# Computation of static DCFF in a heterogeneous half space by using FDM

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Introduction

Tone and Miyatake(2009, SSJ meeting) and Tone et al (2009, SSJ meeting) discussed the effect of heterogeneous crustal structure on static stress field from earthquake by using FDM. In the present paper, we discuss the following technical problems in our computation. 1)Artificial boundary condition on the edge of modeling space, 2) an effect of a term with special differentiation of the Lame constants in elastic equation of motion.

Problem-1 Boundary condition on the edged of the modeling space

In static problem, we often use the fixed boundary condition. On the boundary, the displacement is set to be zero. The 1st problem is how large the modeling space should be taken into account. We calculate the static stress field from a in-plane shear crack in homogeneous medium of n x n size (n is normalized by crack length). We compare the numerically calculated stress field with analytical solution and then discuss the accuracy and size of the modeling space n. When n=5, the fitting between numerical and analytical solution is not satisfactory. If N is more than 20, the fitting becomes well (the difference between them is less than 5%). Considering the computer facility, the modeling space more than 10 is too large for computation, and become practically impossible in 3D FDM computation. For 3D problems, we use the following two steps computations. Firstly, we numerically calculate the displacement field by solving the equation of motion in 20 x 20 ( x 20 ) modeling space using coarse grid FDM . Secondly, we use fine grid FDM in relatively small ( from 3 x 3 to 5 x 5 ) modeling space with boundary contidions obtained in 1st step computation. The process work well.

Problem-2

A term with special differentiation of the Lame constants appears in our equation of motion when a medium is heterogeneous. Without the term, strange solution is obtained. The displacement field does not depend on absolute values of Lame constants. So it should be omitted.