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张掖地区季节冻土地震动效应

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摘要 针对季节冻土地区一场地, 进行了现场地脉动观测, 并在观测点采集原状土样。采用动三轴试验, 取得了融土和冻土的动力学参数, 如土层的剪切模量比和阻尼比等。讨论了具有季节冻土层的场地上地震动反应分析的输入问题, 包括边界条件、地震动时程和土层参数。利用这些参数和场地地震危险性分析结果, 应用一维剪切梁模型, 计算得到场地在季节冻土层消融前后的地面强震地震动参数。进一步假定不同的冻土层厚度, 计算得到地震动峰值参数和反应谱随冻层厚度变化的规律, 以此分析了冻土层对地震动效应的影响。对场地所做的地震动计算结果表明: 地表的冻土层对强震有一定的抑制作用, 冻土层对地震安全性有正面影响, 此效应随冻结深度的增加而加大; 而场地的卓越周期随冻土层厚度的增大而减小。对于季节冻土地区的抗震设计具有一定的意义。

关键词 [土力学; 季节冻土; 地震动效应; 剪切梁模型; 反应谱](#)

分类号

SEISMIC RESPONSE ANALYSIS OF SEASONALLY FROZEN GROUND OF ZHANGYE AREA

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Abstract

A test site in a seasonally frozen region in Zhangye City, Gansu Province, China is taken to investigate the ground motion features in different seasons. Micro-tremors are measured and analyzed. Undisturbed samples are taken from the site and triaxial dynamic tests are performed in their unfrozen and frozen states in order to obtain the dynamic parameters, such as shear modulus ratio and damping ratio of the soils. The input for the ground motion analysis, such as boundary conditions, seismic records and soil parameters are discussed. Together with the results from previous seismic risk analysis, the parameters are input into a one-dimensional shear beam model so that ground motion parameters are calculated for the site in seasons with and without frozen layer. Furthermore, different depths of the frozen layer are assumed and peak ground motion parameters and response spectra are calculated. Calculation shows that the seasonal existence of frozen layer can restrain the strong motion to some extent, therefore, the frozen layer has positive effect on the site subjected to seismicity, and the effect increases with the increase of frozen depth; at the same time, the predominant period of the ground decreases with the increase of the depth of frozen layer. The results obtained can also be applied to other regions with similar ground conditions.

Key words [soil mechanics; seasonally frozen ground; shear beam](#)

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