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太原晋阳西山大佛岩石动静力学参数的对比研究

江　进1，孙进忠1，乔艳红1，杨秀生2

(1. 中国地质大学　工程技术学院，北京　100083；2. 山西省太原市晋源区文物旅游局，山西　太原　030025)

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摘要　运用声波测试方法，结合物理力学试验，研究太原晋阳西山大佛陡崖岩体2个水平钻孔中岩石的质量和风化情况。分析时特别关注岩样的块体密度、动力学和静力学参数在大佛水平进深方向上的分布规律，也研究动静力学参数间的量值关系。研究发现，大佛边坡岩样的组构、动力学和静力学3个方面的参数随钻孔水平进深的变化规律一致，可以反映大佛陡崖岩体在水平进深方向的风化程度变化，在水平进深方向上，岩体的密度、饱和抗压强度与静弹性模量、动弹性模量与波速都随着深度的增加而呈增长趋势；自陡崖表面至水平进深2.5 m左右范围内，岩体风化程度较高，水平进深大于3.0 m，岩体风化程度相对减弱，岩石质量呈稳定上升趋势。2个钻孔的岩石质量存在明显的差异，反映岩性和岩体卸荷带的影响。岩石动弹性模量与弹性波速随水平进深的变化数据表明，动弹性模量对岩体质量的变化反应比弹性波速更灵敏。另外，通过岩石静弹性模量与弹性波速的对比分析发现，岩石的组构情况对岩石动静力学参数间的关系有显著影响，岩石组构的非均匀性会导致岩石动、静力学参数之间对应关系的离散和异常。

关键词　岩石力学；岩体质量；超声波测试；弹性波速；弹性模量；抗压强度

分类号

COMPARISON BETWEEN STATIC AND DYNAMIC PARAMETERS OF GRAND BUDDHA ROCKMASS SPECIMENS IN WEST JINYANG MOUNTAIN IN TAIYUAN

JIANG Jin1，SUN Jinzhong1，QIAO Yanhong1，YANG Xiusheng2

(1. School of Engineering and Technology，China University of Geosciences，Beijing 100083，China；
2. Jinyuan Cultural Relic Travel Office of Taiyuan in Shanxi Province，Taiyuan，Shanxi 030025，China)

Abstract

Combined with mechanical experiment，ultrasonic wave testing is performed to investigate the quality and weathering status of rock specimens obtained in double borings situated in cliff of Grand Buddha of Jinyang in Taiyuan. In the study，the distribution laws of bulk density，dynamic parameters and static parameters of rock specimens in the direction of horizontal depth of the Buddha as well as numerical relationship between static and dynamic parameters are investigated. The results show that the distribution laws are identical，reflecting the diversification of weathering degrees of cliff rockmass in the direction of horizontal depth：in the direction of horizontal depth，the density of rockmass，saturated compression strength and static elastic module，dynamic elastic module and wave velocity present the current of increase with the depth increase. The weathering degree of rockmass ranging from the surface of cliff in depth of 2.5 m is highest，while the weathering degree of rockmass locating the position with depth larger that 3.0 m is weak. The rock specimens¢ quality exists distinct difference，which reflects the

influences of lithology and unloaded rockmass. The relationships of dynamic elastic module，sonic wave velocity and horizontal depth，indicate that dynamic elastic module is more sensitive than sonic wave velocity. On the other hand，with the comparison between static elastic module and sonic wave velocity，it shows that the composition of rock has a great influence on the relationship between static and dynamic parameters，i.e. the diferent rock composition will lead to the dispersion and abnormity of the distribution of static and dynamic parameters.
Key words rock mechanics；rockmass quality；ultrasonic wave testing；elastic wave velocity；elastic module；compression strength

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