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灾害地质

2010年7·27四川汉源二蛮山滑坡-碎屑流特征与成因机理研究

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摘要:

2010年7月27日凌晨4时许,四川省汉源县万工乡二蛮山发生大规模滑坡,约 $48 \times 10^4 \text{ m}^3$ 的强风化玄武岩体,在前期降雨的影响下高位高速滑出,随即解体转化为碎屑流,沿沟谷高速运动,沿途不断携卷和铲刮堆积于沟床及两侧斜坡的表层松散物质,使滑体的体积和含水量不断增大。当运动到沟谷中段时,因沟道在此向右偏转,在强大的惯性力作用下,部分碎屑流体冲向左侧斜坡,将居住于此的双合村一组5户村民房屋掩埋,造成20人失踪;另一部分碎屑流体继续沿沟谷高速运动近1.4km才最终停止。约30min后,堆积于沟谷中段深切沟道内的滑坡堆积物,在重力作用下再次启动,形成二次滑坡。二次滑坡缓慢蠕滑流动数小时,最终到达万工新集镇,将部分房屋推倒掩埋,造成92户房屋受损、1500人被迫紧急转移。本文在对灾害现场进行详细地质调查的基础上,结合现场测绘、颗分试验、航拍等手段,对二蛮山滑坡体的基本特征进行了较深入的调查研究,对滑坡发生及成灾原因进行了初步分析。结果表明,滑源区相对突出的地形条件、风化破碎的玄武岩体和有利的结构面组合是滑坡发生的基本条件;前期降雨期间爆发的泥石流对滑源区坡脚的掏蚀、强降雨的饱水加载作用以及雨水沿陡倾张裂结构面的下渗软化作用,是诱发滑坡发生的直接原因。二蛮山沟谷原为一高频泥石流沟,滑坡发生前并无明显的滑坡迹象,滑坡的发生表现出极强的隐蔽性和突发性以及高位高速远程运动和危害巨大的特点,同时,主滑坡发生后在短时间内滑坡区再次启动发生二次滑坡,这些现象和特点具有特殊性,也具有典型性,值得深入研究。

关键词: 二蛮山滑坡 远程滑坡-碎屑流 二次滑动 成因机理 携卷

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THE ERMANSHAN ROCK SLIDE-DEBRIS FLOW OF JULY 27, 2010 IN HANYUAN,SICHUAN: CHARACTERISTICS AND FAILURE MECHANISM

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Abstract:

At about 4 o'clock on July 27, 2010, a large-scale rock slide happened in Ermanshan of Han Yuan in Sichuan province. Under the influence of the early rainfall, approximately $48 \times 10^4 \text{m}^3$ strongly weathered basalt mass in high position slid down at a high speed, and then disrupted, transferred into debris flow, made a rapid movement along the valley, and unceasingly entrained and scraped the superficial loose material accumulating in the gully bed and on both sides of slopes, which caused the unceasingly increase of the volume and water content of debris flow. When moving to the middle part of the valley, because of the trench orienting towards right here, a part of debris flow ran to the left bank of the slope under the influence of strong inertia force, burying five villagers' houses of ShuangHe village and causing 20 people missed. The other part of debris flow didn't stop moving until it ran rapidly for about 1.4km along the trench. The landslide drift accumulating in the middle part of the deep-river-cut trench started again under gravity form a secondary landslide. After creeping slip for several hours, the secondary landslide eventually arrived at WanGong Town and crushed down some houses, causing 92 houses to be damaged and 1500 people to be evacuate urgently. This paper carries out a detailed investigation and research on the zonal characteristics of the Ermanshan rock slide-debris flow and preliminary analysis of the disaster causes on the basis of massive geologic investigation into the site of the disaster, combined with in-situ

measurement, experimentation, aerial photography and other means. The result indicates that the relatively prominent terrain condition of the source area, the weathered and shattered basalt mass and favorable combination of discontinuities is the fundamental condition for the rock slide. The debris flow undercutting the base of slope, the saturated surcharge of the rainfall, and the rainfall's infiltrating and softening effect along the sub-vertical and tensile texture plane directly caused the landslide. Ermanshan trench was originally a valley where debris flow frequently happened. There is no obvious signal before landslide happens. When it occurs, it demonstrates some characteristics as confidentiality, strong paroxysm, danger in long-rang movement in high position at a high speed and so on. Meanwhile, in a short time after the landslide, a secondary landslide will happen in the sliding zone. These phenomena and characteristics are special and typical. They are worth a further study.

Keywords: Ermanshan rock slide-debris flow
Long rang rock slide-debris flow Secondary slide
Failure mechanism Entrainment

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