

Effect of Horizontal Inhomogeneities in the mantle on Point Dislocations

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Dislocation theories have been advanced time by time, from the dislocation theory for a half-space in 1960s (Maruyama), co-seismic gravity changes for a half-space in 1980s (Okubo), co-seismic potential and gravity changes for a spherical symmetric elastic earth model in 1990s (Sun and Okubo), to the dislocation theory for a visco-elastic earth model in nowadays (Okubo). Therefore, the theories of co-seismic potential and gravity changes for a horizontal inhomogeneous earth have not been discussed successfully, except for strike slip dislocation in such an earth (Pollitz). The main goal of this topic is expected to obtain the general formulae or expressions for potential and gravity changes caused by internal dislocations in a horizontal inhomogeneous earth. The deviations of the earth structure from spherical symmetry are considered so small that the application of the disturbance method is feasible.

The problem of determining the potential and gravity changes caused by an internal dislocation at various points of the Earth's surface is dealt with in the disturbance theory for the case of horizontal inhomogeneities. Since the solution of the lateral homogeneous earth (SNREI model) is known (Sun and Okubo, 1993), this study only tries to solve the effect caused by the increments of density, Lamé Parameters from the SNREI model. The potential and gravity changes at the Earth surface caused by internal dislocation are presented by expansions into spherical functions. With the help of auxiliary solutions, such as the solutions of tide, press and load, the quadrature expansion coefficients are obtained, which are related to horizontal density inhomogeneities, Lamé parameters at various depths, and the internal dislocation itself.

The whole frame had been established successfully. Meanwhile, some theory difficulties keep unsolved in quadrature expansion till now, such as the effect of density inhomogeneities and the effect of internal dislocation. We will try to solve them as soon as possible.