

模型参数对3DEC动态建模的影响

王卫华, 李夕兵, 胡盛斌

(中南大学 资源与安全工程学院, 湖南 长沙 410083)

收稿日期 2005-5-11 修回日期 2005-5-24 网络版发布日期 2008-2-18 接受日期 2005-8-15

摘要

与其他数值软件一样, 用三维离散元程序(3DEC)模拟应力波在节理岩体中的传播和衰减时, 模型参数对模拟结果有很重要的影响。用3DEC对2个例子进行模拟分析: (1) 一维正弦波在无节理的有限长岩杆中的传播; (2) 一维正弦波在含一节理的有限长岩杆中的传播。探讨了单元网格尺寸、边界条件、节理刚度、节理本构模型和节理有无抗拉强度等对3DEC动态模拟结果的影响。研究表明: (1) 单元尺寸对计算精度和计算耗时有很大影响; (2) 粘性边界条件基本上可消除应力波在自由边界上的反射; (3) 节理法向刚度和节理有无抗拉强度对应力波的传播有重要影响, 透射系数随法向刚度的增大而增大, 而反射系数则因压缩波和拉伸波而不同, 压缩波的反射系数随法向刚度的增大而减小, 当节理无抗拉强度时, 拉伸波的反射系数与法向刚度无关; (4) 连续屈服模型对透(反)射系数的影响与无抗拉强度的常刚度模型相似。

关键词

[岩石力学](#); [三维离散元程序\(3DEC\)](#); [动态建模](#); [节理法向刚度](#); [节理本构模型](#)

分类号

EFFECT OF MODEL PARAMETERS ON 3DEC DYNAMIC MODELING

WANG Wei-hua, LI Xi-bing, HU Sheng-bin

(School of Resources and Safety Engineering, Central South University, Changsha 410083, China)

Abstract

Model parameters have the important effects on three-dimensional distinct element code(3DEC) modeling of the stress wave propagation and attenuation in jointed rock masses as well as other codes. Two cases are simulated as follows: (1) one case shows one-dimensional sine wave propagation along a finite-length rock bar without joint; and (2) the other case shows one-dimensional sine wave propagation along a finite-length rock bar with a single joint. Three-dimensional numerical experiments are conducted to investigate the effects of element mesh sizes, boundary conditions, joint constitutive models, joint normal stiffness and tension capacity on modeling of wave propagation and attenuation in jointed rock masses by 3DEC. The results are obtained as follows: (1) the element mesh sizes have the important effects on the computing accuracy and time consumption; (2) the viscous boundary condition can eliminate the reflection of stress wave on the free boundary; (3) joint normal stiffness and tension capacity influence the wave propagation, and the transmission coefficient increases with the increasing normal stiffness, while reflection coefficient is dependent on the type of wave. Therefore, the reflection coefficient decreases with the increasing normal stiffness for compression wave; reflection coefficient is independent of normal stiffness for tension wave propagation on the joint without tension capacity; and (4) the continuous yielding model has the similar effect on the coefficients of the transmission and reflection with the constant stiffness model without tension capacity.

Key words [rock mechanics](#); [three-dimensional distinct element code\(3DEC\)](#); [dynamic](#)

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