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块系岩体动力特性理论与实验对比分析

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摘要 由于深部岩体存在构造等级现象，因而使作为岩石力学分析基础的连续介质力学缺乏依据。超低摩擦实验效应则集中反映块系岩体动力特性的机制，对超低摩擦实验现象的解释与验证非常重要。首先通过对超低摩擦实验现象的描述及数据的整理归纳出规律，然后建立块系岩体动力模型并进行理论分析及数值计算来验证超低摩擦效应，揭示出产生这一效应的根本原因在于法向力的重分布以及动摩擦因数的变化，而且实验现象与数值计算在趋势上是一致的。在具有构造等级的深部岩体介质的变形过程中，储能及返还性状与介质变形的摩擦因数有关。根据深部岩体的构造特点、高地应力及含能和非协调变形的特点，围绕深部岩体工程响应发生的静、动力特征，提出深部岩体的构造、变形与破坏需要研究的科学问题。

关键词 岩石力学；块系岩体；动摩擦因数；超低摩擦；准共振

分类号

COMPARISON OF THEORETICAL AND EXPERIMENTAL ANALYSES OF DYNAMIC CHARACTERISTICS OF BLOCK ROCK MASS

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Abstract

Because the blocks in deep rock mass exist in the form of tectonic order，therefore continuous medium mechanics as the analytic foundation of rock mechanics lacks basis. It is very important to explain and testify the experimental phenomena of ultra-low friction，because the influence of ultra-low friction among rock mass is the main reflection of the dynamic characteristics of block rock mass. The law is referred to describing the experimental phenomena of ultra-low friction and organizing the experimental data；then the dynamic model of block rock mass is established；and the theoretical and the numerical values are worked out to testify the correctness of ultra-low friction. By making such effort，the conclusion has been drawn as follows：the redistribution of vertical force and transformation of coefficient of kinetic friction are the fundamental factors of ultra-low friction. Furthermore，the tendency of experimental phenomena is consistent with that of the numerical results. The capability of storage and energy conversion is related with friction coefficient for the deep rock mass with tectonic level. A new branch of rock mechanics，nonlinear deep rock mechanics，is established. According to the static and dynamic characteristic phenomena and the characteristics of deep rock，the tectonic，deformation and failure problems of deep rock such as the block structure feature，the state of high earth stress，the stored energy and the nonlinearity，discontinuity and incompatibility of deformation，are suggested.

Key words rock mechanics；block rock mass；kinetic coefficient of friction；ultra-low friction；quasi- resonance

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