Non-Uniform Strike-Slip Fault Dislocation Model in a Monoclinic Half-Space

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Abstract
Analytical expressions in closed form for displacements caused by non-uniform vertical strike-slip fault in a monoclinic half space with traction free and rigid boundary have been obtained. Two types of non-uniform strike-slip fault have been considered, i.e., Linear and Parabolic. Graphical calculations have been done with the help of Matlab software and it has been observed that the displacement does not exist when the distance from the fault is zero. We noticed that the displacement has non-uniform pattern in monoclinic medium and the magnitude of displacement due to parabolic slip profile is more as comparison to linear slip profile.
Keywords: 1.Monoclinic, 2.Non-Uniform, 3.Strike-slip, 4.Traction

Introduction

The problem of deformations due to non-uniform slip profiles is very important. The earlier studies were based on uniform slip profile but assumption of uniform slip makes the edge of fault plane discontinuous where the stress is very large and displacement is too small, therefore uniform slip models cannot work on near of fault plane. There are a large number of phenomena that occur near the field. Chinnery and Petrak (1968) studied these phenomena by considering vertical movement associated by strike-slip faulting and the formation of secondary faults. To study such kind of phenomena, it is necessary to consider the models of earthquake faulting with variable slip. Chinnery and Petrak (1968) also calculated the elastic field for a strike-slip fault by taking non-uniform slip that varies exponentially over the face of the fault. Further, Freund and Barnett (1976) developed a model of two dimensional dip-slips faulting with variable slip on the fault plane. Yang and Toksoz (1981) studied a non-uniform trapezoidal type slip on a strike slip fault under the effect of lateral heterogeneities and finite fault scheme. Wang and Wu (1983) obtained analytical expressions for displacements and stress fields for the same type of variable slip and compared the corresponding results with uniform slip. Singh et al. (1994) studied the problem of static deformation in a homogenous, isotropic, perfectly elastic half space caused by a non-uniform slip along vertical strike and dip slip fault. Both faults were of infinite length and at finite depth. Rani and Singh (2007) solved the same problem for two welded half-space due to a strike slip fault.

Further, Chugh et al. (2011) studied static deformation field caused by non-uniform slip profiles along a vertical strike-slip fault situated in a homogenous orthotropic elastic layer which is in welded contact with orthotropic elastic half-space. They also discussed the same problem when boundary of layer with orthotropic half-space is in smooth rigid and rough rigid contact. Sen and Debnath (2012) studied the problem of creeping vertical strike-slip fault in a viscoelastic half space and after that Debnath et al. (2012) studied two interacting creeping vertical strike-slip fault in the viscoelastic half-space. Sahrawat et al. (2014) studied the dislocation problem in a uniform half-space with rigid boundary and Godara et al. (2017) extended this problem from uniform to non-uniform half-space.

Ting (1995) studied an antiplane deformations of anisotropic elastic materials and derived Green's function for infinite half-space and biomaterials by applying antiplane force and screw dislocation. Kumar et al (2003) derived static deformation of monoclinic half-space with stress free boundary by a long inclined strike-slip fault and Tagra et al (2016) derived deformation of monoclinic half-space with rigid boundary. In this chapter, Analytical expressions in closed form for displacements caused by non-uniform vertical strike slip fault in a monoclinic half-space have been obtained. Here two cases are considered, in first case boundary of half-space is free, means stresses at boundary is zero and in second case, boundary is rigid, means displacement at boundary is zero. Here two types of non-uniform slip profiles are considered, namely, linear $B(r) = b_0\left(1 - r/L\right)$ and parabolic $B(r) = b_0\left(1 - r^2/L^2\right)$, where B is the slip at a distance r from the surface, b_0 is the surface slip and L is the fault depth. In first case, this paper is continuance of the paper of Singh et al. (2003) by considering non-uniform vertical strike slip fault instead of uniform inclined strike slip fault and generalization of Madan et al. (2005) for linear and parabolic slip profile and in second case, this paper is continuance of the work of Malik and Singh (2013) apparently by taking non-uniform vertical strike-slip fault in a monoclinic half-space with rigid boundary instead of uniform isotropic half-space.

When Boundary of Half-Space is Stress Free

According to Maruyama (1966), the field of displacement by a long strike-slip geological fault of arbitrary orientation can be written by:

$$u = \int_0^L B(r)G(z_1, z_2, r)dr, \tag{1}$$

Further, Singh et al (2003) obtained the field of displacement by a long strike-slip geological fault in a monoclinic half-space (with free boundary) in which green's function is in the form

$$G(z_1, z_2) = \frac{c}{2\pi}\left(\frac{X_1}{M^2} - \frac{X_2}{N^2}\right), \tag{2}$$

where the line source of unit length due to strike-slip fault is placed is placed at $z_1 = 0$ and $z_2 = d$ and dip angle θ is arbitrary but in the present problem, line source is placed at origin and fault is vertical, so z_2 is also zero and dip angle is 90°.

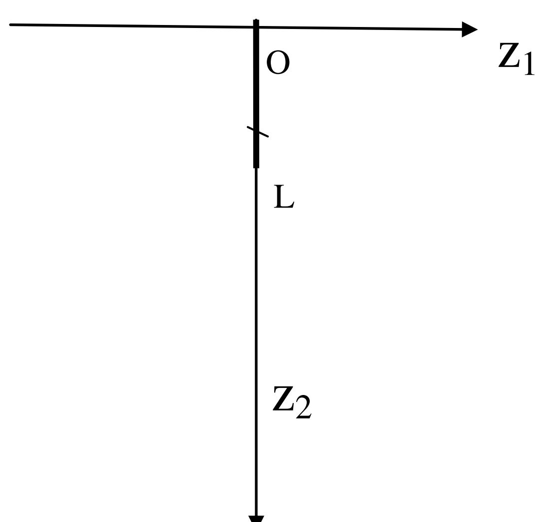

Fig. 1 Vertical Strike-Slip Fault of length L Situated in a Monoclinic Medium

and

$$M^2 = \frac{1}{b}\left\{\left[br - az_1 - bz_2\right]^2 + c^2 z_1^2\right\}, \tag{3}$$

$$N^2 = \frac{1}{b}\left\{\left[br - a\left(z_1 + 2az_2\right) + bz_2\right]^2 + c^2\left(z_1 + 2az_2\right)^2\right\}, \tag{4}$$

$$X_1 = -z_1, \tag{5}$$

$$X_2 = \left(z_1 + 2az_2\right). \tag{6}$$

So, equation (2) becomes

$$G(z_1, z_2) = -\frac{c}{2\pi}\left(\frac{z_1}{M^2} + \frac{z_1 + 2az_2}{N^2}\right). \tag{7}$$

Linear Slip

Let the linear slip profile be

$$B(r) = b_0\left(1 - \frac{r}{L}\right), \quad 0 \le r \le L \tag{8}$$

where L is the fault width and b_0 is the surface slip.

The expression for the displacement obtained for equation (1) and (8) is

$$u = \int_0^L b_0\left(1 - \frac{r}{L}\right)\left(\frac{-c}{2\pi}\right)\left(\frac{z_1}{M^2} + \frac{z_1 + 2az_2}{N^2}\right)dr,$$

Solving above integration with help of Wolfram Alpha, we get

$$u = -\frac{b_0}{2\pi}\left[\frac{(b - aZ_1 - bZ_2)}{b}\left\{\tan^{-1}\left(\frac{b - aZ_1 - bZ_2}{cZ_1}\right) + \tan^{-1}\left(\frac{aZ_1 + bZ_2}{cZ_1}\right)\right\}\right.$$
$$\left. - \frac{cZ_1}{2b}\log\left\{\frac{(b - aZ_1 - bZ_2)^2 + c^2 Z_1^2}{(aZ_1 + bZ_2)^2 + c^2 Z_1^2}\right\}\right] - \frac{b_0}{2\pi}\left[\frac{(b - a(Z_1 + 2aZ_2) + bZ_2)}{b}\right.$$
$$\left\{\tan^{-1}\left(\frac{b - a(Z_1 + 2aZ_2) + bZ_2}{c(Z_1 + 2aZ_2)}\right) - \tan^{-1}\left(\frac{-a(Z_1 + 2aZ_2) + bZ_2)}{c(Z_1 + 2aZ_2)}\right)\right\}$$
$$\left. - \frac{c(Z_1 + 2aZ_2)}{2b}\log\left\{\frac{\{b + (-a(Z_1 + 2aZ_2) + bZ_2)\}^2 + c^2\left(Z_1 + 2aZ_2\right)^2}{(-a(Z_1 + 2\varepsilon Z_2) + bZ_2)^2 + c^2\left(Z_1 + 2aZ_2\right)^2}\right\}\right], \tag{9}$$

where $Z_1 = \frac{z_1}{L}$ and $Z_2 = \frac{z_2}{L}$.

Parabolic Slip

Let the parabolic slip profile be:

$$B(r)=b_0\left(1-\frac{r^2}{L^2}\right),0\le r\le L \tag{10}$$

The expression for the displacement obtained for equation (1) and (10) is

$$u=\int_0^L b_0\left(1-\frac{r^2}{L^2}\right)\left(\frac{-c}{2\pi}\right)\left(\frac{z_1}{M^2}+\frac{z_1+2az_2}{N^2}\right)dr,$$

Using Wolfram Alpha, the above equation becomes:

$$u=-\frac{b_0}{2\pi}\frac{1}{b^2}\left[(b^2-a^2Z_1^2-b^2Z_2^2+c^2Z_1^2-2a\ b\ Z_1Z_2)\left\{\tan^{-1}\left(\frac{b-a\ Z_1-bZ_2}{cZ_1}\right)\right.\right.$$

$$\left.\left.+\tan^{-1}\left(\frac{aZ_1+bZ_2}{cZ_1}\right)\right\}-bcZ_1-c(aZ_1^2+bZ_1Z_2)\log\left\{\frac{(b-aZ_1-bZ_2)^2+c^2Z_1^2}{(aZ_1+bZ_2)^2+c^2Z_1^2}\right\}\right]$$

$$-\frac{b_0}{2\pi}\frac{1}{b^2}\left[\left\{\left(b^2-\left\{a(Z_1+2aZ_2)-bZ_2\right\}^2\right)+c^2(Z_1+2aZ_2)^2\right\}\right.$$

$$\left\{\tan^{-1}\frac{b-a(Z_1+2aZ_2)+b\ Z_2}{c\left(Z_1+2aZ_2\right)}-\tan^{-1}\frac{-a(Z_1+2aZ_2)+b\ Z_2}{c\left(Z_1+2aZ_2\right)}\right\}$$

$$+c\left(Z_1+2aZ_2\right)(-a(Z_1+2aZ_2)+bZ_2)$$

$$\left.\log\left\{\frac{(b-a(Z_1+2aZ_2)+b\ Z_2)^2+c^2(Z_1+2aZ_2)^2}{(-a(Z_1+2aZ_2)+bZ_2)^2+c^2(Z_1+2aZ_2)^2}\right\}-bc(Z_1+2aZ_2)\right]. \tag{11}$$

Particular Case

When we put a= 0, then the equations (9) and (11) coincide with the result of displacements of Madan et al. (2005) obtained for orthotropic non-uniform linear and parabolic slip profiles and when we put a = 0, and b =1, the displacements (9) and (11) coincide with the result of displacements of Singh and Rani (1996) obtained for isotropic non-uniform linear and parabolic slip profiles.

When Boundary of Half-Space is Rigid

The field of displacement by a vertical strike-slip geological fault in a monoclinic half-space (with rigid boundary) in which green's function which was derived by tagra et al (2016) is in the form

$$G(z_1, z_2) = \frac{c}{2\pi}\left(\frac{X_1}{M^2} + \frac{X_2}{N^2}\right), \tag{12}$$

Linear Slip

Using (8) and (12) in (1), We obtain displacement for linear slip is

$$u = -\frac{b_0}{2\pi}\left[\frac{(b-aZ_1-bZ_2)}{b}\left\{\tan^{-1}\left(\frac{b-aZ_1-bZ_2}{cZ_1}\right)+\tan^{-1}\left(\frac{aZ_1+bZ_2}{cZ_1}\right)\right\}\right.$$

$$\left.-\frac{cZ_1}{2b}\log\left\{\frac{(b-aZ_1-bZ_2)^2+c^2Z_1^2}{(aZ_1+bZ_2)^2+c^2Z_1^2}\right\}\right]+\frac{b_0}{2\pi}\left[\frac{(b-a(Z_1+2aZ_2)+bZ_2)}{b}\right.$$

$$\left\{\tan^{-1}\left(\frac{b-a(Z_1+2aZ_2)+bZ_2}{c(Z_1+2aZ_2)}\right)-\tan^{-1}\left(\frac{-a(Z_1+2aZ_2)+bZ_2)}{c(Z_1+2aZ_2)}\right)\right\}$$

$$\left.-\frac{c(Z_1+2aZ_2)}{2b}\log\left\{\frac{\{b+(-a(Z_1+2aZ_2)+bZ_2)\}^2+c^2\left(Z_1+2aZ_2\right)^2}{(-a(Z_1+2\varepsilon Z_2)+bZ_2)^2+c^2\left(Z_1+2aZ_2\right)^2}\right\}\right]. \tag{13}$$

Parabolic Slip

Using (10) and (12) in (1), We obtain displacement for parabolic slip is

$$u = -\frac{b_0}{2\pi}\frac{1}{b^2}\left[(b^2-a^2Z_1^2-b^2Z_2^2+c^2Z_1^2-2a\ b\ Z_1Z_2)\left\{\tan^{-1}\left(\frac{b-a\ Z_1-bZ_2}{cZ_1}\right)\right.\right.$$

$$\left.\left.+\tan^{-1}\left(\frac{aZ_1+bZ_2}{cZ_1}\right)\right\}-bcZ_1+c(aZ_1^2+bZ_1Z_2)\log\left\{\frac{(b-aZ_1-bZ_2)^2+c^2Z_1^2}{(aZ_1+bZ_2)^2+c^2Z_1^2}\right\}\right]$$

$$+\frac{b_0}{2\pi}\frac{1}{b^2}\left[\left(b^2-\{a(Z_1+2aZ_2)-bZ_2\}^2\right)+c^2(Z_1+2aZ_2)^2\right)$$

$$\left\{\tan^{-1}\frac{b-a(Z_1+2aZ_2)+b\ Z_2}{c\left(Z_1+2aZ_2\right)}-\tan^{-1}\frac{-a(Z_1+2aZ_2)+b\ Z_2}{c\left(Z_1+2aZ_2\right)}\right\}$$

$$+c\left(Z_1+2aZ_2\right)(-a(Z_1+2aZ_2)+bZ_2)$$

$$\left.\log\left\{\frac{(b-a(Z_1+2aZ_2)+b\ Z_2)^2+c^2(Z_1+2aZ_2)^2}{(-a(Z_1+2aZ_2)+bZ_2)^2+c^2(Z_1+2aZ_2)^2}\right\}-bc(Z_1+2aZ_2)\right]. \tag{14}$$

When we put a= 0 in (13) and (14), they represent displacement for linear and parabolic slip profile in an orthotropic medium with rigid boundary and coincide with results of Godara et al. (2017).

Graphical Observations and Discussion

In this chapter, we will study the effect of different kind of medium on the displacement due to non-uniform slip along a vertical strike slip geological fault. Therefore, we have compared the results of displacements in monoclinic medium with the displacements in orthotropic and isotropic medium. For monoclinic medium, we assume a = 0.3, b = 1, for orthotropic medium, we take a = 0, b = 2 and for isotropic medium, a = 0, b = 1. We have also taken value of $Z_2 = 1$ and values of Z_1 from -5 to 5.

Figure 2 to 5 shows the changes in displacement $\left(\frac{2\pi u}{b_0}\right)$ in respect to distance from the geological fault (Z_1) for non-uniform linear and parabolic slip profiles with the free and rigid boundary of half-space. From table 1 and figure 2, we observed that from Z_1 -5.0 to 2.5, the magnitude of displacement for monoclinic slip is larger than orthotropic medium which is larger than isotropic medium. From 2.0 to 1.0, the magnitude of displacement of isotropic medium is larger than orthotropic medium and magnitude of displacement of orthotropic is larger than monoclinic medium. At $Z_1 = -0.5$, magnitude of displacement of monoclinic is larger than isotropic and of isotropic is larger than orthotropic At $Z_1 = 0.0$, the value of displacement does not exist, so it is point of discontinuity.

Actually, in all figures, we noticed that value of displacement at $Z_1 = 0$, does not exist. So, $Z_1 = 0$, is the point of discontinuity for all displacement vectors.

In figure 2, Z_1 from 0.5 to 2.5; we notice that magnitude of displacement for monoclinic medium is more than isotropic medium and of isotropic medium is more than orthotropic medium. From Z_1 2.5 to 5.0, the displacement for orthotropic is larger than isotropic and displacement of isotropic is larger than monoclinic medium

One more important thing which we notice in all figures that the displacements in monoclinic medium having non-uniform pattern w.r.t. distance from the geological fault while the displacements for orthotropic and isotropic medium are uniform in pattern and their graph is anti-symmetric about the origin

Table 1 Graphical data of distance from the fault and displacement for linear slip when boundary of half-space is stress free.

Z_1	Displacement for Monoclinic Medium	Displacement for Orthotropic Medium	Displacement for Isotropic Medium
-5.0	-0.9041	-0.6970	-0.5412
-4.5	-0.9026	-0.7433	-0.5878
-4.0	-0.9349	-0.7916	-0.6411
-3.5	-0.9437	-0.8390	-0.7015
-3.0	-0.9399	-0.8798	-0.7680
-2.5	-0.9079	-0.9020	-0.8358
-2.0	-0.8146	-0.8831	-0.8904
-1.5	-0.5897	-0.7840	-0.8932
-1.0	-0.1054	-0.5513	-0.7551
-0.5	0.6880	-0.1710	-0.3409
0.0	Not exist	Not exist	Not exist
0.5	0.9160	0.1710	0.3409
1.0	0.8677	0.5513	0.7551
1.5	0.7036	0.7840	0.8932
2.0	0.5266	0.8831	0.8904
2.5	0.3723	0.9020	0.8358
3.0	0.2460	0.8798	0.7680

3.5	0.1442	0.8390	0.7015
4.0	0.0619	0.7916	0.6411
4.5	-0.0052	0.7433	0.5878
5.0	-0.0605	0.6970	0.5412

Table 2 **Graphical data of distance from the fault and displacement for parabolic slip when boundary of half-space is stress free.**

Z_1	Displacement for Monoclinic Medium	Displacement for Orthotropic Medium	Displacement for Isotropic Medium
-5.0	-0.1503	-0.1986	-0.1374
-4.5	0.0093	-0.2224	-0.1536
-4.0	0.6637	-0.2525	-0.1741
-3.5	0.3098	-0.2914	-0.2008
-3.0	0.4418	-0.3430	-0.2370
-2.5	0.5480	-0.4134	-0.2882
-2.0	0.6033	-0.5109	-0.3647
-1.5	0.5508	-0.6435	-0.4843
-1.0	0.2671	-0.7987	-0.6697
-0.5	-0.3678	-0.8501	-0.8614
0.0	Not exist	Not exist	Not exist
0.5	1.2336	0.8501	0.8614
1.0	1.6744	0.7987	0.6697
1.5	1.9500	0.6435	0.4843
2.0	2.1755	0.5109	0.3647
2.5	2.3797	0.4134	0.2882
3.0	2.5727	0.3430	0.2370
3.5	2.7592	0.2914	0.2008
4.0	2.9415	0.2525	0.1741
4.5	3.1212	0.2224	0.1536
5.0	3.2989	0.1986	0.1374

Table 3 **Graphical data of distance from the fault and displacement for linear slip when boundary of half-space is rigid.**

Z_1	Displacement for Monoclinic Medium	Displacement for Orthotropic Medium	Displacement for Isotropic Medium
-5.0	1.1072	0.9690	0.7373
-4.5	1.1471	1.0430	0.8047
-4.0	1.1910	1.1247	0.8836
-3.5	1.2380	1.2133	0.9762
-3.0	1.2848	1.3055	1.0841
-2.5	1.3227	1.3928	1.2068
-2.0	1.3304	1.4565	1.3366
-1.5	1.2564	1.4586	1.4448
-1.0	0.9890	1.3281	1.4482
-0.5	0.3580	0.9478	1.1456

0.0	Not exist	Not exist	Not exist
0.5	-1.5243	-0.9478	-1.1456
1.0	-1.3994	-1.3281	-1.4482
1.5	-1.1410	-1.4586	-1.4448
2.0	-0.8909	-1.4565	-1.3366
2.5	-0.6822	-1.3928	-1.2068
3.0	-0.5147	-1.3055	-1.0841
3.5	-0.3809	-1.2133	-0.9762
4.0	-0.2732	-1.1247	-0.8836
4.5	-0.1855	-1.0430	-0.8047
5.0	-0.1131	-0.9690	-0.7373

Table 4 Graphical data of distance from the fault and displacement for parabolic slip when boundary of half-space is rigid.

Z_1	Displacement for Monoclinic Medium	Displacement for Orthotropic Medium	Displacement for Isotropic Medium
-5.0	-0.3753	-0.5256	-0.3850
-4.5	-0.2351	-0.5749	-0.4241
-4.0	-0.1028	-0.6333	-0.4716
-3.5	0.0184	-0.7029	-0.5302
-3.0	0.1233	-0.7864	-0.6037
-2.5	0.2029	-0.8862	-0.6975
-2.0	0.2410	-1.0024	-0.8187
-1.5	0.2063	-1.1260	-0.9729
-1.0	0.0388	-1.2138	-1.1458
-0.5	-0.2909	-1.1029	-1.1945
0.0	Not exist	Not exist	Not exist
0.5	1.8878	1.1029	1.1945
1.0	2.3249	1.2138	1.1458
1.5	2.5311	1.1260	0.9729
2.0	2.6804	1.0024	0.8187
2.5	2.8180	0.8862	0.6975
3.0	2.9563	0.7864	0.6037
3.5	3.0983	0.7029	0.5302
4.0	3.2444	0.6333	0.4716
4.5	3.3943	0.5749	0.4241
5.0	3.5472	0.5256	0.3850

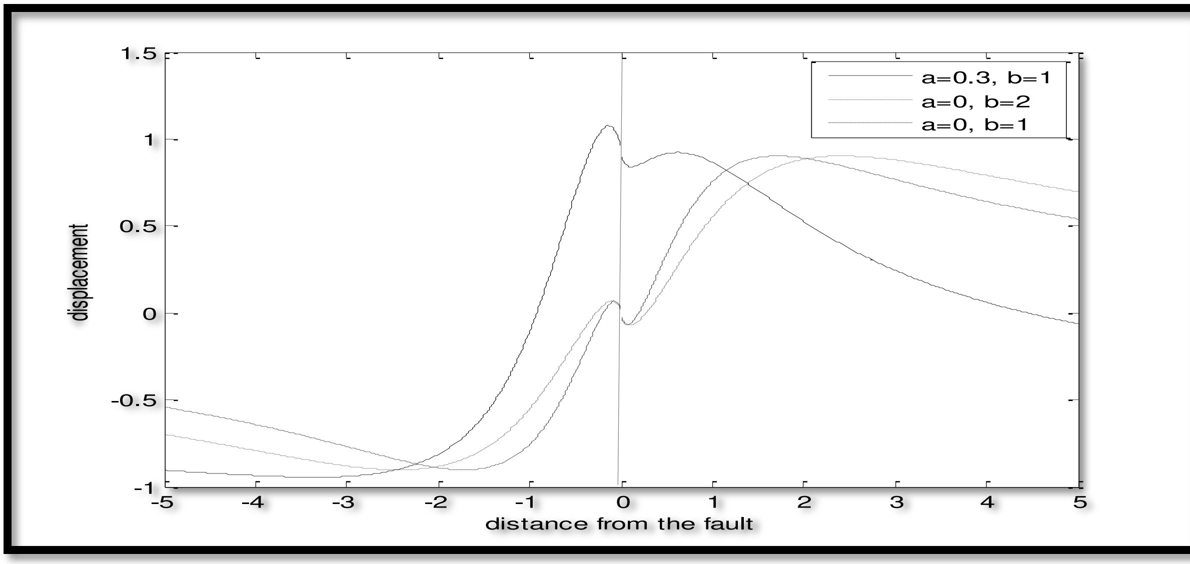

Fig. 2 Changes in displacement in respect to distance from the geological fault for non-uniform linear slip when boundary of half-space is stress free.

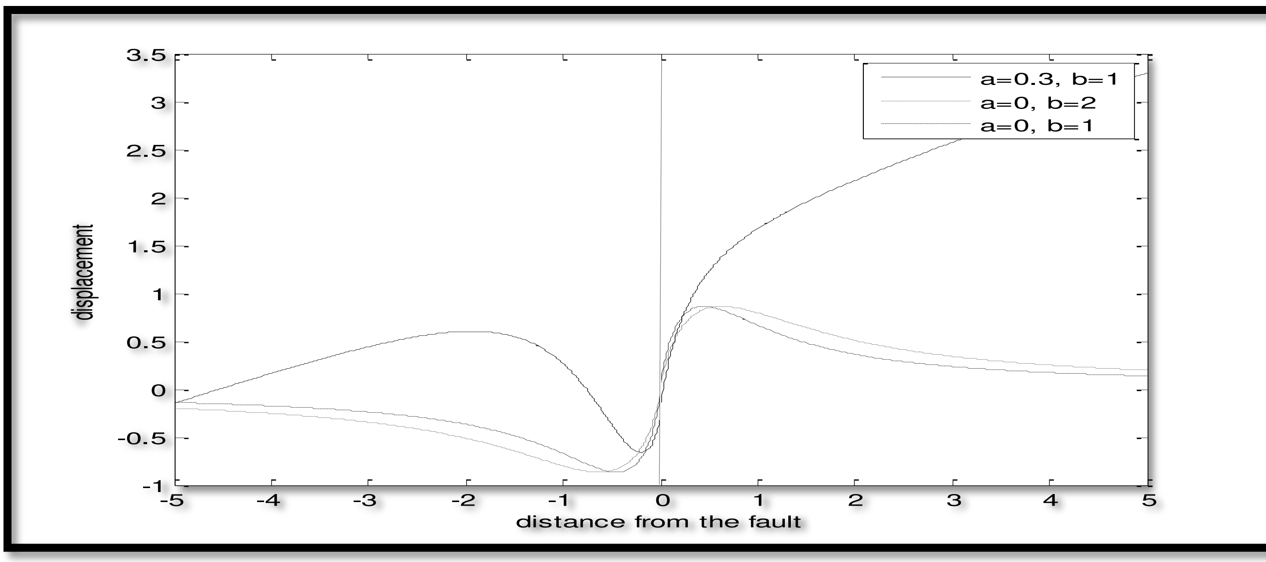

Fig. 3 Changes in displacement in respect to distance from the fault for parabolic slip when boundary of half-space is stress free.

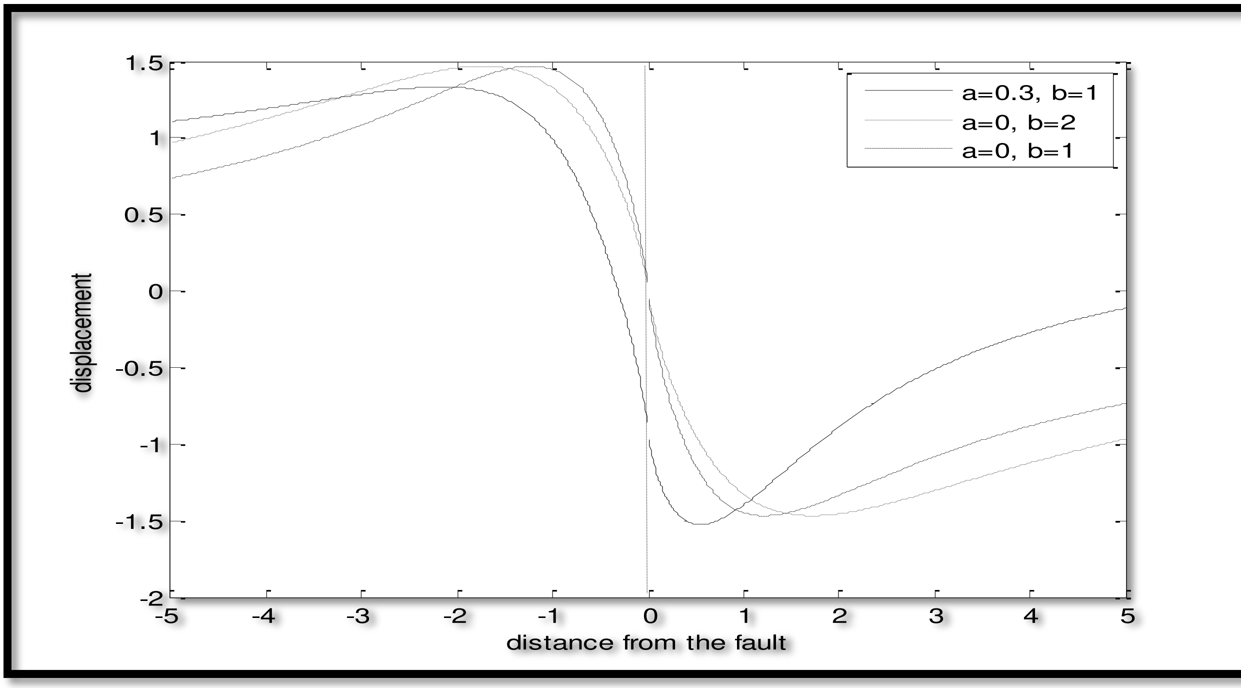

Fig. 4 **Changes in displacement in respect to distance from the fault for linear slip when boundary of half-space is rigid.**

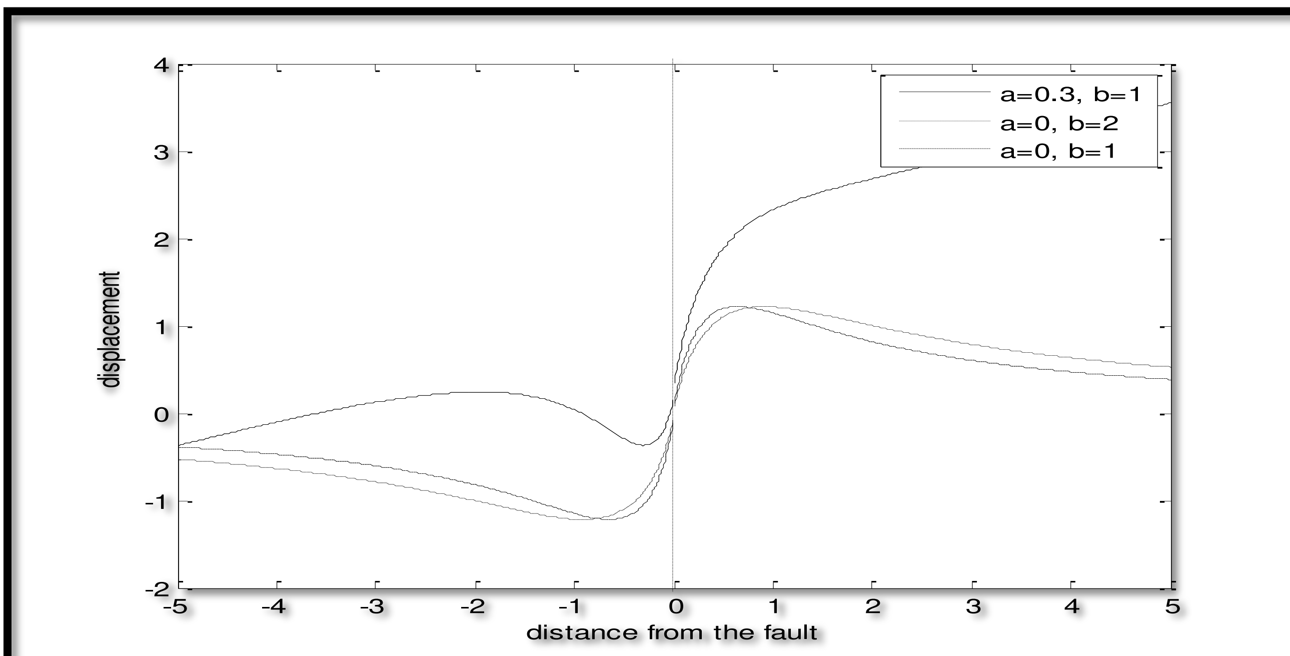

Fig. 5 **Changes in displacement in respect to distance from the fault for parabolic slip when boundary of half-space is rigid.**

Figures 6 to 10 show the comparison of displacements when the boundary of half-space is free and rigid in linear and parabolic slip profiles. Here we have drawn figure for different kinds of medium. Figure 6 shows the changes in displacement in respect to distance from the geological fault for linear slip in monoclinic medium. From tables 1, 3 and figure 6, we have observed that form $Z_{1,}$ -5 to -1, the magnitude of displacement in rigid boundary case are more than free boundary case. At Z_1 = -0.5, the magnitude of displacement in free boundary case is more than the rigid boundary case and Z_1 from 0.5 to 5.0, the magnitude of displacement in rigid boundary case is more than free boundary case. Figures 7and 8, show anti symmetry about origin and we observed that the magnitude of displacements in rigid boundary case are more than the free boundary case. Thus, we conclude that in orthotropic and isotropic medium, the linear slip with rigid boundary half-space is dominating over the linear slip with free boundary half-space.

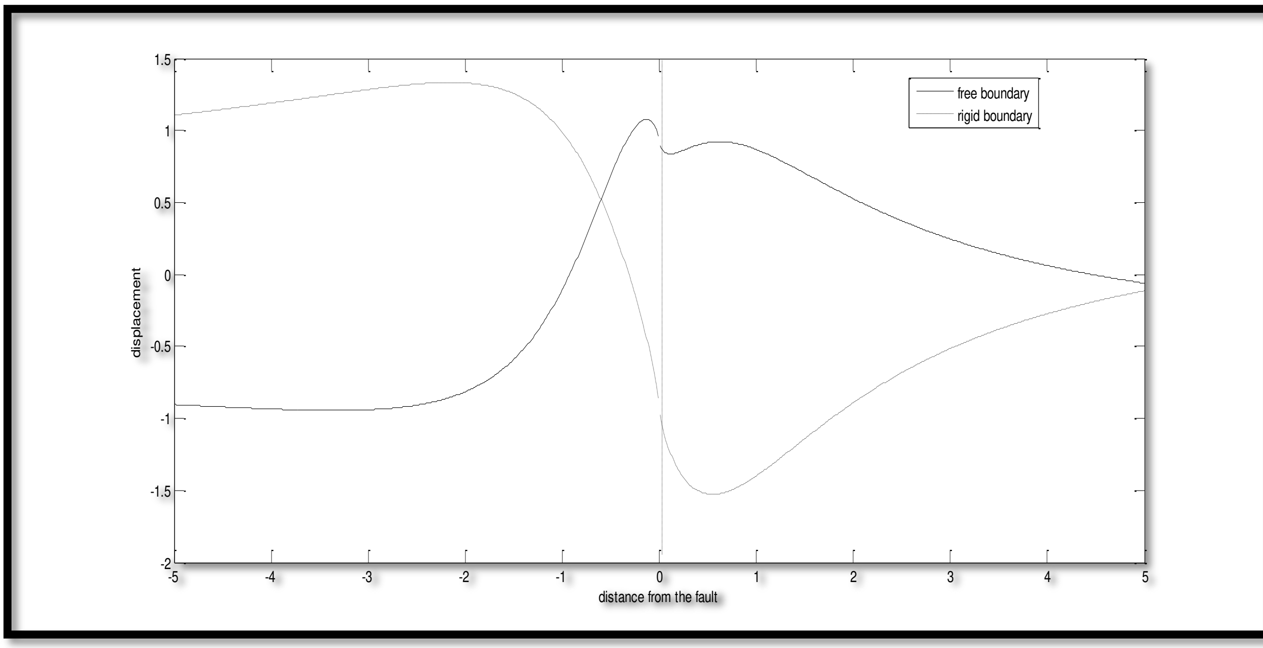

Fig. 6 **Changes in displacement in respect to distance from the geological fault for linear slip in monoclinic medium.**

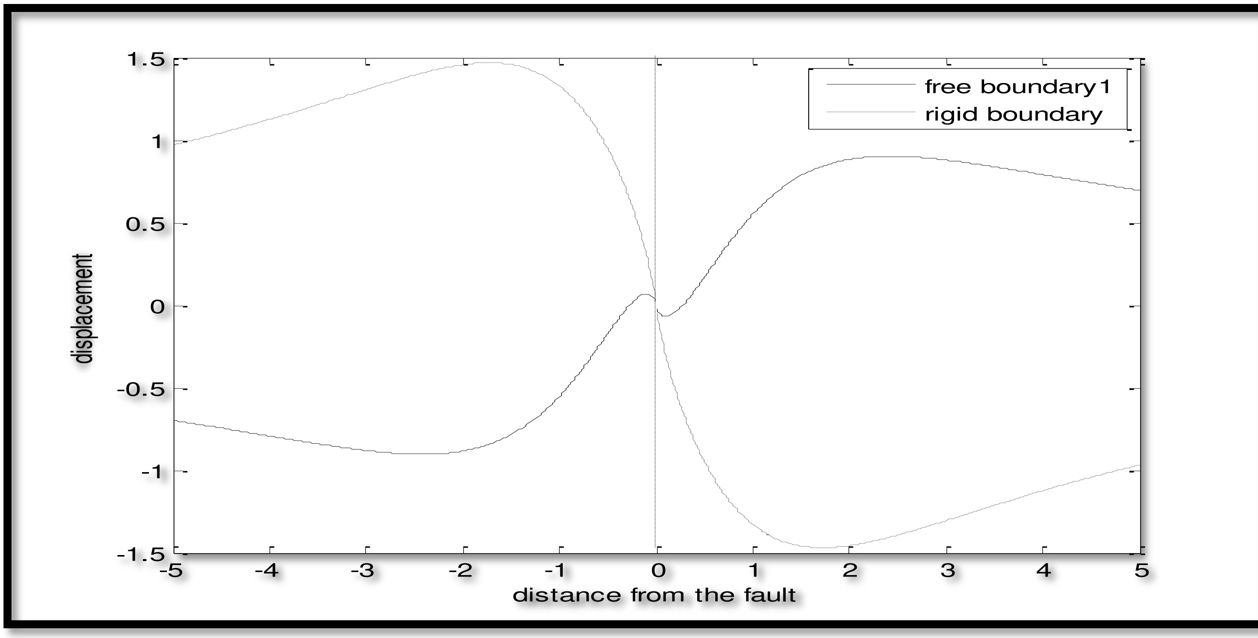

Fig. 7 **Changes in displacement in respect to distance from the geological fault for non-uniform linear slip in orthotropic medium.**

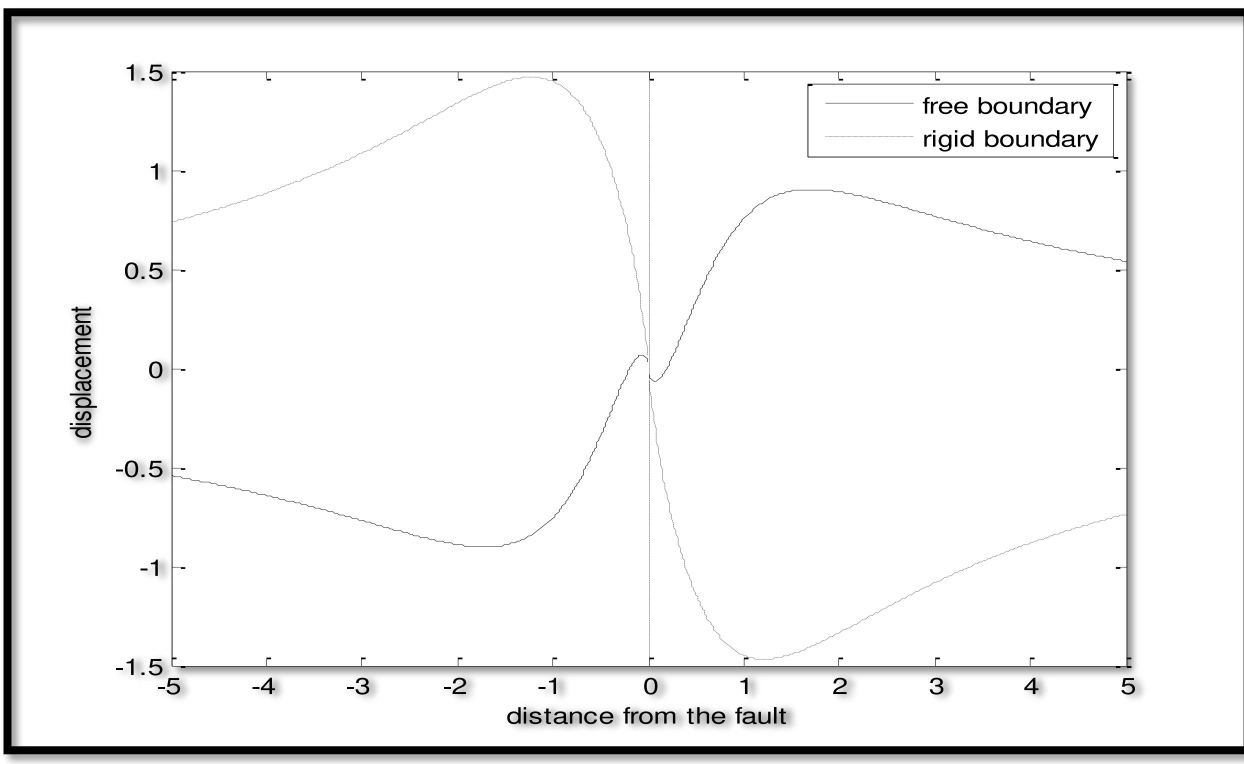

Fig. 8 **Changes in displacement in respect to distance from the fault for linear slip in isotropic medium.**

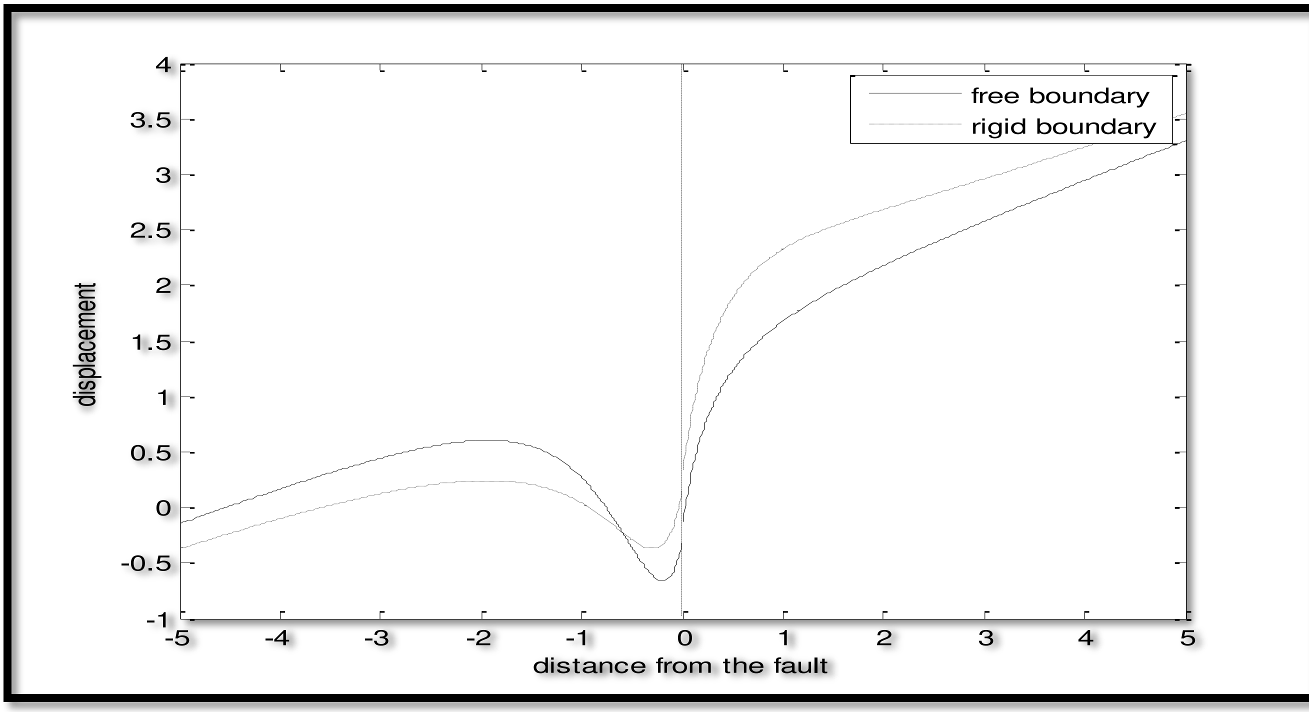

Fig. 9 **Changes in displacement in respect to distance from the geological fault for parabolic slip in monoclinic medium.**

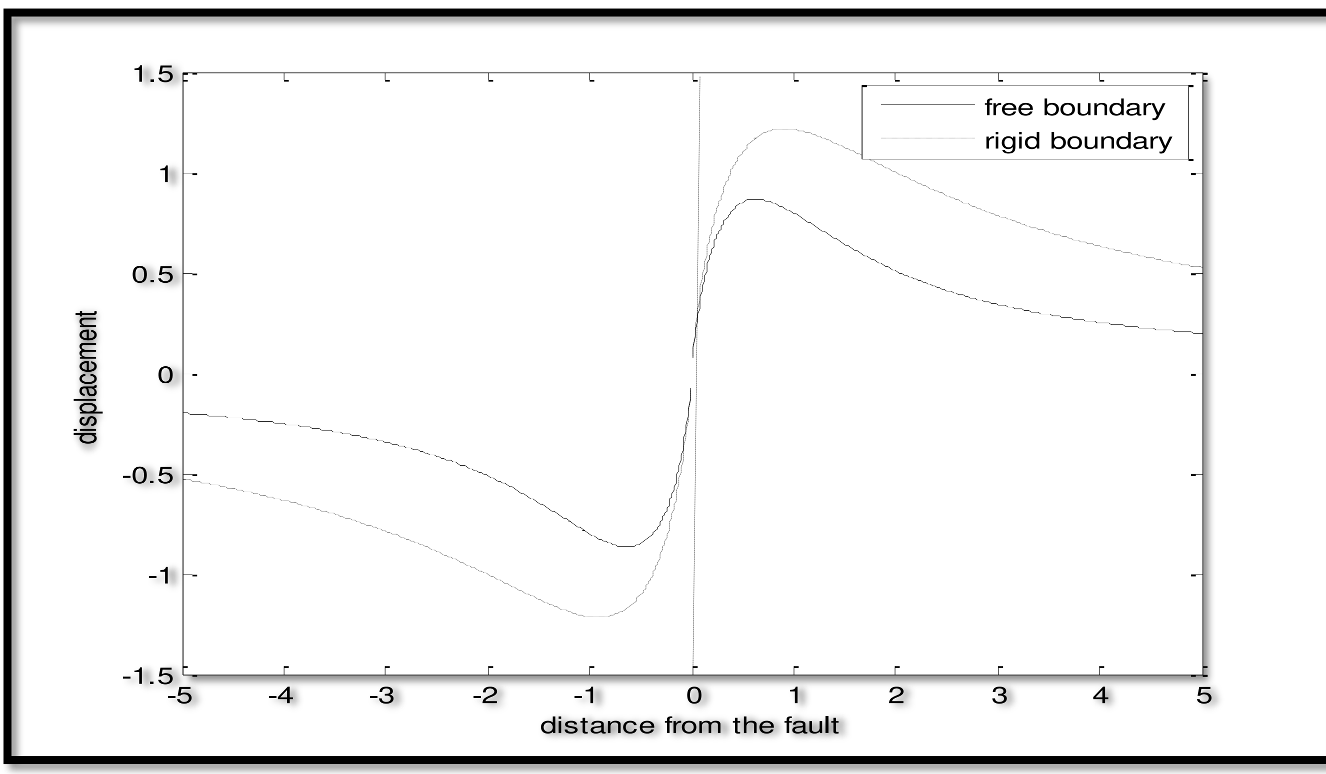

Fig. 10 **Changes in displacement in respect to distance from the fault for parabolic slip in orthotropic medium.**

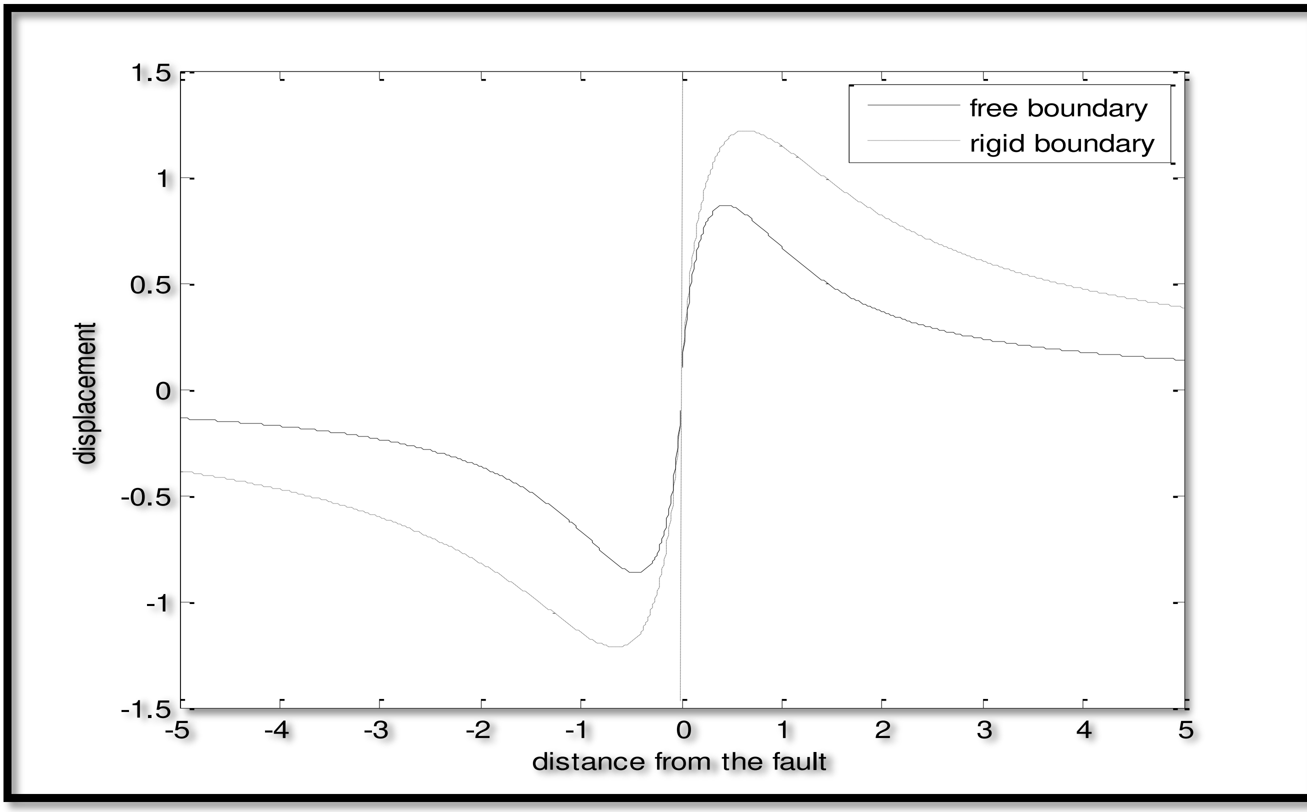

Fig. 11 **Changes in displacement in respect to distance from the geological fault for parabola type slip in isotropic medium.**

Figures 12-15 show the variation of displacement with the distance from the fault for a = -0.3, 0, 0.3 and b = 1 for linear slip and parabolic slip. From table 5 and figure 12, we have observed that at Z_1 = -5.0, the magnitude of displacement for a = -0.3 is greater than a =0.3 which in turns greater than at a = 0. At Z_1 = -4.5, the magnitude of displacement for a = -0.3 is greater than a =0 which in turns greater than at a = 0.3. From Z_1 = -4.0 to -1.5, the magnitude of displacement for a = -0.3 greater than at a = 0.3 and it is greater than a = 0. From Z_1 = -1.0 to 0.5, the magnitude of displacement for a = -0.3 greater than at a = 0 and it is greater than a = 0.3. At Z_1 = 0.5, the magnitude of displacement for a = 0.3 is greater than a =-0.3 which in turns greater than at a = 0. At Z_1 = 1.0, the value of displacement for a = 0.3 greater than at a = 0 and magnitude of displacement at a= =0 is greater than -0.3. At Z_1 = 1.5, the value of displacement for a = 0 greater than at a = 0.3 and magnitude of displacement at a= 0.3 is greater than -0.3. At Z_1 = 2.0, the value of displacement for a = 0 greater than at a =- 0.30 and magnitude of displacement at a= -0.3 is greater than 0.3. From Z_1 = 2.5 to 5.0, the magnitude of displacement for a = -0.3 greater than at a = 0 and it is greater than a = 0.3.

Table 5 **Graphical data of distance from the fault and displacement for linear slip when boundary of half-space is stress free and when a = 0.3, 0, -0.3 and b = 1.**

Z_1	Displacement for a = 0.3	Displacement for a = 0	Displacement for a = -0.3
-5.0	-0.9041	-0.5412	0.0605
-4.5	-0.9026	-0.5878	0.0052
-4.0	-0.9349	-0.6411	-0.0619
-3.5	-0.9437	-0.7015	-0.1442
-3.0	-0.9399	-0.7680	-0.2460
-2.5	-0.9079	-0.8358	-0.3723
-2.0	-0.8146	-0.8904	-0.5266
-1.5	-0.5897	-0.8932	-0.7036
-1.0	-0.1054	-0.7551	-0.8677
-0.5	0.6880	-0.3409	-0.9160
0.0	Not exist	Not exist	Not exist
0.5	0.9160	0.3409	-0.6880
1.0	0.8677	0.7551	0.1054
1.5	0.7036	0.8932	0.5897
2.0	0.5266	0.8904	0.8146
2.5	0.3723	0.8358	0.9079
3.0	0.2460	0.7680	0.9399
3.5	0.1442	0.7015	0.9437
4.0	0.0619	0.6411	0.9349
4.5	-0.0052	0.5878	0.9205
5.0	-0.0605	0.5412	0.9041

Table 6 **Graphical data of distance from the fault and displacement for parabolic slip when boundary of half-space is stress free and when a = 0.3, 0, -0.3 and b = 1.**

Z_1	Displacement for a = 0.3	Displacement for a = 0	Displacement for a = -0.3
-5.0	-0.1503	-0.1374	-3.2989
-4.5	0.0093	-0.1536	-3.1212
-4.0	0.6637	-0.1741	-2.9415
-3.5	0.3098	-0.2008	-2.7592
-3.0	0.4418	-0.2370	-2.5727
-2.5	0.5480	-0.2882	-2.3797
-2.0	0.6033	-0.3647	-2.1755
-1.5	0.5508	-0.4843	-1.9500
-1.0	0.2671	-0.6697	-1.6744
-0.5	-0.3678	-0.8614	-1.2336
0.0	Not exist	Not exist	Not exist
0.5	1.2336	0.8614	0.3678
1.0	1.6744	0.6697	-0.2671
1.5	1.9500	0.4843	-0.5508
2.0	2.1755	0.3647	-0.6033
2.5	2.3797	0.2882	-0.5480
3.0	2.5727	0.2370	-0.4418
3.5	2.7592	0.2008	-0.3098
4.0	2.9415	0.1741	-0.1637
4.5	3.1212	0.1536	-0.0093
5.0	3.2989	0.1374	0.1503

Table 7 Graphical data of distance from the fault and displacement for linear slip when boundary of half-space is rigid and when a = 0.3, 0, -0.3 and b = 1.

Z_1	Displacement for a = 0.3	Displacement for a = 0	Displacement for a = -0.3
-5.0	1.1072	0.7373	0.1131
-4.5	1.1471	0.8047	0.1855
-4.0	1.1910	0.8836	0.2732
-3.5	1.2380	0.9762	0.3809
-3.0	1.2848	1.0841	0.5147
-2.5	1.3227	1.2068	0.6822
-2.0	1.3304	1.3366	0.8909
-1.5	1.2564	1.4448	1.1410
-1.0	0.9890	1.4482	1.3994
-0.5	0.3580	1.1456	1.5243
0.0	Not exist	Not exist	Not exist
0.5	-1.5243	-1.1456	-0.3580

1.0	-1.3994	-1.4482	-0.9890
1.5	-1.1410	-1.4448	-1.2564
2.0	-0.8909	-1.3366	-1.3304
2.5	-0.6822	-1.2068	-1.3227
3.0	-0.5147	-1.0841	-1.2848
3.5	-0.3809	-0.9762	-1.2380
4.0	-0.2732	-0.8836	-1.1910
4.5	-0.1855	-0.8047	-1.1471
5.0	-0.1131	-0.7373	-1.1072

Table 8 **Graphical data of distance from the fault and displacement for parabolic slip when boundary of half-space is rigid and when a = 0.3, 0, -0.3 and b = 1.**

Z_1	Displacement for a = 0.3	Displacement for a = 0	Displacement for a = -0.3
-5.0	-0.3753	-0.3850	-3.5472
-4.5	-0.2351	-0.4241	-3.3943
-4.0	-0.1028	-0.4716	-3.2444
-3.5	0.0184	-0.5302	-3.0983
-3.0	0.1233	-0.6037	-2.9563
-2.5	0.2029	-0.6975	-2.8180
-2.0	0.2410	-0.8187	-2.6804
-1.5	0.2063	-0.9729	-2.5311
-1.0	0.0388	-1.1458	-2.3249
-0.5	-0.2909	-1.1945	-1.8878
0.0	Not exist	Not exist	Not exist
0.5	1.8878	1.1945	0.2909
1.0	2.3249	1.1458	-0.0388
1.5	2.5311	0.9729	-0.2063
2.0	2.6804	0.8187	-0.2410
2.5	2.8180	0.6975	-0.2029
3.0	2.9563	0.6037	-0.1233
3.5	3.0983	0.5302	-0.0184
4.0	3.2444	0.4716	-0.1028
4.5	3.3943	0.4241	0.2351
5.0	3.5472	0.3850	0.3753

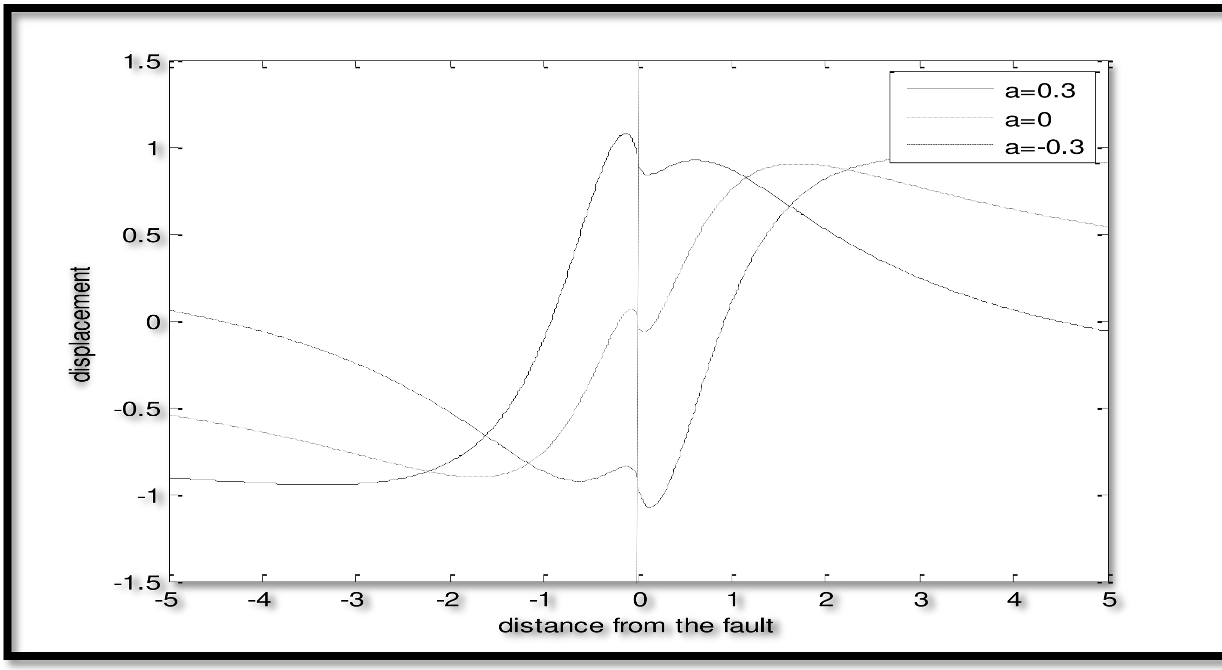

Fig. 12 **Changes in displacement in respect to distance from the fault for linear slip when boundary of half-space is stress free.**

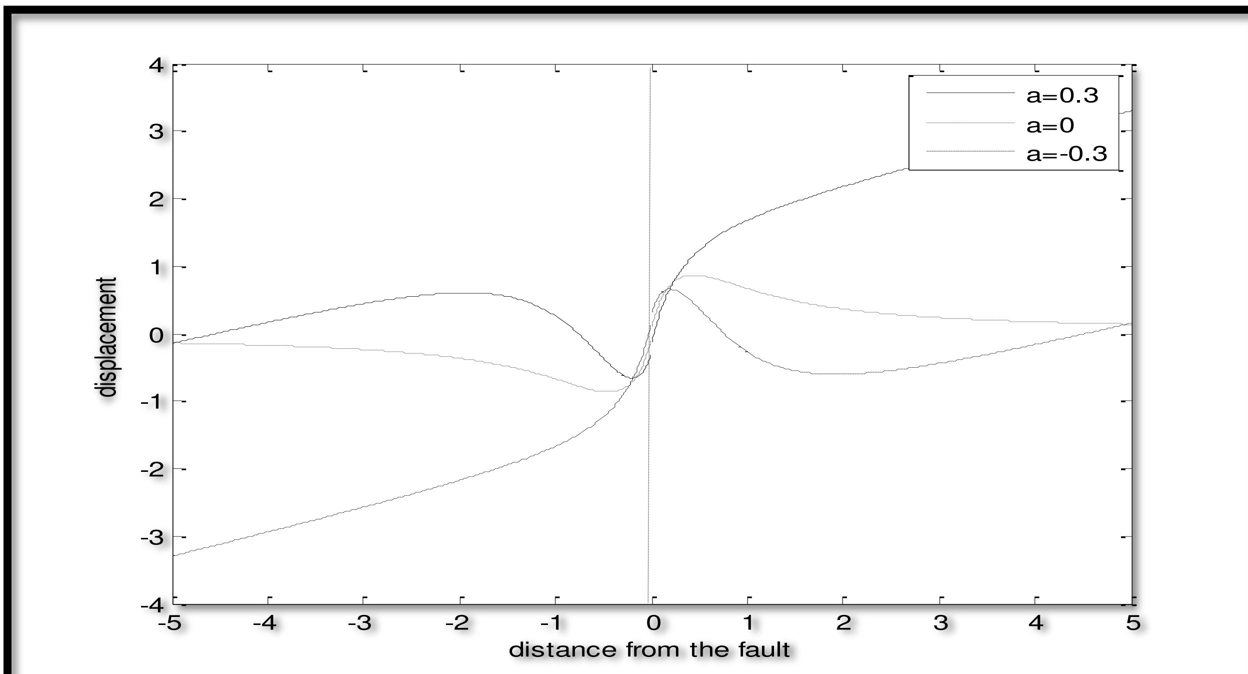

Fig. 13 **Changes in displacement in respect to distance from the geological fault for parabola type slip when boundary of half-space is stress free.**

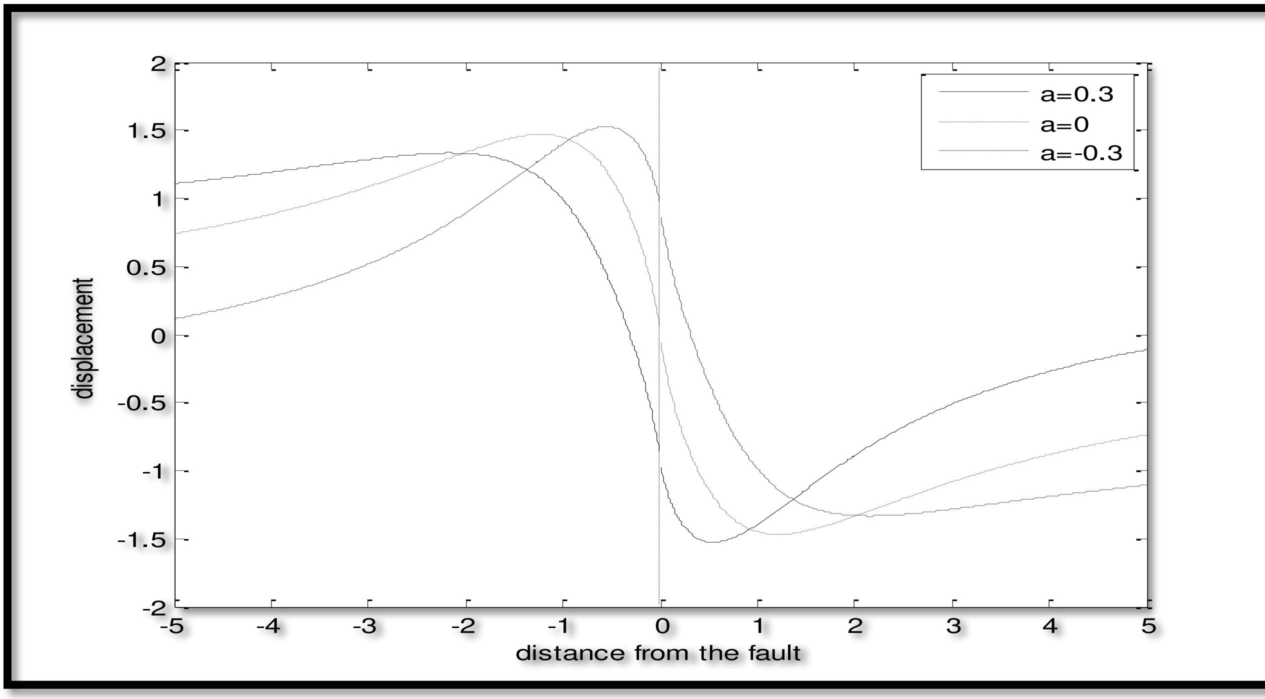

Fig. 14 **Changes in displacement in respect to distance from the fault for linear slip when boundary of half-space is rigid.**

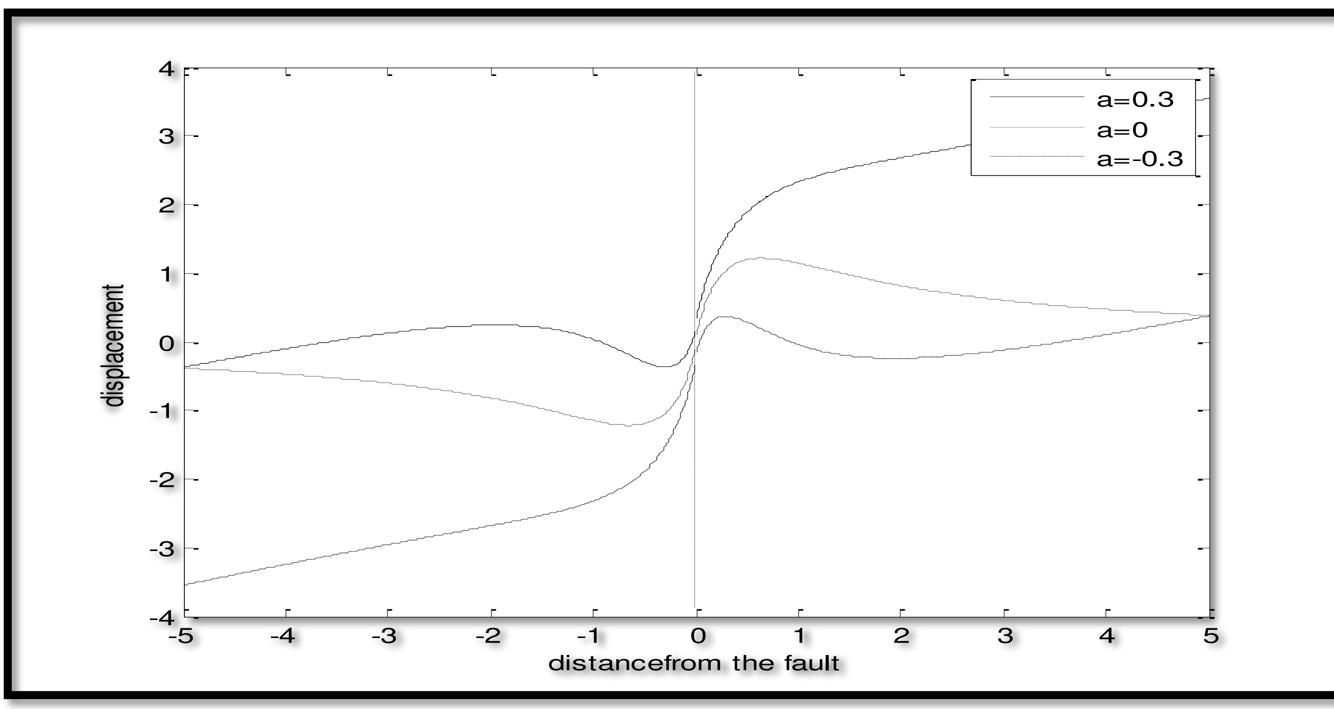

Fig. 15 **Changes in displacement in respect to distance from the geological fault for parabola type slip when boundary of half-space is rigid.**

Conclusion

Displacement field for linear and parabolic strike-slip fault has been calculated by using green function approach and two types of boundary condition have been considered on boundary: one is traction free and other is rough rigid. It has been observed graphically that displacement does not exist when the distance from the fault trace is zero and it is in non-uniform pattern in monoclinic medium while it is in uniform form for orthotropic and isotropic medium and also anti-symmetric in nature about the fault trace. One more thing has also been noticed that deformation in parabolic strike slip is more as comparison to linear strike-slip fault.

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