

滑带在高速剪切条件下的固液两相流问题

吴 剑^{1, 2}, 罗先启², 程圣国²

(1. 中国科学院 武汉岩土力学研究所, 湖北 武汉 430071; 2. 三峡大学, 湖北 宜昌 443002)

收稿日期 2006-6-1 修回日期 2006-8-25 网络版发布日期 2007-1-30 接受日期 2006-6-1

摘要 在滑坡快速下滑过程中, 滑带的剪切运动是某种形式的固液两相流。固相颗粒主要是碎石颗粒, 液相则是黏土颗粒和水的混合物。固相颗粒之间的液相, 无论是静止、流动还是两相流状态, 都会对固相颗粒的粒间作用力产生较大影响。在剪切速率达到一定程度后, 固相颗粒的随机碰撞产生的颗粒间作用力将成为颗粒间主要作用力, 在此作用力作用下, 固相颗粒运动符合Navier-Stokes方程所描述的流体运动。由于滑带特有的边界条件, 滑带材料在高速剪切条件下的流体运动, 可以用简化的Navier-Stokes方程, 即雷诺公式来表示。在一定边界条件下, 根据雷诺公式, 液相流体产生动压变化, 液相的动压变化引起固体颗粒之间的接触应力变化, 最终导致滑带整体的抗剪强度的变化。

关键词 [边坡工程](#); [固液两相流](#); [滑坡](#); [滑带](#); [动压](#)

分类号

RESEARCH ON SOLID-LIQUID TWO-PHASE FLOW IN SLIDING BAND AT HIGH SPEED

WU Jian^{1, 2}, LUO Xianqi², CHENG Shengguo²

(1. Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan, Hubei 430071, China;
2. Three Gorges University, Yichang, Hubei 443002, China)

Abstract

When landslides slide down at high speed, the motion of the materials in sliding zone can be described as a kind of two-phase flow motion. The solid phase is made of grain, while the liquid phase is a mixture of clay and water. In the pore of the solid phase, the stress state of liquid phase will make great effect on the stress between the particles. When the shearing speed is high enough, the crash effect in solid phase becomes the main factor of stress between particles. In the state, the motion of solid phase abides by the Navier-Stokes equation. Because of the specific boundary condition of the sliding zone, the movement equation of material(Navier-Stokes equation) can be simplified to Reynolds equation. For some boundary condition, the liquid-phase pressure changes as the shearing speed changes according to the Reynolds equation, so the pressure will affect the contact stress between the solid-phase particles. As a result, the shearing strength will be changed.

Key words [slope engineering](#); [solid-liquid two-phase flow](#); [landslide](#); [sliding band](#); [hydrodynamic pressure](#)

DOI:

通讯作者

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(182KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含 “边坡工程; 固液两相流; 滑坡; 滑带; 动压” 的相关文章](#)
- ▶ 本文作者相关文章

- [吴 剑](#)
-
- [罗先启](#)
- [程圣国](#)