

OPTICAL SNOW LEVEL MONITORING IN AVALANCHE PATHS, SAXON



MODIFIED CAMERA TO
MONITOR THE SNOW LEVEL



AUTONOMOUS OPERATION

Use of a modified camera with autonomous power supply to monitor the snow level at the foot of the Pierre Avoi by means of graduated poles installed in avalanche paths threatening the commune of Saxon.



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Title page: Camera installed to monitor the snow level below the Pierre Avoi.

Figure 1: Left: Map of the area with the location of the camera (red dot) and the avalanche danger zone (orange). Right: Picture of one of the graduated poles, which were installed together with the camera located on the crest in the background.

PROBLEM

The Pierre Avoi is an imposing rock face culminating at 2470 m and which towers above the Rhone Valley, between the commune of Saxon and the ski resort of Verbier. In summer as well as in winter, the Pierre Avoi is a popular route for hikers or backcountry skiers. In winter, it is not uncommon for the avalanche paths located northwest of the Pierre Avoi to be heavily snowed in and for major avalanches to occur naturally, threatening some of the houses and roads of the commune of Saxon located below. In order to secure the infrastructures, the commune of Saxon collaborates with the security service of the slopes of the resort of Verbier – 4 Vallées in order to trigger avalanches when necessary, during the winter. This strategy allows to avoid too important snow accumulations, which could cause the triggering of big avalanches. In order to know when the snow level was high enough to trigger avalanches, graduated poles were installed. The snow level was read using binoculars from the Rhone valley. Since the trigger zones are located in an area that is not easily accessible and visibility from the valley is not always guaranteed in winter, the local authorities needed additional information to help manage the avalanche danger in the region.

SOLUTION

The commune of Saxon mandated the engineering firm Nivalp and GEOPREVENT to provide a technical solution. Since graduated poles for reading the snow level already existed at key locations in the various corridors of interest, GEOPREVENT proposed to develop a camera specially adapted for taking pictures of the snow cover and capable of operating reliably in alpine and exposed conditions. To do this, the existing PROCam system was adapted in several ways. First, an optical filter was mounted on the camera lens to reduce reflections from the sun and increase contrast. In addition, a power supply system including a solar panel with a battery and low energy consumption components were carefully selected. In addition, GEOPREVENT has developed a system with a snow blower that allows the lens to be cleared of snow on a regular basis when it is obstructed by snow. These different developments allow the system to take pictures with an hourly cadence during 2–3 weeks of bad weather, facilitating the decision making of the municipality concerning artificial avalanche releases.



Figure 2 : Image taken by the camera with the different graduated poles.



Figure 3 : Camera with the snowblower at the lens and a solar panel.