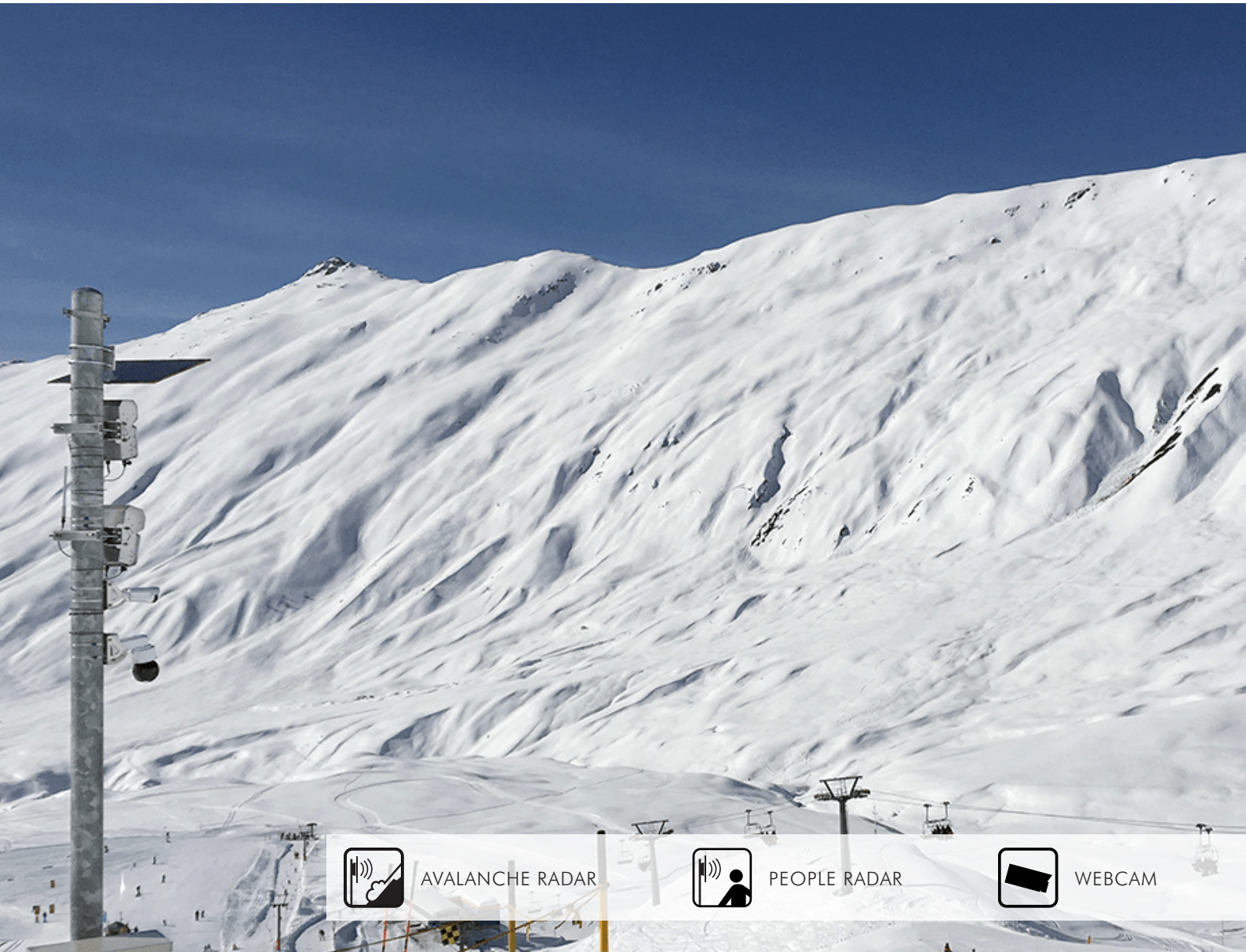


# AVALANCHE/PEOPLE RADAR BELALP



AVALANCHE RADAR



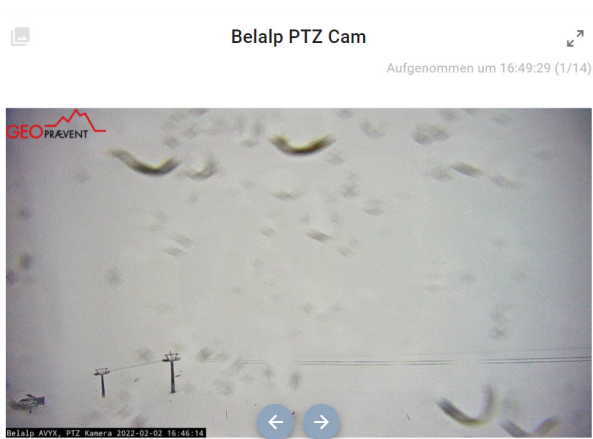
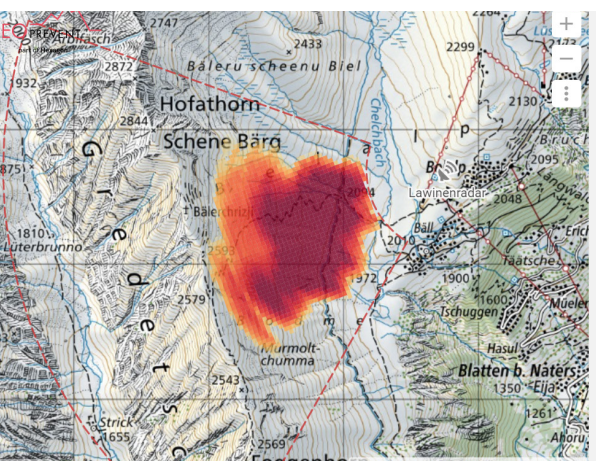
PEOPLE RADAR



WEBCAM

State-of-the-art, remote avalanche monitoring system for real-time detection of triggered and spontaneous avalanches as well as people in the hazard zone at Belalp, Switzerland.





Title Page: Avalanche radar and the ridge avalanche covers a 4 km wide starting zone.

Figure 1: The avalanche radar detects avalanches independent of weather and time of day. Verification of this avalanche would hardly have been possible without radar.

### CHALLENGE

The "Ridge avalanche" at Belalp (Valais, Switzerland) has a 4 km wide starting zone with an altitude difference between start and deposition areas of up to 1600 m. The infamous avalanche can assume extreme dimensions and pose a threat to the main road and individual buildings of the village named Blatten. Since construction measures in the starting area did not lead to the desired results, the local avalanche warning service now concentrates primarily on artificially triggering avalanches. The permanently installed Gazex systems enable remote avalanche control even in bad weather. But how to verify the avalanche in fog, snow or in the dark?

### SOLUTION

The automatic avalanche monitoring system on Belalp is a combination of avalanche and people radar. The avalanche radar monitors the avalanche starting zone of the ridge avalanche at a distance of up to 3.5 km and detects spontaneous and artificially triggered avalanches at any time and in all visibility conditions. Radar works day and night in fog, storm or snowfall. The avalanche radar detects moving snow masses and tracks them until they stop or leave the radar's field-of-view. The radar also

records duration, velocity and size of the avalanche and the system-integrated camera automatically captures event images or videos. Upon detection, the system immediately notifies the responsible people by SMS and email. All data is transmitted to the Geoprevent online data portal where avalanche maps, event pictures and associated characteristic measured values are displayed. Authorised users can access the information any time via smartphone, tablet or PC, from the office or the ski slope.

The peaks in the starting zone of the ridge avalanche are popular destinations for ski tours and are frequently visited. To ensure that no people are present in the hazard zone prior to avalanche control, we equipped the system additionally with a people radar. This type of radar automatically detects and tracks the movements of people in the monitored area. The system ignores or filters out any tracks of skiers and snow groomers on the nearby ski slopes of the ski resort. Upon detection of a moving person, the person radar activates an optical as well as a thermal imaging camera to automatically record picture series or videos for visual verification.

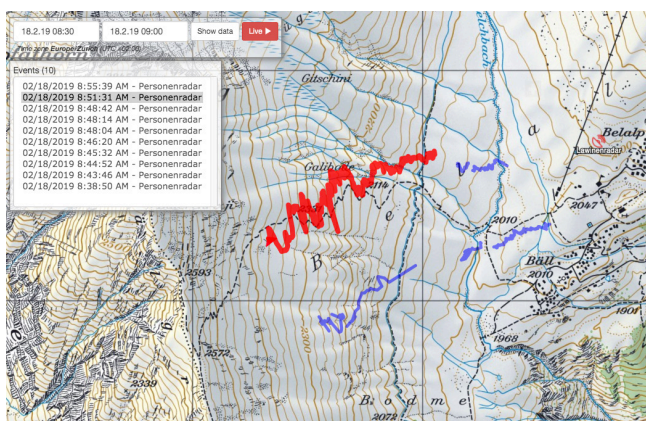


Figure 2: The people radar detects moving people and records their tracks. Highlighted in red is the ascent of a group of ski tourists.



Figure 3: The avalanche radar reliably detects avalanches in any weather and at any time of day and triggers camera images.