



Khait rock avalanche, Tajikistan: application of orbital remotely-sensed data for the characterization and analysis of a catastrophic landslide

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The 1949 Khait landslide is one of the top five single-event landslide disasters of the last millennium, and may be the most deadly single-event landslide in historical time. Despite its magnitude, the earthquake-triggered event remains relatively unstudied, with large discrepancies in landslide volume and fatalities. Such discrepancies are due, in part, to secrecy surrounding the event imposed by the former USSR government. In addition, volume estimates are confounded by the entrainment of a large amount of saturated loess causing as much as a five-fold increase in the volume of the moving mass. Examination of the Khait landslide using remotely-sensed orbital data (optical imagery, digital elevation model, and interpreted population data) was conducted to provide an accurate and detailed characterization of this catastrophic landslide. The study is a detailed analysis of the landslide prior to field study and demonstrates the use of remote sensing technology as a method of preparation for site investigation. The Khait rock avalanche was mapped by analysis of surface cover and of three-dimensional morphology. Digital elevation model estimates of volume, extent, and thickness of the landslide were used to calculate entrainment volumes. Gridded population data was used to provide an upper constraint on the number of lives lost in the Khait catastrophe. Results are compared with other values reported in the literature. Conditions acting as precursors to this catastrophe are identified and are found to occur throughout the region. Based on our characterization of the Khait landslide and on conditions observed throughout the region, a hazard assessment was conducted for the surrounding area.