



PRESS RELEASE

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Snow is disappearing in Switzerland

Areas with little or no snowfall now cover 44% of the national territory compared to 36% previously, according to an analysis of two decades of satellite data.

In Switzerland, snow is disappearing and this phenomenon is probably linked to global warming. While areas with little or no snow (between 0 and 20% probability of snowfall) covered 36% of the territory during the decade 1995-2005, they spread to 44% between 2005 and 2017. An increase of 5200 km² which is well beyond any margin of error. This irrefutable observation, drawn up by researchers from the University of Geneva (UNIGE), Switzerland, and the GRID-Geneva of the United Nations Environment Programme, is based on the preliminary analysis of 22 years of satellite data covering the entire Swiss territory. This study was made possible through the development of a new tool, the **Swiss Data Cube**, initiated on behalf of the Federal Office for the Environment (FOEN). The researchers gathered all the images taken by the last three American satellites of the Landsat Earth observation program, driven by USGS and NASA, and those of the European Sentinel-2 satellite, since their respective launches in the early 1970s.

The data extracted from the Swiss Data Cube reveals that snow is gradually disappearing from the plateau and is also becoming scarcer at higher quotes. The «eternal snow» zone, where the probability of snowfall varies between 80% and 100%, still covered 27% of the Swiss territory in the decade 1995-2005. Ten years later, it has fallen to 23%, a loss of 2100 km² equal to seven times the size of the canton of Geneva. “Generally speaking, we can also observe that the low snow conditions prevailing on the plateau are gradually gaining ground in the Jura and in the Alps, a phenomenon particularly evident in the Rhône Valley”, notes Grégory Giuliani, researcher at the UNIGE Institute for Environmental Sciences (ISE) and at GRID-Geneva. This is part of the evidence shown by the data that was analysed by PhD student Charlotte Poussin and ISE researcher Bruno Chatenoux.

A scientific collaboration with UZH

Detailed knowledge of snow cover and its evolution in Switzerland is an essential tool for public policies decision-making. Beyond the economic issues related to tourism, other questions arise such as flood risk management or water supply, given the storage role that snow plays, retaining water in winter to release it in spring and summer. Thanks to a scientific collaboration between UNIGE and the University of Zurich (UZH), funded within the framework of the strategic par-



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Data extracted from the Swiss Data Cube represent decades of observations and will be freely available to everyone, states Grégory Giuliani, researcher at the UNIGE Institute for environmental Science.

High definition pictures

tnership signed between the two universities in autumn 2017, a new type of data will soon be added to the existing database. The snow-cover.ch project will use data from the European satellite Sentinel-1, a radar satellite that will also measure the amount of melting snow, allowing for a more comprehensive view of the snow cover evolution over time.

Earth observation satellites regularly pass above the same location. For example, the Geneva region is overflowed every 15 days by Landsat satellites, and every five days by Sentinel-2. One can therefore superimpose the images of the same place and precisely follow its evolution over time. By «stacking» the pictures, it is possible to add a temporal dimension to the two spatial dimensions offered by each shot taken from space. Hence the name Swiss Data Cube, derived from this three-dimensional architecture. “We have stored the equivalent of 6500 images covering 34 years, a feat that only an open data policy has made possible. If we had to acquire these images at market value, more than 6 million Swiss francs would have been invested”, says Grégory Giuliani. “Knowing that each pixel of each image corresponds to the observation of a square of 10 by 10 meters, we have 110 billion observations today, it is an inestimable wealth for the scientific community.”

The data is freely available to the greater public

In addition to snow, the Swiss Data Cube offers the possibility of studying many other topics: vegetation, evolution and rotation of agricultural areas, urbanisation and even water quality as satellite images can be used to monitor three essential indicators in lakes and rivers: suspended particles, whether organic or mineral, chlorophyll content and surface temperature.

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“Switzerland is the second country in the world, after Australia, that has developed such a data cube, and we are the first to produce such a detailed map on a country scale”, explains Grégory Giuliani. The project was launched in spring 2016 on behalf of the Federal Office for the Environment, which wanted to evaluate the technological solution developed by Australia. Convinced by the first tests, the federal authorities decided the following year to equip themselves with a complete cube which today delivers its first results. The data are freely accessible not only to scientists worldwide, but also to the general public: a viewer integrated into the swissdatacube.org website will make it easy to compare data for specific areas of the territory at different times. “Our ambition is that everyone should be able to navigate freely in Swiss territory to understand its evolution”, concludes Grégory Giuliani.

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Find out about the Swiss Data Cube: www.swissdatacube.org