

三峡永久船闸高陡边坡整体稳定性的多因素综合评价

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摘要 三峡永久船闸高陡边坡工程是1个开放的复杂巨系统, 对其整体稳定性的评价需要综合考虑地质资料、数值分析计算成果以及监测数据等多源信息, 基于多因素优化融合的思想, 采用定性定量综合集成的方法。基于系统工程的观点, 借助可拓学理论, 依据菱形思维模式和物元的可拓性, 建立了三峡永久船闸高陡边坡工程整体稳定性的多指标分层次综合评价体系。采用物元的概念将研究对象、评价指标和量值结合为一体, 应用物元变换建立整体稳定性评价的物元模型, 从而实现对三峡永久船闸高陡边坡整体稳定性的质与量的综合描述, 并结合其随时间的变化趋势, 可以完成对高陡边坡整体稳定性的三维动态评估。另外应用优化理论, 进行了评价指标的主、客观组合赋权。经计算得出边坡整体稳定性属1级, 特征值为1.86, 介于优与良之间。同时, 所述方法亦可应用于大坝健康性态整体评价、岩体质量评估、大坝老化评估等其他领域。

关键词 [岩石力学; 高陡边坡; 整体稳定性; 可拓理论; 综合评价; 三峡永久船闸](#)

分类号

MULTIPLE-INDEX ASSESSMENT FOR GLOBAL STABILITY OF HIGH-STEEP ROCK SLOPE OF THE THREE GORGES PROJECT PERMANENT SHIPLOCK

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Abstract

It is a controversial problem to assess comprehensively the global stability of high-steep rock slope of the Three Gorges Project permanent shiplock. The information on slope stability includes geological data, results of numerical analysis, measuremental data, experiential knowledge, and so on. Therefore, a suitable analytical methodology of system engineering integrating the comprehensive qualitative and quantitative information is needed. A multi-index system and model, which is able to evaluate comprehensively the global

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stability of high-steep rock slope by using extension theory, is proposed. The qualitative grade and quantitative degree for the global stability of high-steep rock slope by the index system and model can be obtained. The slope stability can be assessed dynamically. Analytic Hierarchy Process method has been used to compute the subjective weights of evaluation indexes. The objective weights can be obtained by calculating the relational degree between evaluation indexes and grades with extension theory. By combination of the views of both the subjective and objective weights, an optimization theory has been used to calculate the weights for index evaluation. The results have shown that for the high-steep rock slope of the Three Gorges Project permanent shiplock, its grade and degree of global stability are 1 and 1.86, respectively. Then the global stability can be ranged between excellent and good. The numerical example has shown that the proposed method is feasible and effective, and the evaluation results are reasonable. In addition, this method can also be used to assess dam health, rock quality, and dam aging.

Key words [rock mechanics](#); [high-steep rock slope](#); [global stability](#); [extension theory](#); [comprehensive evaluation](#); [Three Gorges Project permanent shiplock](#)

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