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# Comparison of photogrammetric and field survey data from the sliding surface of the 1963 Vajont Slide, Italy

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The Vajont Slide is one of the largest catastrophic slope failures of the past century. About 270 million m3 of limestone, mudstone, and marl slid into the Vajont Reservoir on October 9, 1963, producing a displacement wave that overtopped the dam and killed over 2000 people in the valley below. Although the landslide has been extensively studied over the past several decades, its morphologic and structural controls, mechanisms, and dynamics are still not completely understood. The recent development of new technologies enables a better characterisation and understanding of the landslide. In particular, photogrammetry allows the structure of inaccessible areas of the failure surface to be characterised in detail. Collaborative research between Simon Fraser University (SFU) and the University of Padova aims to characterise the Vajont sliding surface and to compare remote sensing and field survey results.
Photogrammetry at Vajont was completed using a Canon50D camera with lenses of 20, 50, 100, 200, and 400 mm focal length. The survey provided images of the sliding surface with a range of resolutions, and the photogrammetric models provided data on the orientation, persistence, spacing, and roughness of discontinuities. Structural data, using a conventional geomechanical mapping approach, were collected in the field at 88 stations within and outside the landslide. At each station, lithological data were collected and structural measurements, such as the orientation, spacing, persistence, and roughness of joints and Geological Strength Index (GSI) and Schmidt Hammer tests, were made. Structural analysis of the field data revealed three domains on the sliding surface. Domains 1 and 3, which are respectively the eastern and western sectors of the sliding surface, are characterised by relatively flat bedding planes, with discontinuities and some steps and folds. Domain 2, located near the centre of the sliding surface where the Massalezza gully incises the slope, is the most complex of the three structural domains as it is characterised by faults, joints, and two main folds with axes that correspond to regional structural trends. The field data indicate that five main discontinuity sets daylight on the sliding surface, serving as release surfaces, steps, and groundwater conduits. The photogrammetric analysis verified the results of the field survey and provided structural information in previously inaccessible areas. The photogrammetric models allowed us to refine the domain boundaries detected by field and aerial photo analyses. The models revealed both small- and large-scale roughness. Conjugate steps have a consistent orientation – larger steps strike northeast and smaller steps strike north – which correlates to regional tectonic structures. The combined field and photogrammetry results highlight the main discontinuity sets that controlled the 1963 movement and further clarify the morphostructural setting of the Vajont Slide. For example, folds daylighting on the failure surface may have had an important influence on initial movement of the sliding mass.