 degree. So here is the north mark, so this is the south is corresponds to 180 degree so 248 degree will be 190, 200, 210, 220, 230, 240, 248. So as Sakib has already said in many examples. We will take the angle on the east-west line measure and the angle is 27 degree so this corresponds to 27 degree.

Now we will again bring the tracing paper in its original position. Now to determine the limb, corresponding to this pole maxima we will again bring this point to the east-west line and now what we will do is that, we will go 90 degree from this point and the great circle 90 degree from this point will obviously represent the limb because as Sakib has mention in one of the problems 90 degree from a plane represents a pole, we will do the reverse operation here. 90 degree from the pole will give us the plane.

So we will count 90 degree. Clearly this is 27 degree. So in order to get 90 degree, we will count 63 degree from this side. So this is 10, 20, 30, 40, 50, 60, 63. So this great circle would represent one of the limbs. So clearly first what we will do is that this great circle on the east-west line. The dip is already known to us because this will represent the dip as Sakib has mentioned in the previous problem that dip is seen in the east-west line.

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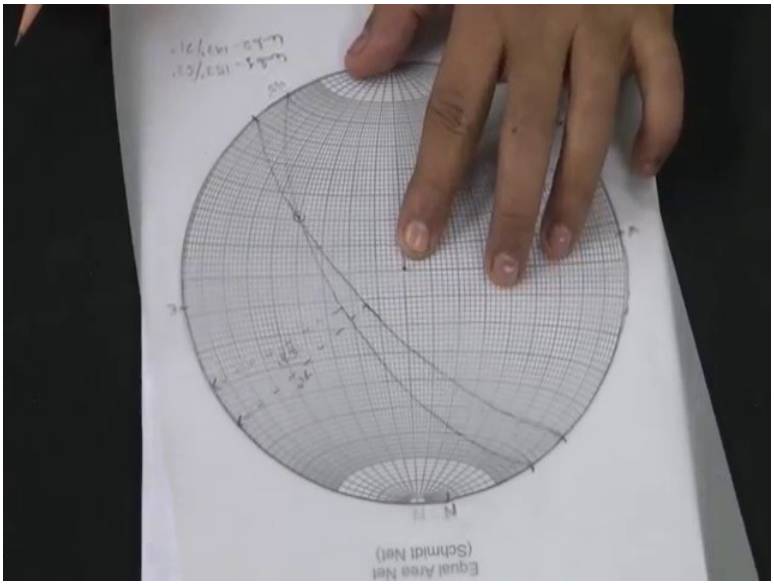

And now I mark the great circle. So clearly this would and this would be another end of the strikes. Now we will again rotate and bring it to coincide with the north and we see that the strike is around. So if this is 90 degree, this is 100, this is 110, 120, 130, 140, 150, 160. So the strike is 158 degree. So the dip angle is 63 degree of one limb and the strike is 158 degree. So limb orientation of limb one will be 158 degree, 63 degree. The dip amount is 63 degree.

Now in the similar manner we will plot the second pole. The second pole is 237 degree is the trend and the plunge is 19 degree. So first we will see whether the 237 degree south corresponds to 180 degree. So this is 190, 200, 210, 220, 230. So this would be around 237. In a similar way we will rotate this to an east-west line and then we will calculate 19 degree. Clearly this is the 19 degree, so this is represents the pole 2. So 90 degree from this pole, the great circle 90 degree apart from this pole will clearly represent limb 2.

So now in case of limb 2 what we will do is that we will calculate this is 19 degree. So from here we will calculate 71 degrees. So because 71 plus 19 corresponds to 90, so this is 10, 20, 30, 40, 50, 60, 70, 71. So clearly again the dip amount is 71 degrees and this represents the second limb of the fold. So this is one strike, this is another strike and the dip angle is 71 degree. Now again we bring the north and we see that the two limbs of the fold intersect at this point but before that we will mark the strike end of the second limb. So the east corresponds to 90 degrees.

So 100, 110, 120, 130, 140, 147, so the orientation of limb two is the strike is 147 degree and the dip amount is 71 degree. Now as Sakib mentions in the previous example where the two limbs of the fold intersect, the point represents the fold axis in the stereonet. As Sakib did we will do the same operation. We will first what we will do is we will rotate the fold axis in the stereonet to move it in the east west plane and now we will count the angle.

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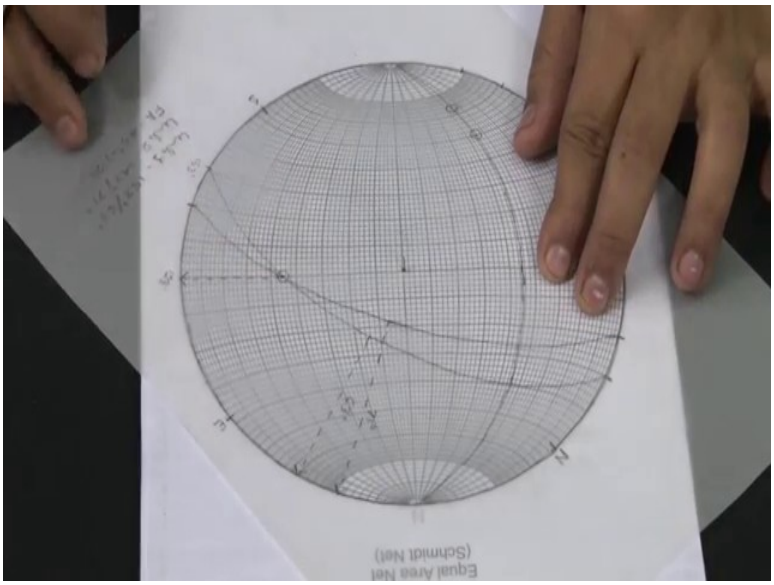

So the angle clearly is 1, 3, 5, 15, 25, 35, 45. So the plunge amount of the fold axis is 45 degrees and the fold axis plunges towards 100, 110, 120, 128 degree. So the orientation of fold axis is 45 degrees towards 128 degrees. Now we will have to determine the axial plane. So in the problem it is mentioned that the fold is the symmetrical non-neutral fold. So as Sakib has done in the previous problem I would rotate the fold axis in the east-west plane and first count 90 degrees. So the 90 degree from the fold axis will obviously in the east-west plane will give us the profile plane.

So this is 45 here, so this 45 from here and we will count 45 again from the center so from the fold axis to center is 45 and center to the great circle represents the profile plane would be 45 again. So 10, 20, 30, 40, 45. So this great circle will be our profile plane. Now what to do is that which angle to bisect? So if the fold is symmetrical so we have two angles. This is a very low angle in between the two limbs. We refer to as internal angle and this plus this refers to the external angle with respect to the limbs in the profile plane.

Now in a symmetrical fold the inter limb angle will be bisected but how to determine which angle the interior angle or the exterior angle to bisect? Now it is mentioned in the problem that fold is a non-neutral fold. In this time we have to think of the fold geometry. What happens in a non-neutral fold is that the axial plane dip should be steeper than the dip of one of the limbs. So in this case if we bisect the exterior angle clearly the dip of the limb would become shallower as the great circle will lie closer to the periphery (of) in the stereonet.

Hence in this problem what we will do is that we will bisect the very low angle in between the interior angle between the limbs. So first we will calculate the interior angle.

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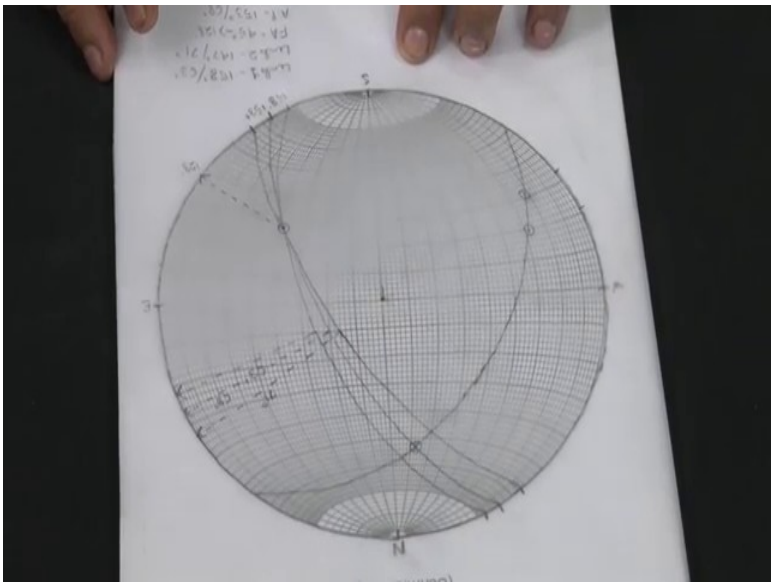

Basically the interior angle is 2, 4, 5, 2, 4, 6, 8, 10, 12, 13. So 6, 6 and a half corresponding to 7 will be the point of bisection. So the bisecting point would be this is 6, so probably this is the bisector of the inter limb angle. Clearly now the plane passing through this fold axis and the bisector will represent the axial plane. So now I will rotate this tracing paper, so as to pass a great circle through the fold axis and this plane.

Now we have found the great circle that passes through both the points. So we will mark the great circle. As we have done we will mark this two points to determine the strike and clearly on the east west plane, we will calculate the dip of this great circle which represents the axial plane and the dip corresponds to 8, now 8, 18, 28, 38, 48, 58, 68. So the axial plane, the dip is 68 degrees and the strike is this east is corresponds to 90, 100, 110, 120, 130, 140, 150 so this is and

we have marked the limb one wrongly. The strike of limb one would be not 153 but 158 degrees. So the axial plane of this fold, the orientation of the axial plane of this fold is the strike is 153 degrees and the dip is 68 degrees. So from two poles of a plane, we have reconstructed the fold.