Advances in Space-Air-Ground Collaborative Landslide Monitoring Technology: Postprint

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Abstract

Landslide disasters rank among the most frequently occurring, widely distributed, and severely damaging natural hazards worldwide, posing grave threats to human life and property as well as the safety of major engineering infrastructure. Scientific monitoring serves as a crucial technical foundation for landslide early warning, prediction, and proactive mitigation. Through years of intensive research and technological development, integrating multiple innovative methods—including high-resolution optical remote sensing, satellite InSAR, unmanned aerial vehicle (UAV) photogrammetry, and wireless sensor networks (WSN)—landslide monitoring has transitioned from traditional point-based manual observation to "space-air-ground" multi-dimensional collaborative monitoring, achieving significant progress in geological disaster risk identification and early warning in China. Building upon years of research understanding of landslide initiation mechanisms and deformation-failure processes, this paper systematically synthesizes recent advances in landslide monitoring technologies in China from a three-dimensional perspective of space (optical remote sensing and InSAR), air (UAV photogrammetry), and ground (professional monitoring such as Global Navigation Satellite Systems and crack gauges). It analyzes and discusses the technical advantages and applicability of different technologies in engineering practice, constructs a "space-air-ground" collaborative monitoring technical system for the entire process of landslide deformation and failure, and offers a new conceptual paradigm and empirical guidance for the scientific prevention of landslide geological disasters.

Full Text

Preamble

Technical Progress of Space-Air-Ground Collaborative Monitoring of Landslides

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Ab-
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Landslide disasters rank among the most frequent, widespread, and destructive natural hazards globally, posing severe threats to human life, property, and critical engineering infrastructure. Scientific monitoring constitutes a critical

Keywords: Landslide; Optical remote sensing; InSAR; UAV photogrammetry; Wireless Sensor Networks; "Space-Air-Ground" collaborative monitoring

Note: Figure translations are in progress. See original paper for figures.