

# LANDSLIDE MONITORING VAL PARGHERA



GEORADAR



GAUGE RADAR



NOTIFICATION

Comprehensive monitoring system of the debris flow channel in Val Parghera with automatic warning of the responsible persons via SMS as soon as a predefined limit value is exceeded.





Title Page: View on the radars.

Figure 1: Left: The bridge of the cantonal road was destroyed by the debris flows. An emergency bridge was built as an immediate measure. Right: The debris flow carries earth and rock material, even entire tree trunks, down to the valley.

## CHALLENGE

Since the 2000s, a landslide has been active in the Val Parghera near the town of Chur in Grisons. Below the area there is important infrastructure such as the cantonal road from Chur to Thusis, the Rhaetian railway line, the A13 motorway and the Paleu Sura/Felsberg industrial zone. Since autumn 2012, the activity has increased and, as a result of precipitation in combination with snowmelt, around 100,000 m<sup>3</sup> of earth and rock material threatened to slide in spring 2013. The first major debris flows occurred on April 19, 2013. As a result, the cantonal road was closed and shortly afterwards an emergency bridge was built. Since the construction of extensive protective structures takes a lot of time, our proven debris flow monitoring system was used as an immediate measure. The system increased safety and improved the understanding of the landslide based on background analyses.

## SOLUTION

Shortly after the first debris flows, Geoprevent installed the first cameras and gauge radars within a short time. A weather station also provided actual precipitation and temperature data for the area. In order to determine the extent of the landslide and to enable an estimation of the

still moving or unstable material, interferometric radar measurements were carried out in June. The analysis of the camera images as well as the radar data showed that the landslide flowed down the valley with velocities between a few cm and two metres per day. The bedload trap had been extended in case of emergency, because more material continued to accumulate. This material had to be continuously dredged, deposited or liquefied in order to be gradually discharged into the Rhine river. In order to make the work in the bedload trap and the flushing of the drainage channels as efficient as possible and to ensure the safety of the traffic and transport infrastructure, Geoprevent installed additional webcams and gauge radars in August 2013. The authorities were thus able to monitor the landslide, the emergency bridge, the bedload trap and the landslide area at several locations remotely in our online data portal. The online data portal is accessible via desktop, tablet or smartphone and offers an overview of all live and recorded data. In the event of critical level changes, warnings were automatically sent by SMS to enable immediate action to be taken.



Figure 2: The installed weather station provides local data on precipitation and temperature. This data is important for debris flow forecasts.

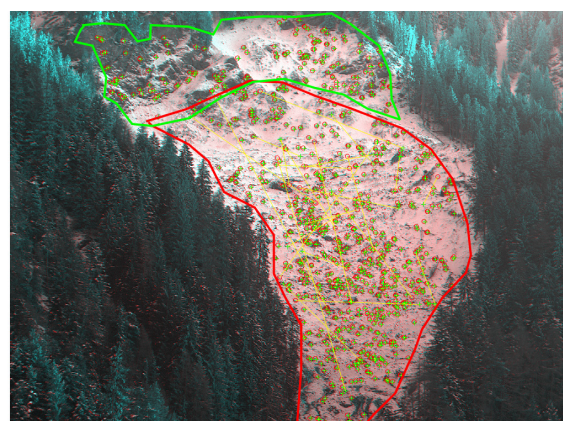


Figure 3: The analysis of the camera images shows flow velocities of the debris flow between 20 cm and 2 m per day.