Method for unrolling conical surface and restoration of linear structure on it

In the Chitradurga Fold, the bedding-maxima for different sectors have outward dip directions (antiformal sense) except in sectors 3 and in 11, 12 and 13, where the bedding dips indicate an inversion. So these beds and their corresponding β's are not considered in the process of unfolding. Similarly, in sectors, having more than one maximum, only the beds whose dip directions are outwards and whose strike conforms the fold-pattern have been considered. Figure A.1 shows the great circles representing the bedding maxima for different sectors of the conical fold and the attitude of respective β's on them.

Now, suppose the plane surface PQR (in Fig. A.2) is folded into a circular cone so that PQ coincides with RQ (Fig. A.3).

In Figure A.2, $QO = PQ = QR = 1$ (say)

Let $QN = 1$

$PMR = s = \text{circumference of the circular section of the cone with unit cone axis (QN)}.$

$\angle MQN = X = \text{apical angle of the cone}.$

Also, $r = \tan X$ and $l = 1/\cos X$

Therefore, $s = 2\pi r = 2\pi \tan X$

Now in Figure A.2, $\angle PQR = \frac{\text{arc PR}}{l}$

Since the arc PR forms the circular sections of the cone,

$PR = s = 2\pi \tan X$
\[ \angle PQR = \frac{PR}{1} = 2\pi \tan x \cdot \cos x = 2\pi \sin x \quad \text{(in radians)}. \]

Since 1 radian = \( \frac{180^\circ}{\pi} \)

\[ PQR = 2\pi \sin x \text{ radians} = \left( \frac{180 \cdot 2\pi \sin x}{\pi} \right)^\circ = (360 \cdot \sin x)^\circ \]

Since \( x = 7^\circ \), \angle PQR = (360 \cdot 122)^\circ = 43.92^\circ \]

In Figure A.4, suppose the inclination of PQ (i.e., dip direction of the bedding on any point of the line PQ lying on the conical surface) is towards north. The line QT represents the bed in the dip direction of 103°, XY is the strike of the bedding dipping towards 103°, X representing 193° direction and Y representing 13° direction. Rake of \( \beta \) on this bed is 60° southerly (see the bedding maximum for sector 1 in Fig. A.1).

Now, the arc of 43.92° angle represents the complete 360° direction in space when the surface is in conical form. So 1° division of the arc represents 8.2° direction in space. Since QT has inclination towards 103°, \( \angle TQP = (103/8.2)^\circ = 12.56^\circ \).

In Figure A.5, where PQR represents a planar vertical surface (on east - west plane), the dip direction of bedding is drawn QT making \( \angle PQT = 12.56^\circ \). The strike line XY is marked on it fixing the direction of X and Y with respect to the dip direction of 103°. Since the rake of \( \beta \) is 60° southerly, the line representing \( \beta \) is drawn making an angle of 60° with X (southern) direction of the strike. Similarly other \( \beta \)'s are drawn on the unfolded conical surface.
### Table A.1

Calculation of the angle between the restored and the vertical line on the unrolled (E-W vertical) plane

<table>
<thead>
<tr>
<th>Sector No.</th>
<th>Dip-direction of bedding maximum</th>
<th>Rake of ( \beta ) on the bedding</th>
<th>Division in arc</th>
<th>Angle between the vertical and ( \beta ) on the unrolled plane</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>171°</td>
<td>80°Wly</td>
<td>20.8°</td>
<td>20.8° + (90° − 80° ) = 20.8° + 10° = 30.8°</td>
</tr>
<tr>
<td>8</td>
<td>204°</td>
<td>82°WNWly</td>
<td>24.9°</td>
<td>24.9° + (90° − 82° ) = 24.9° + 8° = 32.9°</td>
</tr>
<tr>
<td>9</td>
<td>210°</td>
<td>80°WNWly</td>
<td>25.6°</td>
<td>25.6° + (90° − 80° ) = 25.6° + 10° = 35.6°</td>
</tr>
<tr>
<td>1</td>
<td>103°</td>
<td>60°Sly</td>
<td>12.56°</td>
<td>12.56° + (90° − 60° ) = 12.56° + 30° = 42.56°</td>
</tr>
<tr>
<td>6</td>
<td>102°</td>
<td>62°Sly</td>
<td>12.44°</td>
<td>12.44° + (90° − 62° ) = 12.44° + 28° = 40.44°</td>
</tr>
<tr>
<td>7</td>
<td>209°</td>
<td>76°NWly</td>
<td>25.5°</td>
<td>25.5° + (90° − 76° ) = 25.5° + 14° = 39.5°</td>
</tr>
<tr>
<td>10</td>
<td>250°</td>
<td>76°NNWly</td>
<td>30.5°</td>
<td>30.5° + (90° − 76° ) = 30.5° + 14° = 44.5°</td>
</tr>
</tbody>
</table>
Table A.1 shows the angle between the restored $\beta$ and the vertical line on the unrolled (E-W vertical plane) along with respective dip direction of bedding maximum and the rake of $\beta$ on it for different sectors.