能和电性之间的关系。将电阻率的变化与岩石力学性质联系起来，进而通过现场的电阻率探测，描述和评价开采扰动地层的损伤状态；以窑街海石湾矿为背景，进行坡下开采岩体移动破坏相似模拟实验和利用GDEM软件进行开采扰动边坡稳定性数值分析，揭示随地下开挖边坡破坏和移动规律；(11)完善了边坡工程地质信息管理与灾变分析和预警系统，并对唐山古冶区尾矿库进行了采动影响下的岩体力学参数识别和预测，所得结果与实测结果相符。

关键词：地质模型 土石混合体 地应力 多尺度 地质与数值建模

The Study of Analysis Method for Engineering Geological Structure Model and Basic Information of Geological Condition

Jiang Linjing
(University of Science & Technology Beijing,USTB)

Abstract：The planned task of this year has been basically completed by the ways of in situ investigations,experiments and researches. It mainly included:(1)The geological data of three landslides were acquired by on site investigation,the hazard distribution characteristic was analyzed and the control plan was proposed.(2)A more convenient and efficient GSI quantization table is proposed.(3)To meet the needs of different rock mechanics experiments, the related laboratory equipments were developed and the experiments were conducted, a new understanding of the rock failure mechanism and constitutive relation were got.(4)The mechanical properties,seepage and failure characteristics of earth-rock aggregate were got through the experiments.(5)Through the analysis of the rule between the underground mining area and the movement of the slope in Wulong Jiwei mountain area,the impact of the underground mining on landslide was determined.(6)The interface identification techniques and methods for geotechnical and geological formation were improved.(7)By experimental studies of the acoustic emission and microscopic contact damage characteristics when it was creeping of fractured rock, it showed the long term mechanical behavior and the precursor information of the unstable failure.(8)Three key issues of the multi-scale geological modeling were solved and applied in Huating coal field.(9)The partial least square method was applied in the calculation of in situ stress field.It was more advantaged when combining with multi-scale method;the complex boundary conditions were used to inversely calculate the in situ stress field on the basis of the secondary development of ABAQUS software,which is more close to the actual situation.(10)The relationship between electrical and mechanical properties in the process of the damage was studied based on Fushun east open mine,and the damage variable calculation method was established on based on detection method for elasticity modulus and resistivity, at the same time,the relationship between the mechanical and electrical properties of rock was created.For Haishiwan coal mine,the similar simulation experiments of moving damage of rock and numerical analysis were done for the stability of the slope after mining,it showed the damage and moving rule of the slope with the progress of excavation.(11)The system for the slope engineering geological information management, and the disaster analysis and early warning was improved.

Key Words：Geologic model;Rock-soil aggregate;Ground stress;Multi-scale;Geological and numerical modeling

重大工程地质灾害的预测理论及数值分析方法研究年度报告

袁明武[1] 孙树立[1] 黄克服[1] 刘晓宇[2] 陈永强[1]
(1.北京大学;2.中科院力学所)

摘 要：基本完成了SAP84-NOLM的PC版本并进行了测试，可以实现在PC上计算大约30万自由度的地质体结构。其中包括带有裂隙的地质体的初始网格生成和裂隙扩展时的网格自适应；2D/3D渗流场的计算；用弧长法来计算材料的软化，以考虑水对地质体本构的影响以及大规模并行计算的初步实现。小尺寸滑坡物理测试平台已经完成并进行了实验，大尺寸滑坡物理测试平台正

在施工建设中。

关键词：滑坡 稳定性 网格生成 试验 渗流

Models for Fragmentation Failure of Geological Body and Interaction Between Fracture Medium and Fluid and Corresponding Numerical Methods

Yuan Mingwu[1] Sun Shuli[1] Huang Kefu[1] Liu Xiaoyu[2] Chen Yongqiang[1]
(1.Peking University;2.Institute of Mechanics,Chinese Academy of Sciences)

Abstract：The PC version of SAP84-NOLM package is completed basically and tested. The capacity of the package is that the geological body with 300000 DOFs can be simulated.The package includes the following function modules:initial mesh generation for cracked geological body and the adaptive technique for crack extension;2D/3D computations for seepage;computations of material softening by arc-length method to take into account the effects of raining on constitutive relations of geological body and the preliminary realization of large size parallel computing.A small size of physical testing platform for slope has been constructed and several in-house testing was completed.A large size of physical testing platform for slope is in construction.

Key Words：Landslide;Stability;Mesh generation;Testing platform;Seepage

大型地下洞室位移量级预测方法研究报告

邓建辉 魏进兵 陈菲 高春玉
（四川大学）

摘 要：位移是岩体最容易测量与控制的参数，其量级与速率是隧道工程围岩稳定评判或位移监控的基本参数。但对于大型地下洞室而言，目前尚未建立相应的标准。以我国西南地区已建或开挖完毕的6个水电站大型地下厂房的位移监测成果为基础，总结影响地下厂房围岩位移量级的因素，提炼出主要影响因素，即围岩初始地应力水平和岩体性状，分别用最大主应力与岩块饱和单轴抗压强度表征。引入围岩应力强度比代表2个主要因素，建立其与边墙最大和平均位移量级的2个经验关系式，取得了较好的研究结果，该成果可为地下洞室位移监测设计、预警与监控标准的建立提供参考。

关键词：大型地下洞室 位移量级 位移预警 监控标准

Displacement Prediction of Large Underground Caverns

Deng Jianhui Wei Jinbing Chen Fei Gao Chunyu
(Sichuan University)

Abstract：For rock masses, displacement is a parameter that can be easily measured and controlled, and its magnitude and rate is the basic parameter for evaluating the stability of rock masses or for displacement control in tunnels.However, such a standard is still not established for large underground caverns.Based on the measured displacements of 6 large-scale underground powerhouse caverns in Southwest China, factors that affect the displacement development in rock masses are summarized and major factors, i.e.in-situ stress and rock mass quality are refined, which are then represented by the maximum in-situ stress and the saturated unconfined compressive strength.The ratio of stress to strength is then introduced to describe the above two factors and two empirical relations are established by regression method to describe its relation with the maximum and average displacements of the cavern sidewalls.The empirical relations give a good fitting result and can be used as reference for the monitoring design and precaution of displacement, and for the establishment of displacement control standard in large underground caverns.

Key Words：Large underground cavern ;Displacement magnitude ;Displacement precaution ;Control standard