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大型复杂堆积边坡稳定性的离散元分析

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DISCRETE ELEMENT ANALYSIS OF A LARGE-SCALE COMPLEX SLOPE IN DEBRIS DEPOSIT

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- 摘要
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全文: PDF (562 KB) HTML (KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 与一般高边坡相比,堆积边坡在物质组成、边界条件、力学特性上具有明显差异,其变形与破坏表现出明显的非连续介质特性,传统的边坡稳定分析方法难以反映其失稳方式与破坏过程,而离散元法在分析非连续介质的变形和破坏方面具有较好优越性。以某一大型复杂堆积边坡为依托,首先模拟边坡土体室内三轴试验过程,通过与试验结果对比确定边坡土体的细观力学参数,进而通过建立堆积边坡离散元模型研究其失稳机制,预测其失稳方式和变形过程。结果表明:未开挖前该边坡处于稳定状态,一期开挖完成后边坡上部存在2个潜在滑动体,且表现为沿下伏基岩面的深层滑动; 二期开挖完成后,下部存在一较明显滑动体,其失稳会进一步加剧上部两潜在滑动体的变形破坏; 整个堆积边坡的失稳表现为沿基岩的自下而上牵引式渐进破坏。

关键词: 堆积边坡 稳定 离散元 破坏机制 变形过程

Abstract: Compared to general high slopes,there is an obvious difference in the material composition,boundary condition and mechanical character for deposit slopes.Because of the obvious discontinuity character of deposit slopes in terms of deformation and failure,it is difficult to reveal its failure mode and process for conventional stability analysis method.The discrete element method(DEM)can provide an optimum solution to problems such as deformation and failure of discontinuity.Firstly,based on a large-scale complex slope in debris deposit,a numerical test is carried to simulate triaxial test of deposit soil.Micromechanics parameters are determined through comparison to the laboratory test results.A general study on its failure mechanics was carried out using DEM.Failure mode and deformation process were also involved.The results show: the slope before excavation is stability.There are two potential slides mass on the upside of slope after first step of excavation showing deep sliding along bedrock underlying debris deposit.There is an obvious slide mass at the bottom of slope after second step of excavation.Its failure will speed deformation and sliding of two potential slides.For the whole slope in debris deposit,its failure mechanics mainly shows in a gradual deformation and failure mode along contact surface from bottom to upside.

Key words: Slope in debris deposit Stability Discrete element method Failure mechanics Deformation process

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