



## **New research centre focusing on climate change, extreme events and natural hazards in the Alpine region**

The new research centre will research and develop ways of enabling Grisons to remain an attractive, liveable and safe mountain canton in the future, given the threat posed by global warming. While the new centre's research is intended to have international impact, it will also feed into regional knowledge, thus allowing the centre to contribute to solutions that can be implemented locally. Its findings will be relevant for other mountainous cantons and, more broadly, mountainous regions worldwide.

### **Core research areas**

To achieve this, the new research centre will require expertise in a number of different disciplines. It will conduct research in six main areas, which complement the areas already being studied at SLF.

#### *(1) Weather and climate extremes in the Alps*

As global warming progresses, weather and climate extremes are becoming more frequent in the Alpine region. The intensification of extreme weather events is one of the aspects of climate change that has the greatest impact on our lives. In the Alps, such events could potentially trigger social and economic crises by increasing the frequency and effects of natural hazards, for instance, or causing the loss of existing ecosystem services. The centre's research will help to deepen understanding of the effects of these extremes and the associated risks and identify ways of mitigating or managing them for the benefit of society.

WSL and ETH Zurich are establishing a joint professorship within this research area; it will focus on the impact of climate change on mountainous regions.

#### *(2) Permafrost*

Permafrost shapes Switzerland's mountainous landscape and plays a major role in the planning and construction of high-altitude infrastructure, in the local drinking water supply and in natural hazard management, among other things. Should the permanently frozen ground thaw, there is a risk of natural hazards like rockfalls and debris flows. Its research in permafrost regions will enable the centre to gather fundamental information about the thermal condition of the permafrost and the dynamics influencing it with a view to gaining a better understanding of the processes affecting it, detecting future developments at an early stage and preventing risks and hazards.

#### *(3) Remote sensing, early detection and early warning*

The effects of climate change are especially severe in the Alpine region and the potential for natural hazards at high altitudes is increasing. However, it is not possible to predict where extreme events will occur and it is neither technically nor economically feasible to set up comprehensive protection systems for settlements and traffic routes. Ground-, drone-, aircraft- and satellite-based remote sensing tools are thus becoming increasingly important for natural hazard research, as they enable changes to be recorded continuously and potential hotspots to be identified at an early stage. Moreover, safety can be enhanced through continuous, closely-meshed monitoring and early-warning systems. The centre will investigate the best way of implementing such systems in high-altitude areas of the Alps in the future with a view to identifying and preventing hazards.

#### *(4) Alpine mass movements*

To gauge the effects of climate change on the movement and deposition processes of avalanches, landslides, debris flows and rockfalls, a wide array of scenarios must be taken into account, including scenarios for which there are barely any reference cases. Consequently, the simulation of the dynamics of such alpine mass movements is extremely important. When changes are unpredictable, simulation forms the basis for risk assessment and the planning of protective measures. By means of field and laboratory experiments, the centre will study the formation, movement and deposition processes of avalanches, landslides, debris flows and rockfalls and reproduce them with physical models, paying particular attention to the hazard process chain. Through this work, the centre will support risk-based, sustainable management of natural hazards.

WSL and ETH Zurich are establishing a joint professorship within this research area; it will focus on alpine mass movements and permafrost.

*(5) Mountain ecology and protective forests*

In the coming decades, mountain ecosystems will undergo major transformations as a result of climate change, shifts in land use, and natural disturbances and extreme events. This will affect many of the environmental services they provide, including their recreational function, their protective function (protective forests), their biodiversity function and their role in the sustainable use of timber and other regional products. The centre's research will help to further understanding of changes in mountain ecosystems and gauge their future impact. Building on this, options for measures could be devised with a view to preventing natural hazards and securing and optimising the availability of environmental services in mountainous regions in the long term.

*(6) Risk management, risk communication and resilience*

Mountainous areas of Switzerland, like the canton of Grisons, are under threat from natural hazards such as flooding, avalanches, debris flows, landslides and rockfalls. These hazards must be handled efficiently and effectively if communities are to continue to exist in mountainous regions in the long term. Prevention, intervention and restoration measures are required with a view to managing the hazards and risks and enhancing society's resilience. However, rare extreme events are beyond the capabilities of conventional natural-hazard management approaches, with risk communication proving particularly challenging. The centre's research will encourage the emergence of a risk culture that better reflects the changes in society and the climate.

The centre will research the fundamental scientific and sociological aspects connected with the six core research areas listed above. Drawing on a comprehensive understanding of the relevant processes, combined with projections regarding future development, it will foster the rapid transfer of knowledge between experts and practitioners and between Switzerland and other mountainous countries with a view to creating direct, immediate and effective value and sharing knowledge and experience across disciplines in a targeted manner. The centre's findings will also be passed on through teaching and through the transfer of knowledge and technology. The core research areas may be adjusted or supplemented if the canton's changing needs or new research findings so require. Construction work will begin at SLF's Davos premises in 2021.