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Research in Graubünden

Rock avalanche at Piz Scerscen

Searching for the trigger

The release area on Piz Scerscen after the rock avalanche of 14 April 2024.
Photo: Dominik Hunziker, Head of SAC Bernina Mountain Rescue.

In the early hours of 14 April 2024, 3.5 million cubic meters of rock broke away from Piz Scerscen in the Engadin. The rock avalanche also swept along around two million cubic meters of glacier ice, as well as snow and ice on the Tschierva Glacier. The mass travelled almost six kilometers. Just half an hour earlier, people had still in the vicinity.

What caused the rock face to collapse? Livia Pierhöfer is investigating this question in her doctoral research at the WSL Institute for Snow and Avalanche Research SLF. Together with an ETH master's student, the geologist is analyzing the rock structures in the release area and searching for additional factors that may have triggered the collapse. They work with three-dimensional "point clouds" generated from laser scans and drone imagery. In these datasets, they map cracks and discontinuities, determine their orientation and assess which of them may have acted as zones of weakness or sliding surfaces. ETH glaciologists are also analyzing ground-penetrating radar measurements that reveal possible pathways for water within the glacier. Specialists from other disciplines are examining the glacier, seismic signals and the movement of the avalanche mass. Pierhöfer is fascinated by this collaboration: each discipline contributes one part of the explanation. Her task is to combine these findings with her own analyses and develop a coherent theory of what triggered the event.

The analyses conducted so far show that the rock structures favored the collapse. A largely continuous discontinuity had a similar orientation to the eventual sliding surface. Models suggest, however, that these zones of weakness alone were not sufficient. An additional influence must have come into play. Much points to water and ice having contributed to the rock avalanche. Several findings support this theory: glacier-specific models produced by ETH Zurich for the glacier in the release zone indicate considerably more meltwater than usual during the two years preceding the event. Ground-penetrating radar measurements reveal possible water pathways within the glacier. Photographs taken after the collapse also document water emerging from the exposed rock face, as well as permafrost ice. Some of the water may have entered the rock through cracks, partially frozen there and created additional pressure as it expanded. The combination of zones of weakness, water and refreezing is therefore currently considered a particularly plausible explanation.

The precise sequence of events cannot be proven. “We see the result, but we cannot go back in time and look at what happened inside the mountain,” Pierhöfer explains. It remains unclear when the water entered, when it froze and how the pressure developed.

Such extensive data are rarely available for large rock avalanches. The research team is therefore trying to extract as much knowledge as possible from the event. The findings may help researchers to look more specifically for potential triggers in rock faces with a similar geological structure. They do not yet make it possible to predict such events. But each new analysis increases our understanding of the additional factors that can trigger a rock avalanche in an already unstable rock face.

Livia Pierhöfer and Daniela Heinen

Livia Pierhöfer. Photo: supplied

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