Comprehensive Identification and Deformation Evolution Characteristics of Landslides in the Lianghekou Hydropower Station Reservoir Area During Initial Impoundment (Postprint)

Authors: Li Xueqing, Li Weile

Date: 2025-08-20T00:00:00+00:00

Abstract

Reservoir impoundment in large dams exerts a significant triggering effect on reservoir bank landslides. Early identification of such landslides and investigation of their deformation evolution provide crucial support for geological disaster prevention and control in reservoir areas. The Lianghekou Hydropower Station reservoir area is characterized by complex geological conditions, deep-incised valleys, steep slopes, and intense weathering and unloading processes. The initial impoundment induced numerous landslide hazards, posing severe threats to hydropower station operations and the lives and property of reservoir area residents. This study first employs an integrated approach combining Stacking-InSAR technology, high-resolution optical satellite imagery, airborne LiDAR technology, and field investigations to identify active landslides and establish a dynamic inventory database. Secondly, based on deformation information derived from SBAS-InSAR technology, an evaluation index system for landslide activity is constructed, and potential landslide hazards in the reservoir area are classified according to activity levels. Subsequently, combined with the geological environmental characteristics of the study area, the spatial distribution patterns of active landslides are analyzed. Finally, taking typical landslides as case studies and employing integrated multi-source remote sensing detection and field investigation methods, coupled with rainfall-reservoir water level-time series deformation data, the deformation and failure characteristics and evolution mechanisms of typical landslides are revealed.

Full Text

Preamble

Comprehensive Identification and Deformation Evolution Characteristics of Landslides in the Reservoir Area during the Initial Impoundment of the Lianghekou Hydropower Station

Xueqing Li[1],[2], Weile Li[1]

[1]State Key Laboratory of Geohazard Prevention and Geoenvironment Protection, Chengdu University of Technology, Chengdu 610059, China
[2]Sichuan Institute of Comprehensive Geological Survey, Chengdu 610081, China

Abstract

The impoundment of large reservoirs exerts a significant triggering effect on reservoir bank landslides. Research on early identification and deformation evolution of these landslides provides crucial support for geological disaster prevention and control in reservoir areas. The Lianghekou Hydropower Station reservoir area is characterized by complex geological conditions, deeply incised valleys, steep slopes, and intense weathering and unloading effects. The initial impoundment has induced numerous potential landslide hazards, posing severe threats to both the operation of the hydropower station and the lives and property of local residents.

This study first employs an integrated approach combining Stacking-InSAR technology, high-resolution optical satellite imagery, airborne LiDAR technology, and field surveys to identify active landslides and establish a dynamic inventory database for the reservoir area. Second, based on deformation information obtained from SBAS-InSAR technology, we construct an evaluation index system for landslide activity and classify potential landslide hazards according to their activity levels. Third, we analyze the spatial distribution patterns of active landslides by integrating the geological and environmental characteristics of the study area. Finally, taking typical landslides as case studies, we employ integrated multi-source remote sensing detection and field investigation methods, coupling rainfall, reservoir water level, and time-series deformation data to reveal the deformation characteristics and evolution mechanisms of these representative landslides.

Keywords: Lianghekou reservoir area; active landslides; comprehensive identification; deformation evolution characteristics; reservoir water level

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