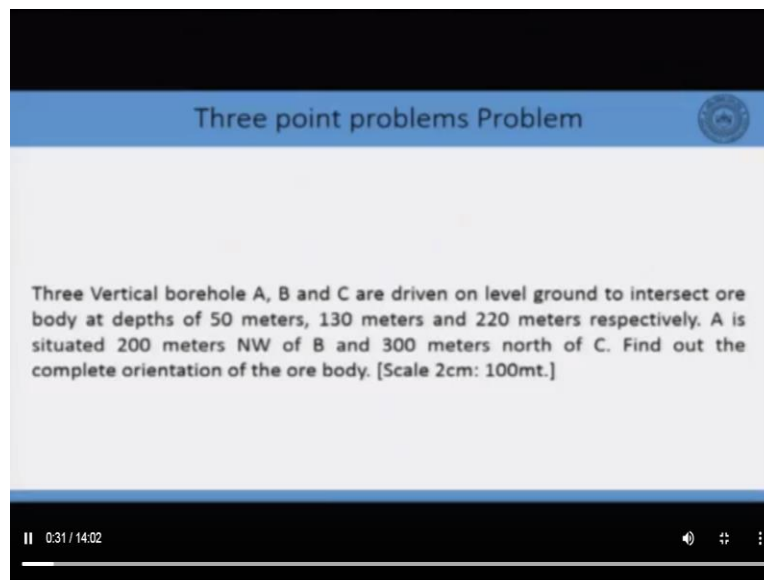


Structural Geology
Professor Santanu Misra
Department of Earth Sciences
Indian Institute of Technology, Kanpur
Lab Session
Three Point Problem.
Lecture No 46

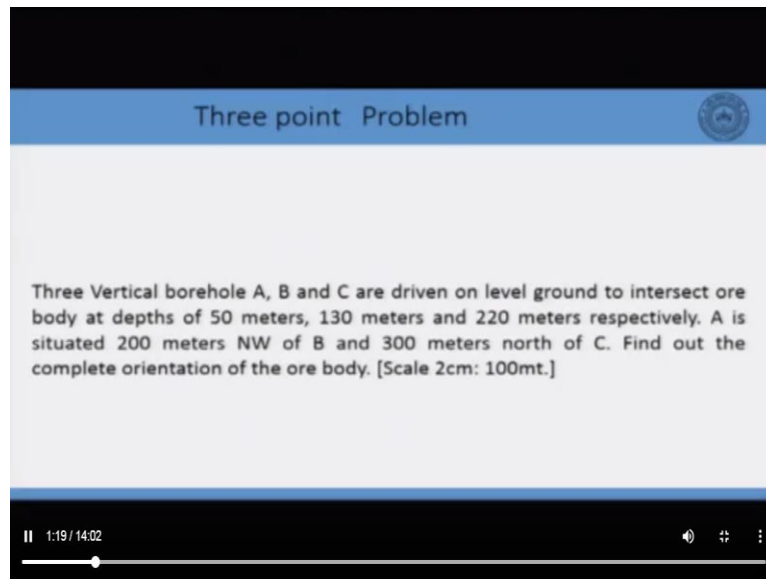
Welcome, once again to this NPTEL online lecture series on structural geology. So in this final week we have once again come up with another problem that is called the three point problem.

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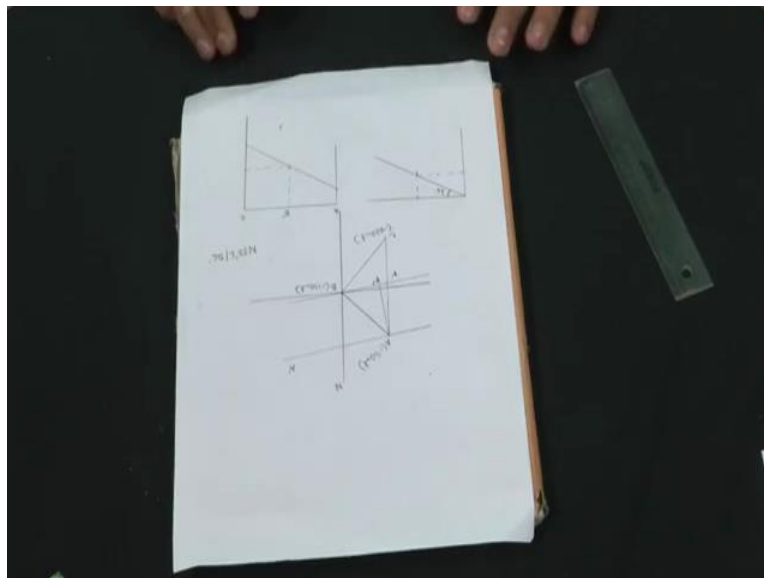
In three-point problem we have three points from which we try to construct the orientation of a bed. So in this particular problem, we have bed whose orientation we need to determine that is an ore body and we have 3 vertical boreholes whose disposition in space we know and from that information we have to calculate the orientation of the ore body.

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The question reads as follows 3 vertical boreholes A, B and C are driven on level ground to intersect ore body at depths of 50 meters, 130 meters and 220 meters, respectively. A is situated 200 meters north west of B and 300 meters north of C. Find out the complete orientation of the ore body. The scale of the problem is 2 centimeter is to 100 meters. So again, for this problem without the help of stereo net we will try to find out the orientation of the ore body.

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So again in a blank A4 paper first, we draw a biaxial diagram to fix the coordinate system. Now, we plot the spatial disposition of the boreholes. So first we fix a bore hole in the origin. In this problem we fix the borehole B, suppose this is the borehole B. Now we know that the borehole A is situated 200-meter northwest of B. So we conventionally take this as north and then North West is basically 45 degrees west of north.

So I plot the 45 degrees North West. So in this line, which is joining the origin with North West direction if we go along the scale 4 centimeters that is 200 meters we will find out the position of the borehole A. So we go 4 centimeters and this is the position of borehole A.

Now from borehole A if we go 300 meters south, we should find position of borehole C. So we do that we go. Now, this is our North South direction. If we go 6 centimeters, we should find position of C, so this is the position of C. So now I rotate again and join this.

Now we know that the ore body height from the level ground underground in the position BC and AR this is minus 130 meters minus because it is going down, we are going down. This is minus 220 meters and this is minus 50 meters because A, B, C are the positions where the boreholes hit the ore body and we know the depth.

So clearly, we could find in the AC line a 130 meter point. Then we can construct a strike line of minus 130 meter of the ore body. So for that we do a subsidiary drawing in which we first take the horizontal separation of A and C. Now we know their vertical separation as well. So A is minus 50 meters so this that corresponds to 1 centimeter according to our scale and C corresponds to 4 is to 100 so this is 225, so this point.

So now I join the vertical separation of A and C. So clearly along this line there would be a point where the height would be minus 130 meters. So from here, we know that 130 meters will corresponds to this is 125, this is 130. So now if we project this point in the horizontal plane spacing, we will clearly find out a point in the AC line whose height corresponds to 130 meters. So for that we do the projections, I just rotate this paper for convenience of my drawing.

Now clearly if I name this as B dash, so I find out a position A to B dash where in the AC line which corresponds to minus 130-meter depth. So I take the distance from A to B dash and I plot it in the AC line. So clearly now if I join B with this point B', I would get the minus 130 meters

strike line. And then if I construct a parallel line, any parallel line to the corresponding 130 meter strike line from the point A or from the point C we will get another strike line from point A if we construct we will get a strike line of minus 50 meters, if from point C we construct we will get a strike line of minus 220 meters. First, I construct the minus 130 meter strike line, which is this.

Now in this problem, I construct a strike line parallel to the minus 130-meter strike line from the point A which will corresponds to the minus 50 meter strike line so I name it AA dash. So now basically what we have is that we have the strike lines of two depths of the ore body. One AA dash which is the strike line of the ore body corresponding to minus 50 meters depth and another is BB dash which is the strike line of the ore body corresponding to minus 130 meter depth. Clearly minus 130 meter is below minus 50 meters so the bed is dipping towards this direction.

So now what I do is that I completely reorient the page and draw a perpendicular from A to BB dash. Now this perpendicular line which I have drawn from A will intersect the BB dash line, which I call suppose P or P dash. So this AP dash is basically our direction, the direction towards which the bed dips and this is basically the vertical distance between these two lines the minus 50 meter and the minus 130 meter line in the plane.

In order to find out the dip, we will first construct another subsidiary diagram in which along the X axis we will plot the distance of AP dash and now we know the vertical spacing between the AP dash which is basically 80 meters. So I go to the 80 meters according to the scale.

Now to find out the dip we will construct 2 parallel lines, one parallel to X, one parallel to Y and where the 2 lines intersect if we join it with the origin we will find out the deep of the ore body. So for that process we start and join these 2 points and measure the angle which will be the deep angle of the ore body. So, the angle is 26 degrees and I measure the strike of the ore body and it corresponds to north of 82-degree East. So the complete orientation of the ore body is north of 82 degree East and 26 degree.

So basically, the strikes 82 degree and the deep of the ore body is 26 degree. So from 3 vertical positions of boreholes that intersect our ore body we have constructed the orientation of the ore body and this kind of problem is known as three point problems. So, thank you all for this session and stay tuned for further upcoming sessions.

