Structural Geology
Professor Santanu Misra
Department of Earth Sciences
Indian Institute of Technology Kanpur India
Lab Session Stereonet 7
Fold geometry from pitch of the limbs on another plane

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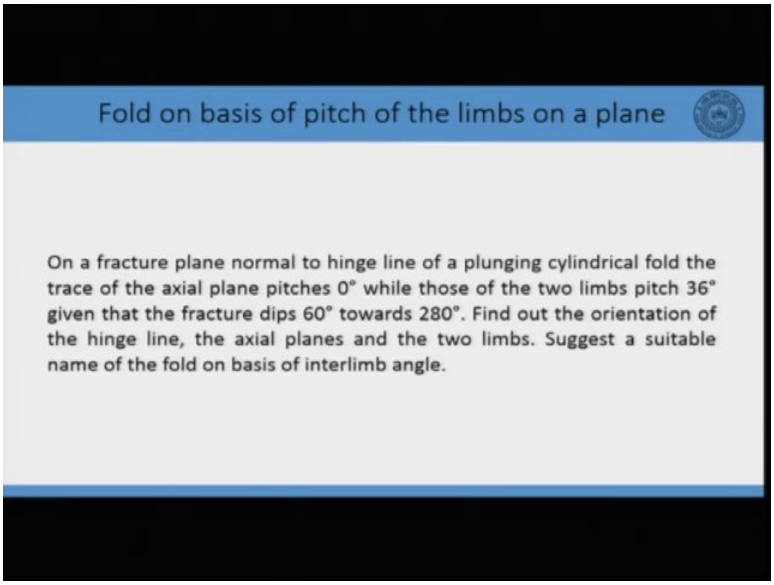

So, now, we have come with another problem. So, when we have the data of pitch of the limbs of a fold on another plane, then how to reconstruct the fold geometry. So, the question reads as - On a fracture plane normal to the hinge line of a plunging cylindrical fold the trace of the axial plane pitches 0 degree while those of the two limbs 36 degree given that the fracture dips 60 degree towards 280 degree. Find out the orientation of the hinge line, the axial planes and the two limbs. Suggest a suitable name of the fold on the basis of interlimb angle.

Now, when we read the question we have to get the information out. So, first it is written on a fracture plane normal to the hinge line. So clearly, a plane normal to the hinge line or the fold axis is the profile plane. So the fracture plane is clearly the profile plane of the fold and we know the orientation of the profile plane which is mentioned later in the question as 60 degree towards 280 degree. So the profile plane dips 60 degree and the direction is 280 degree.

So, we have another information, the fold is in a plunging cylindrical fold and the trace of the axial plane pitches 0 degree on the profile plane or the fracture plane. Now, we have been sure

about the fracture plane is basically the profile plane. So, the trace of the axial plane on the profile plane of the fold pitches 0 degree and other information is that the two limbs pitch 36 degree on the profile plane. So, with this information we will try to figure out what is the fold geometry of the given fold. So, we will again help the use of the same tool that we have been using, that is the stereonet.

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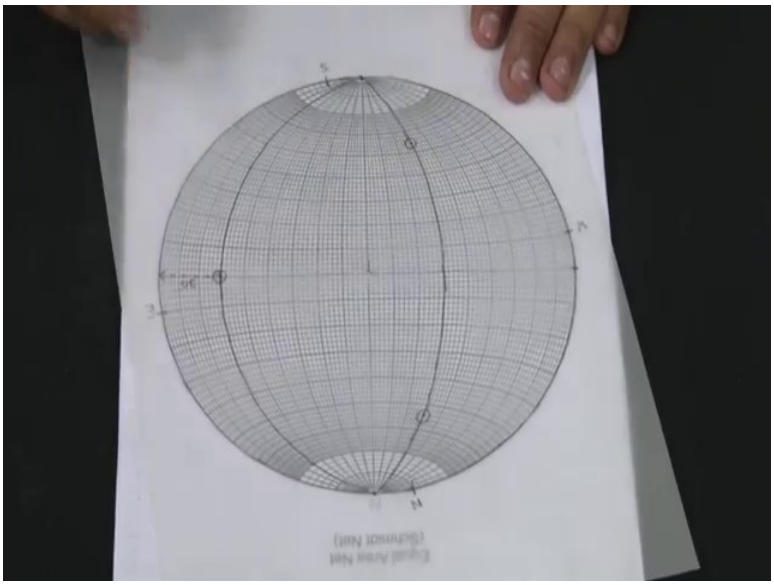

Now, in this problem we will first mark the fracture plane or otherwise the profile plane of the fold. So the profile plane of the fold dips 60 degree towards 280 degree. So, west corresponds to 270 degree so 280 degree is this mark which I have drawn. Now, I make the 280 degree on the east west limb and calculate 60 degree. So, this is 10, 20, 30, 40, 50, 60. So, this grade circle is basically the profile plane of our concern fold. Now, we have marked the profile plane of the concern fold.

Now, 90 degree from this profile plane is basically the fold axis. So this is 30 degree from this profile plane to the center so we will calculate another 60^{o} from the center to get the fold axis. So this is 10, 20, 30, 40, 50, 60. So, this is clearly the fold axis or the hinge limb. Now, the axial plane passes through the fold axis and we have another information on the axial plane then the trace of the axial plane pitches 0 degree on the fracture plane or profile plane in this fold. So, if the axial trace pitches 0 degree on the fracture plane so clearly the axial plane would pass through these points.

Because these two points correspond to the 0 degree pitch on this plane or this fracture plane. So if we count certain values then it will have certain values of pitch from one of the directions of the strike. But it is mentioned that the axial plane pitches 0 degree on the fracture plane. You should be convinced that the axial plane will pass through these two points because the pitch of the axial planer phase is 0 degree on the fracture plane and also the axial plane passes through the fold axis. So the grade circle corresponds to this point and the fold axis will give us the axial plane. So we also now draw the axial plane of this fold.

So the dip of the axial plane is this and the dip amount is 30 degree. Now it is again mentioned that the two limbs pitch 36 degree on the fracture plane or the profile plane of the fold. Now, it is not mentioned from which end the pitch we should calculate, it is not mentioned from which end of the fracture plane we should move 36 degrees but it is mentioned that the fold is in plunging cylindrical fold. The fold is plunging. We obviously see that the fold axis does not lie on the periphery of the stereonet.

So, the fold obviously plunges. Now, the question comes is that, which end of the fracture plane we should take the pitch of the limbs. Now, as it is mentioned the fold is in the cylindrical fold so the two limbs should be in two opposite directions because in a cylindrical fold a limb should move parallel to itself to generate the fold surface and if that is the case then the two limbs should be in two directions. So, pitches of the two limbs will be from the two ends of this fracture plane and the amount of pitch is same for both the limbs that is 36 degree. Because the fold is symmetrical so we calculate 36 degree from this end to get the point of one of the limbs and 36 degree from the other end to get the point of another limb. And so if we join this point which is 36 degree from one of the ends of the fracture plane with the fold axis we will get one of the limbs and we again join the other point with the fold axis we will get another limb. So, now I plot the 36 degree pitch on this fracture plane which is clearly 10, 20, 30, 32, 34, 36. So, this is one and this is another 20, 30, 36.

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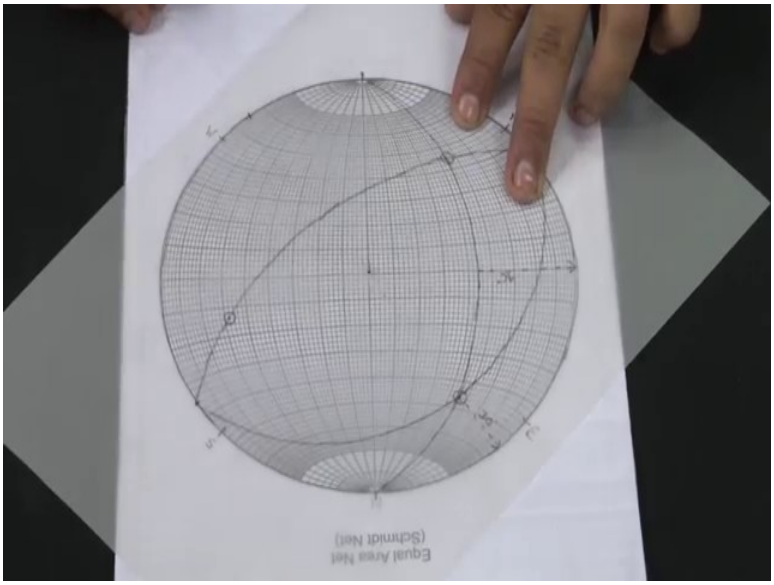

So, now, I rotate the overlay of the tracing paper to find out one of the limbs which pass through the fold axis and also the point we have obtained from the pitch of the limb trace on the fracture plane and clearly, this grade circle represents one of the limbs. This would one of the strikes, and this is one of the strikes and the dip is this, So the dip is 6, 16, 26, 36, 46.

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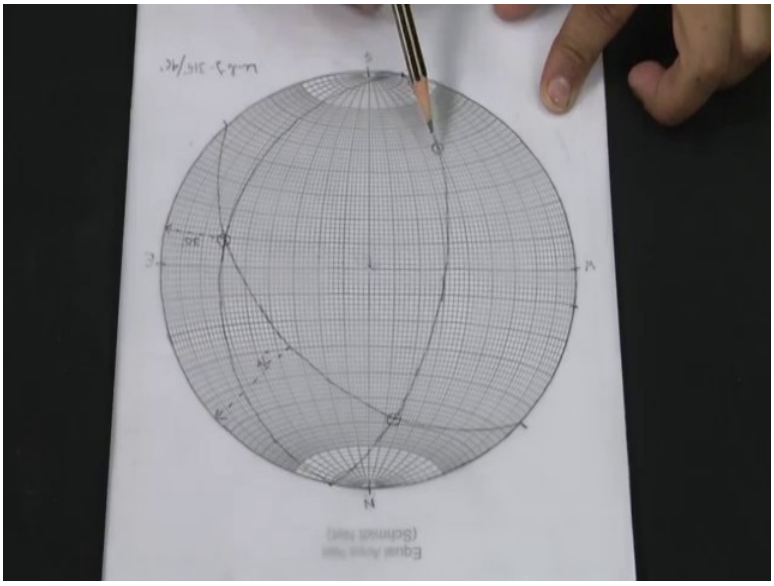

So, now, I rotate the overlay. So we have found the orientation of one of the limbs. Now we count the streak east corresponds to 90 this is 100, 110, 120, 130, 134, 135 but considering right-

hand rule we will consider this end of the streak of the limb which is west corresponds to 270, 280, 290, 300, 310, 315. So the orientation of one of the limbs is 315 degree, is the strike and the dip is 46 degree. Now, to find the orientation of the other limb we will join this point and again the fold axis.

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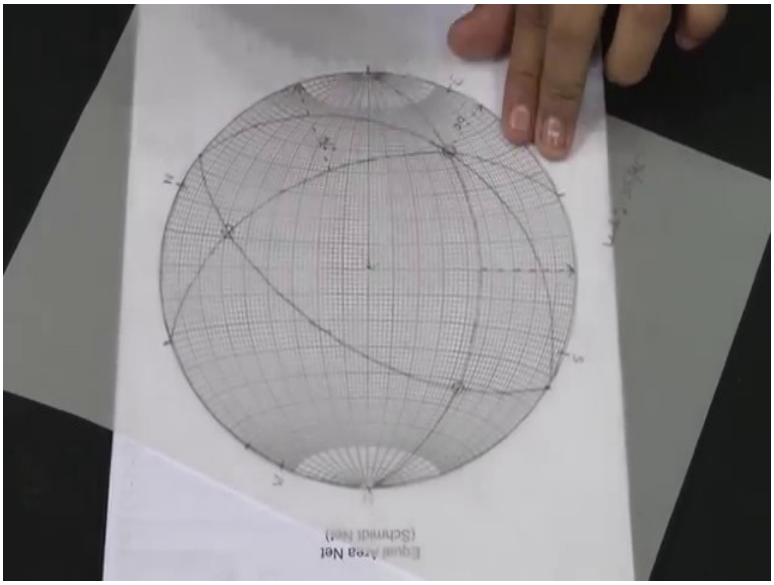

So we will find the grade circle passing through this point by rotating the overlay. Probably we have arrived at the same grade circle. Yeah, so now we will join these two points. So the grade circle that passes through, this is the other strike and we mark the dip. So the dip is 5, 10, 15, 25, 35, 45.

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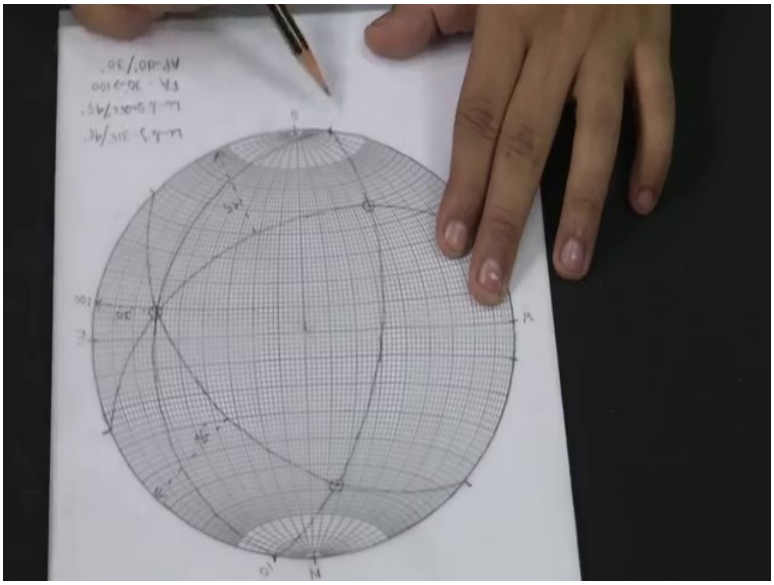

So, now, I again rotate the overlay and read the strike. So the dip amount is 45 and the strike is north so this is 20, 30, 40, 50, 60, 66. So the limb two we have 66 degree is the strike and the dip amount is 45 degree. Clearly, this is the fold axis so the fold axis is plunging 30 degree in direction of 100 degree. So, the orientation of the fold axis is plunging 30 degree and the orientation is 100^{o} and clearly this is our axial plane. So, the axial plane we find out the streak.

The axial planes this aim at the strike of the axial plane and the dip is also 30 degree similar to the fold axis and the axial plane streak is 10 degree. So the axial plane orientation is 10 degree and the dip amount is 30 degree. We have pitch of the two limbs on another plane, we can reconstruct the fold geometry by the method we have shown.