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基岩地震动随机特性有限元反分析算法

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摘要 从有限元动力分析的基本原理出发，将地面地震运动看作一个随机过程，利用脉冲响应函数、随机振动理论和傅立叶变换原理，推导了由地面地震运动统计特性反算基岩地震运动统计特性的有限元反分析计算公式，提出了一种用于由地面地震动统计特性计算基岩地震动统计随机特性的二维有限元反分析法。该方法可由已知的地面地震动模型方便地计算出基岩地震动统计参数。算例表明：地层改变了地震动的频率组成，同时对基岩地震动有一定的放大作用，在地下结构抗震计算时，应以基岩地震运动作为地震动输入。

关键词 岩石力学；基岩；地震动特性；随机振动；有限元反分析；傅立叶变换

分类号

FINITE ELEMENT BACK ANALYSIS METHOD FOR EVALUATING STOCHASTIC SEISMIC CHARACTERISTICS OF BEDROCK

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Abstract

With considering the earthquake motion as a stochastic process，based on the basic principles of dynamical analysis by using finite element method，formulas for the back-evaluating stochastic seismic characteristics of the bedrock from the stochastic seismic characteristics of the ground surface are derived by using the impulse-response function，the theories of random vibration，and the principles of Fourier transform. A method of finite element back analysis for this purpose is put forward. By using this method，the stochastic seismic characteristics of the bedrock could be calculated from the stochastic seismic characteristics of the ground surface. A numerical example shows that the ground changes the frequency composition of earthquake motion and has an obviously amplifying effect on seismic motion of the bedrock. The seismic motion of the bedrock should be input to earthquake motion during the analysis of earthquake resistance of underground structures.

Key words rock mechanics；bedrock；seismic characteristics；random vibration；finite element back

analysis；Fourier transform

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