

植被护坡的局限性及其对深层滑坡孕育的贡献

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收稿日期 2003-6-25 修回日期 2003-8-21 网络版发布日期 2007-2-6 接受日期 2003-6-25

摘要 根系对土体的加固效应是显著的, 植被能够遏制面状水土流失及浅层滑坡。但是, 由于大多数植物的根系都分布在地表以下1.5 m的深度以内, 其加固深度远小于深层滑坡的滑面埋深; 另外, 蒸腾能够显著降低地下水位, 但由于其主要发生在降雨事件的间歇期或旱季, 而且进展缓慢, 不能有效控制降雨过程中地下水位的大幅抬升及应力环境的恶化, 因此, 植被在深层滑坡防治方面的作用是有限的。与植被相关的干裂缝、动物通道、膨胀裂缝及结构性孔隙等在岩土体中形成的相对稳定的大空隙系统可以显著优化地下水的补给环境, 使得斜坡能够吸收除植被拦截之外的几乎所有降雨量; 植被发育斜坡的“渗入—径流—蒸腾”复合型水循环将引起地下水径流模数持续增大及岩体综合质量的渐进性衰退, 为斜坡整体滑移奠定基础。植物根系呼吸及枯枝落叶降解等生物地球化学过程会向土体中释放CO₂及有机酸等酸性物质, 提高土体酸度及渗入水的侵蚀性。同时, 植被发育斜坡中地下水的新老交替可以使水岩交换相饱和指数始终处于较低水平, 保证水岩化学作用的持续进行。因此, 植被对深层滑坡孕育的贡献是显著的。

关键词 [边坡工程](#); [植被](#); [浅层滑坡](#); [水循环](#); [水岩化学作用](#); [深层滑坡](#)

分类号

LIMITATIONS OF BIOTECHNICAL SLOPE PROTECTION AND CONTRIBUTION OF VEGETATION TO DEEP SEATED LANDSLIDE PREPARATION

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Abstract

The mechanical reinforcement provided by roots is remarkable. However, because the root zones of most plants distribute generally within 1.5 m underground, failure planes of deep seated landslides typically pass well below the rooting zone. As an important discharge way, the transpiration can lower groundwater table of slope aquifer. Because transpiration takes place mainly in intermittent periods of rain events or in dry season, it can not substantially reduce peak groundwater levels in precipitation. Vegetation cover has minimal effect in deep landslide mitigation. Dry crack, animal passage way, expanding fractures, and structural pores related to vegetation cover, constitute a relatively stable macrospore system in upper slope mass, which improve markedly the recharge environment of groundwater and make slopes absorb all precipitation except interception by vegetation. The compound circulation model of 'Infiltration-groundwater runoff-transpiration' in

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vegetated slopes lead to the continued increase of groundwater runoff rate and the gradually dropoff of rock-mass composite quality. Biogeochemical processes, such as root breathing and litter degrading, release acidic substances like CO₂ and organic acids and raise the acidity of soilmass and the erosiveness of the infiltrating rain. At the same time, the pre-event water giving place to the event water in vegetated slopes makes saturation index of water-rock exchange phases keep a low level and chemical water-rock interaction can continue. Therefore, the contribution of vegetation to the deep seated landslide preparation is notable.

Key words [slope engineering](#); [vegetation cover](#); [shallow landslide](#); [groundwater circulation](#); [chemical water-rock interaction](#); [deep seated landslide](#)

DOI:

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