Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Landestopografie swisstopo

wissen wohin
savoir où
sapere dove
knowing where

swisstopo

swisstopo als integraler Bestandteil der Umweltbeobachtung Schweiz

InfoVerm 2024
11. April 2024
TU München

InfoVerm2024

Dr. Fridolin Wicki
Direktor swisstopo
fridolin.wicki@swisstopo.ch

Bilddaten

swisstopo

Orthophoto

Höhenmodelle

Topografisches Landschaftsmodell

Landeskarten etc.

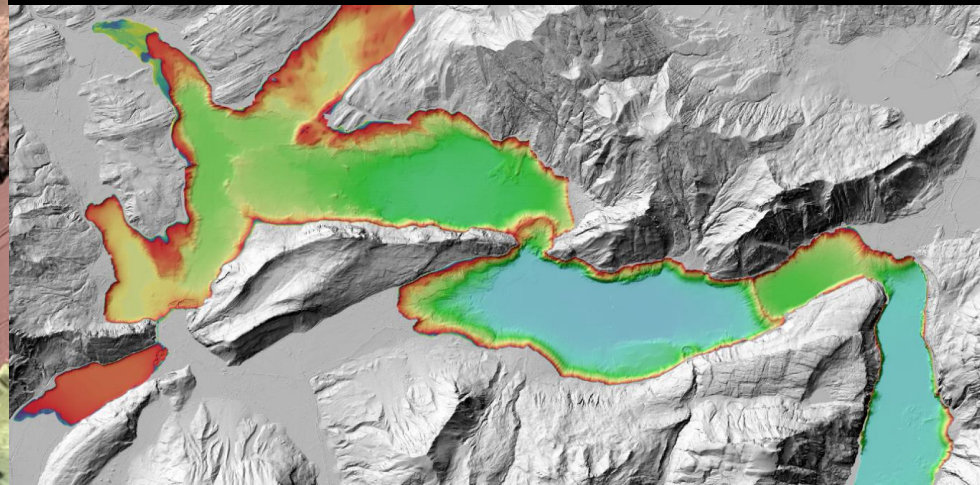
Fachanwender / OGD

Luftbilder – Flugdienst

Seit 1926 betreibt swisstopo in enger Zusammenarbeit mit der Luftwaffe einen Flugdienst.

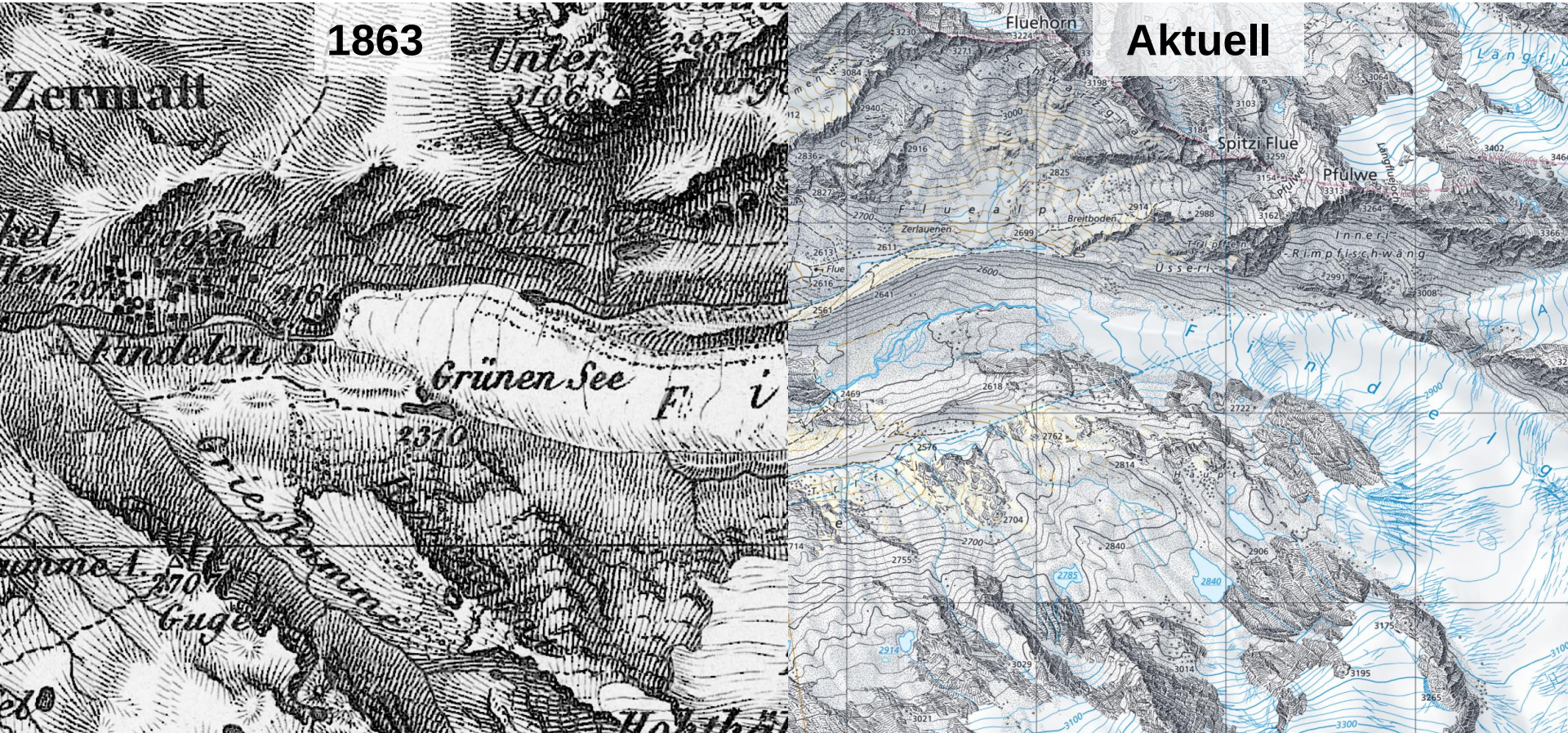
Orthofotos - Die Schweiz in hoher Auflösung

Höhenmodelle



Landschaftsmodell

Landeskarten



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Gletschermessnetz GLAMOS

Landschaftsbeobachtung Schweiz LABES

Moore & Biotope

Landesforstinventar

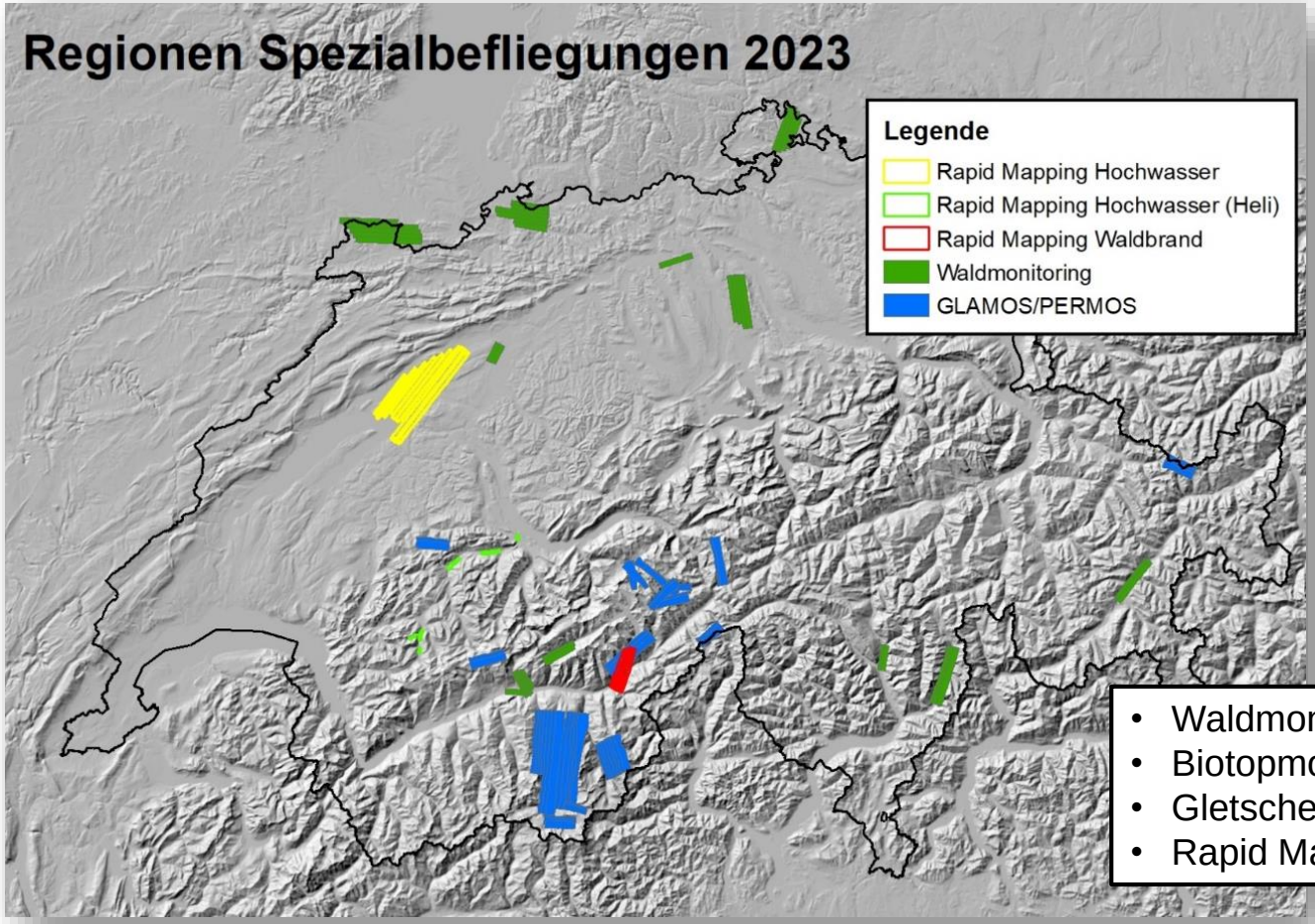
Langfristige Waldöko-system-Forschung LWF

Waldmonitoring

Projekte ASTRA, BAZL…

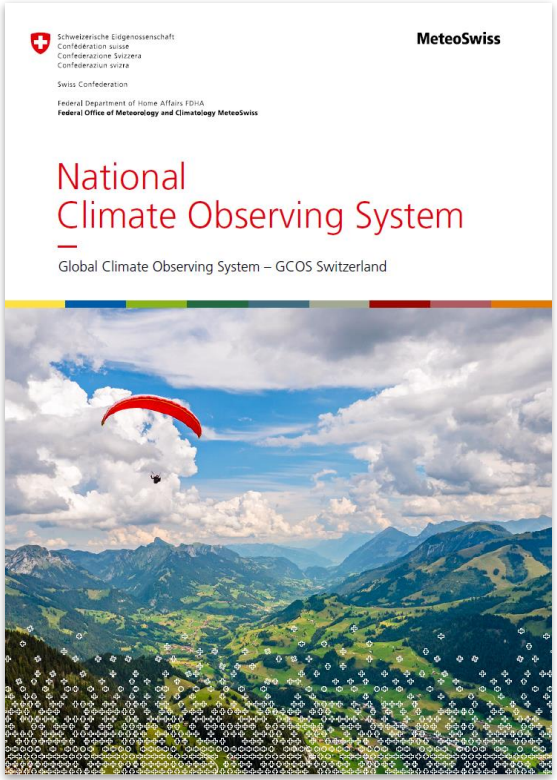
etc.

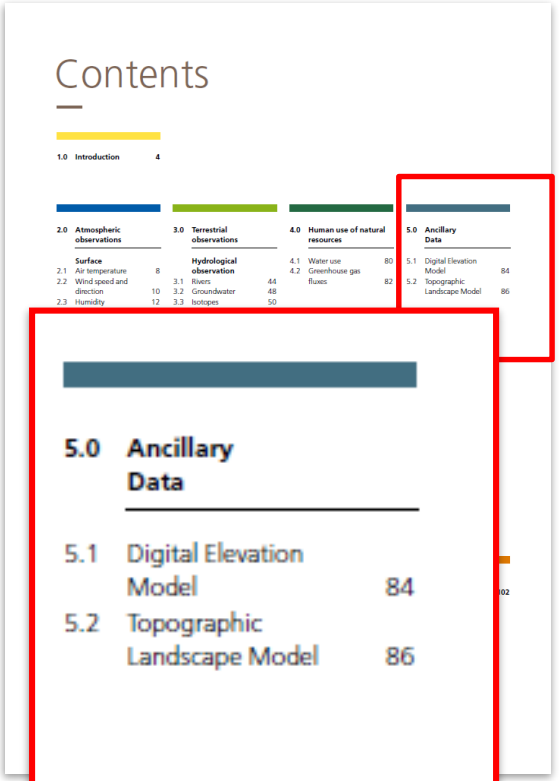
Spezialbefliegung 2023

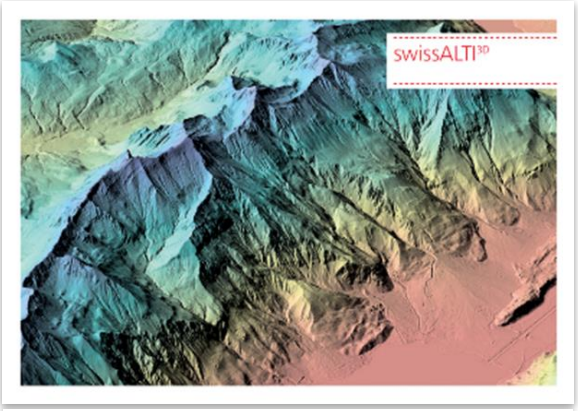


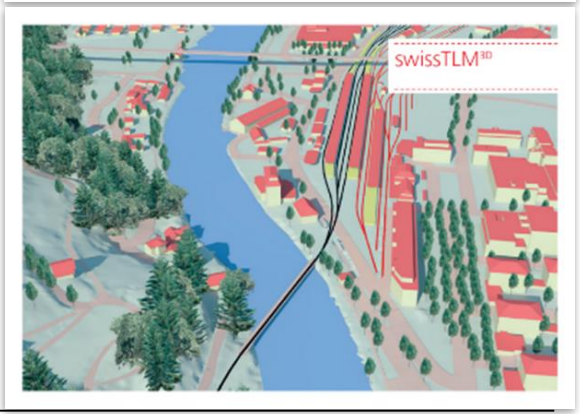
- Waldmonitoring: 358 km^2
- Biotopmonitoring: 106 km^2
- Gletschermonitoring: 682 km^2
- Rapid Mapping: 271 km^2

Klimabeobachtung



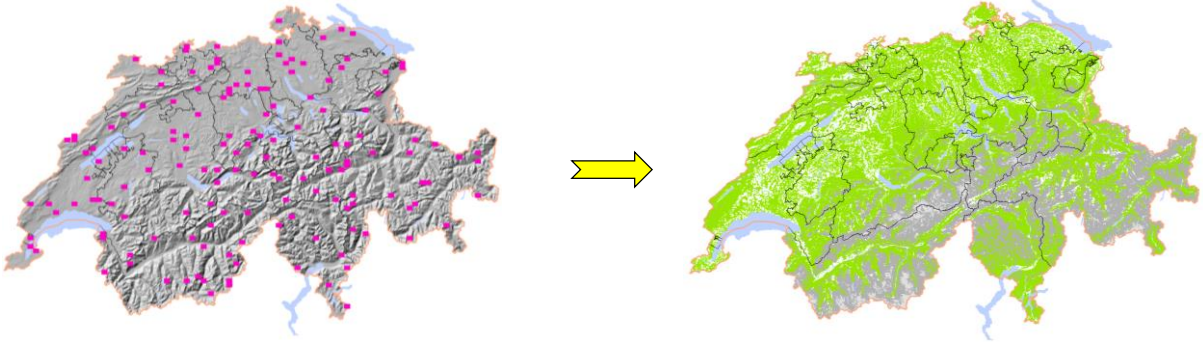






Bundesamt für Landestopografie swis

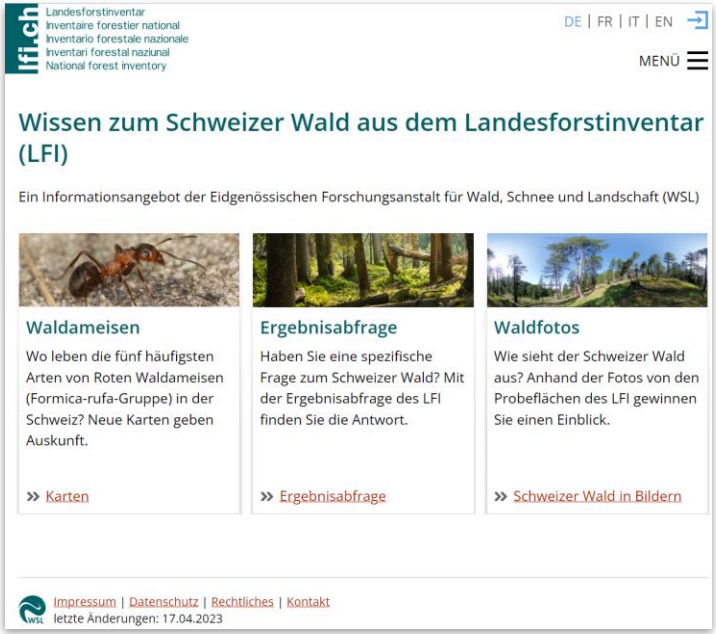
Landschaftsbeobachtung Schweiz (LABES)



- Stichprobenflächen

- Flächendeckend
- swissTLM^{3D}
- Aktuell

Raum-Monitoring



Gletscher als «Botschafter des Klimawandels»

Lange Datenreihen sind entscheidend für das Prozessverständnis und die Dokumentation.

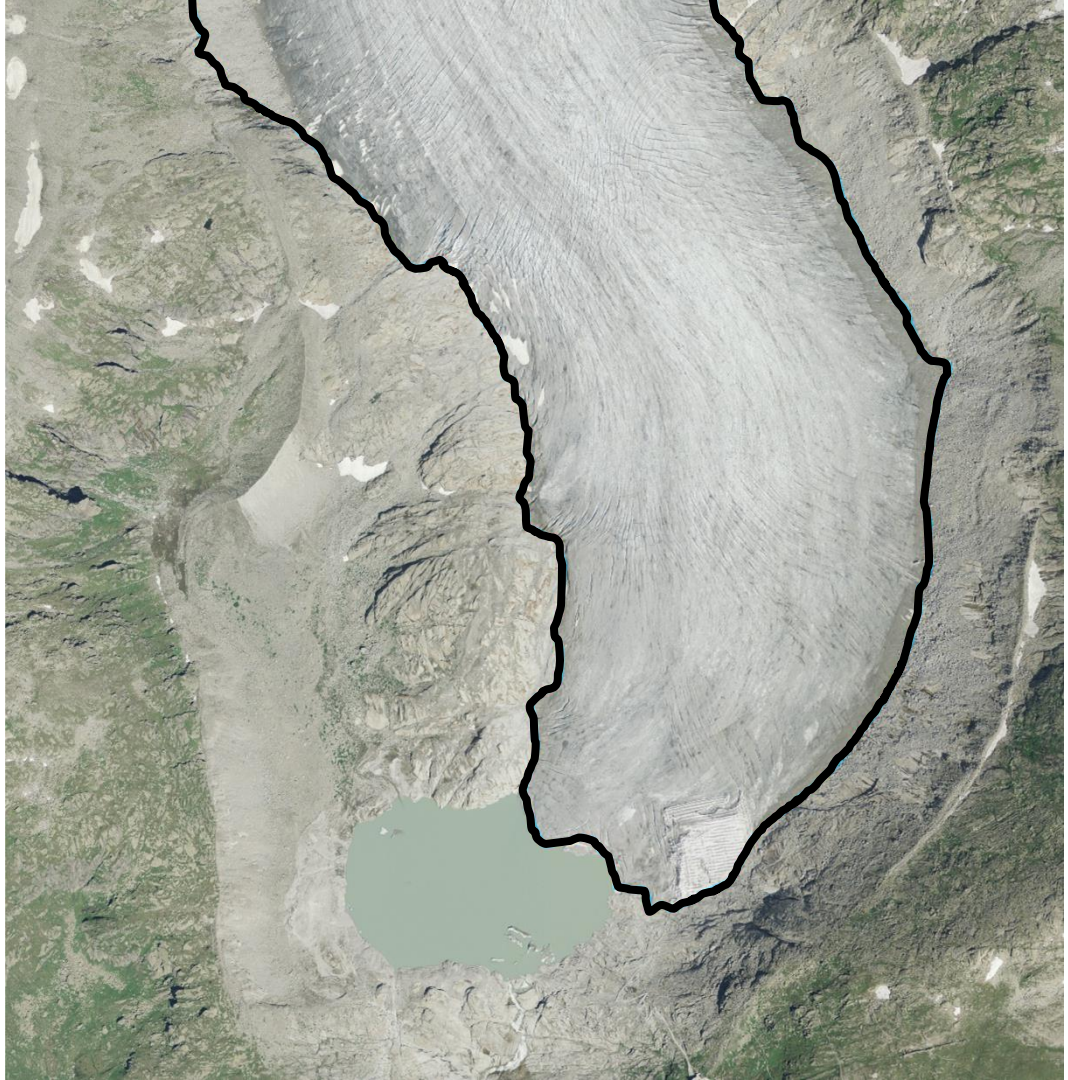
Relevanz von 3D-Geodaten zur Analyse von Klimafolgen

Rhonegletscher

Fläche:
14.64 km^2 (2016)

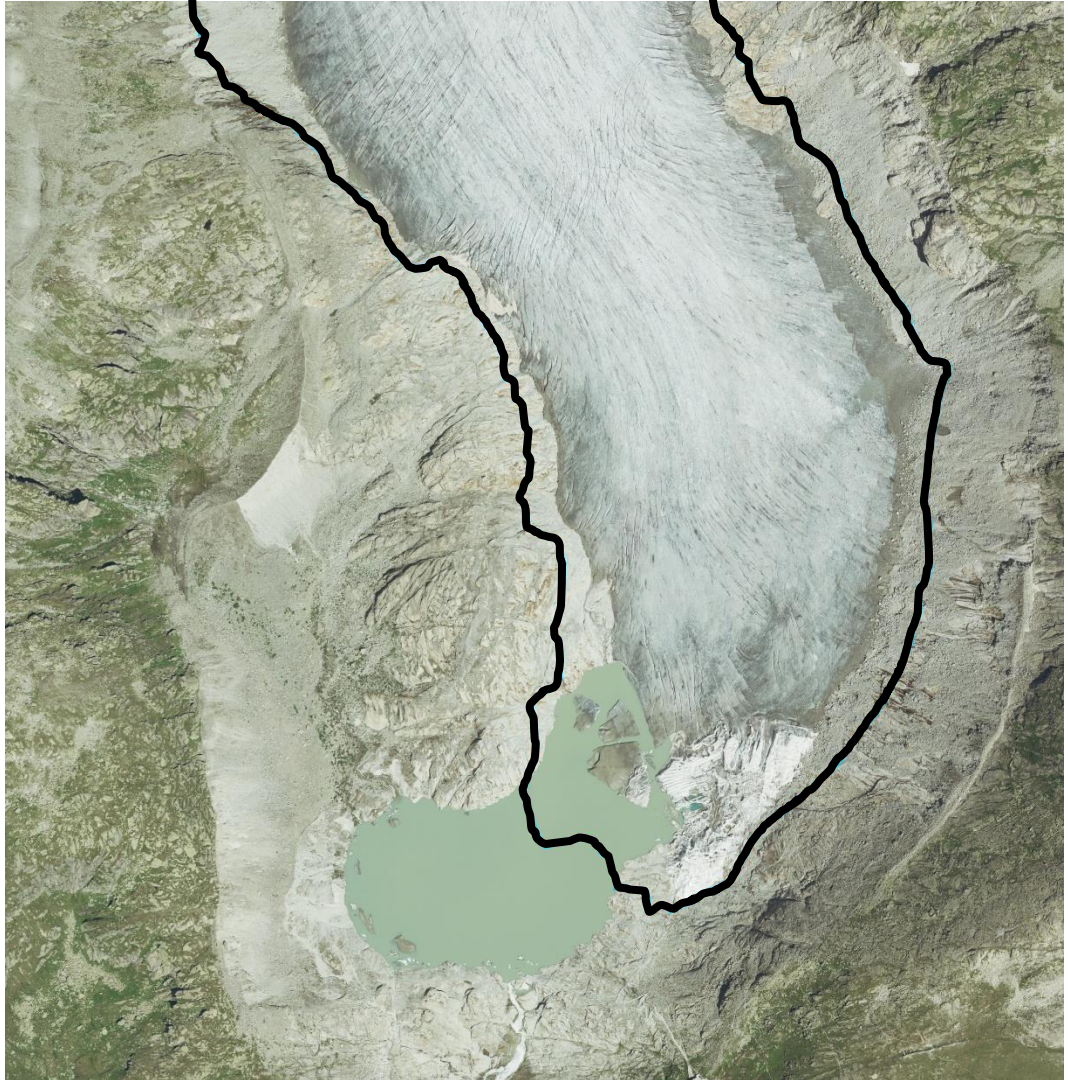
Längenänderung:
-2653 m (1879-2021)

Höhe:
2210-3621 m



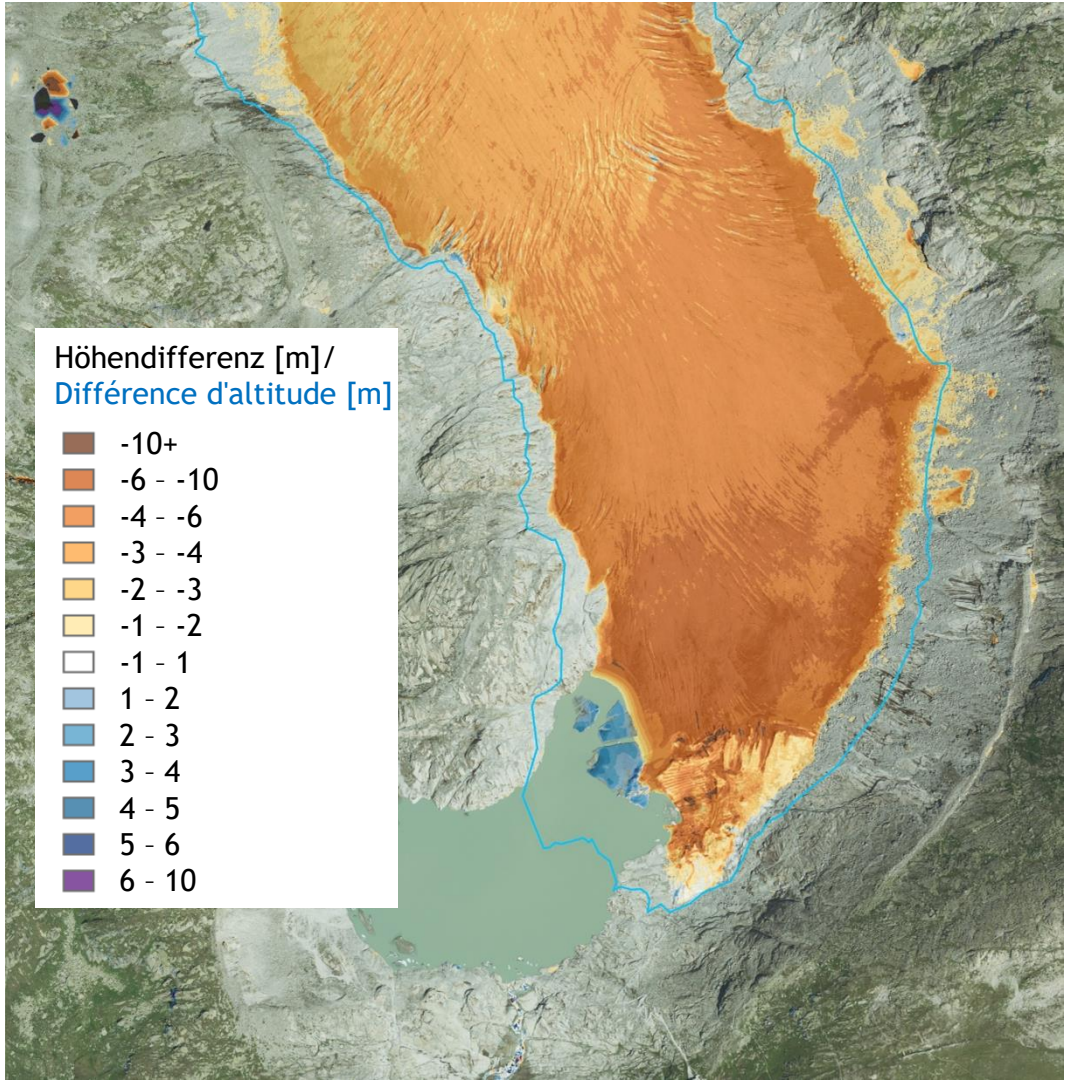
Rhonegletscher 2016

Orthofoto
→ Gletscherausdehnung TLM
→ GLAMOS



Rhonegletscher 2022

Orthofoto
→ Gletscherausdehnung TLM
→ GLAMOS

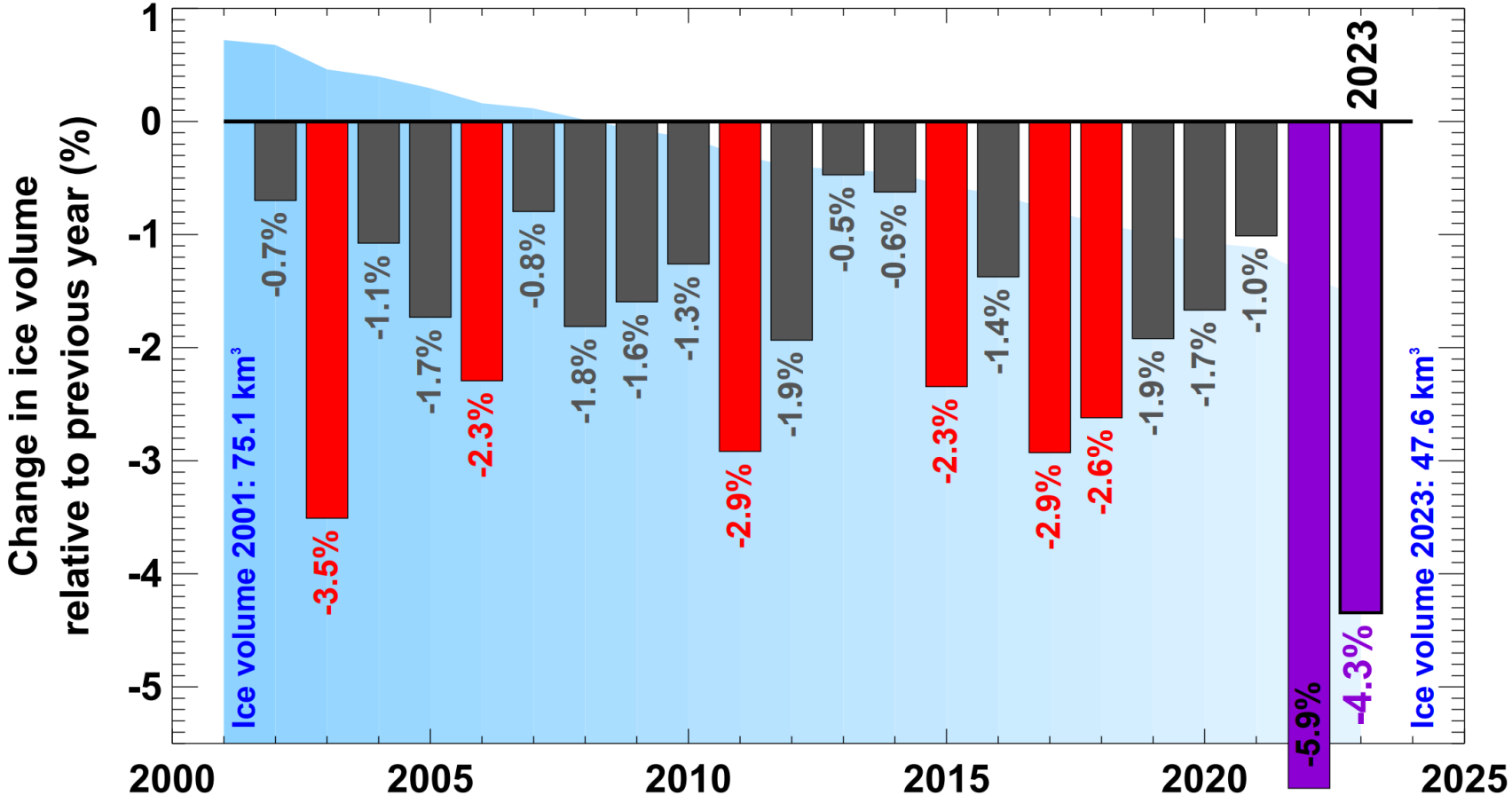


Rhonegletscher 2021-2022

Höhendifferenz →
Volumenänderung →
GLAMOS

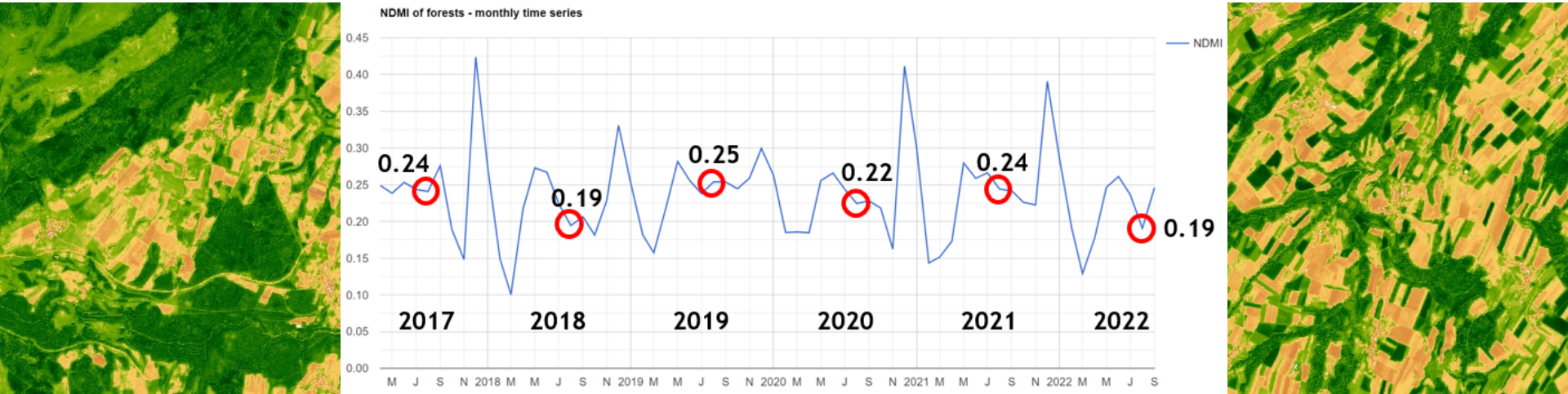
Was ist das Resultat?

GLAMOS (2023). Swiss Glacier Volume Change, release 2023, Glacier Monitoring Switzerland, doi:10.18750/volumechange.2023.r2023.



Warnung vor Trockenheit

swisstopo baut in Zusammenarbeit mit dem Bundesamt für Umwelt (BAFU) und dem Bundesamt für Meteorologie (MeteoSchweiz) eine neue **Warnkategorie für lang anhaltende Trockenheit** auf und verarbeitet dazu **Satelliten-Zeitserien**.



Bilddaten

Rapid Mapping

swisstopo

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Projekte ASTRA, BAZL…

etc.

FO BAFU, Stäbe

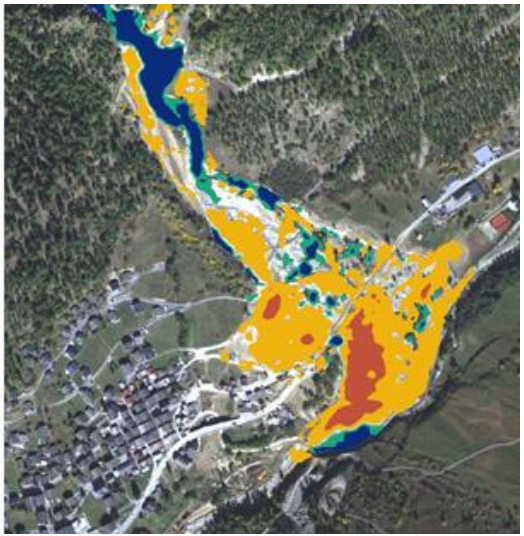
Fachanwender / OGD

Was ist Rapid Mapping?

Eine **Dienstleistung** des Bundes bei **Naturereignissen** mittels einer **zeitgerechten** Erhebung/Bereitstellung von Geodaten für die **Ereignisdokumentation** und **Ereignisbewältigung.**

Pre-Disaster

Post-Disaster



Change

Einbindung von swisstopo im Krisenfall

- Organisationseinheit «**Kriseninformation und NPOC**»
- Aufrechterhaltung eines **Bereitschaftsdienstes** 365/24/7
- Auftraggeber: FO **BAFU** und **NAZ**
- Szenarien: Grossflächige **Naturereignisse**
- Auftrag: Bereitstellung von **Geodaten**

→ *Pre-Disaster: Referenzdaten, Prävention*

→ *Post-Disasterdaten: Ereignisbewältigung und Dokumentation*

Einsatzmittel Rapid Mapping

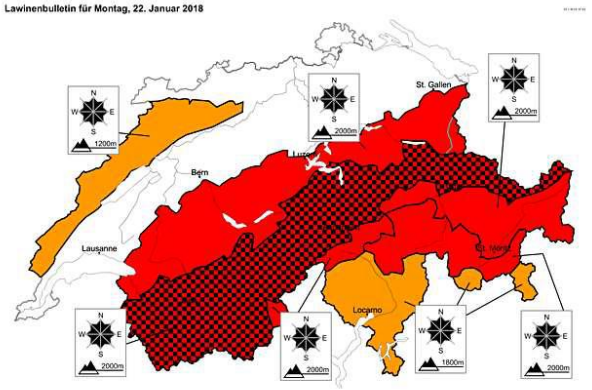
Satellitendaten
→ NPOC/International Charter Space and Major Disasters

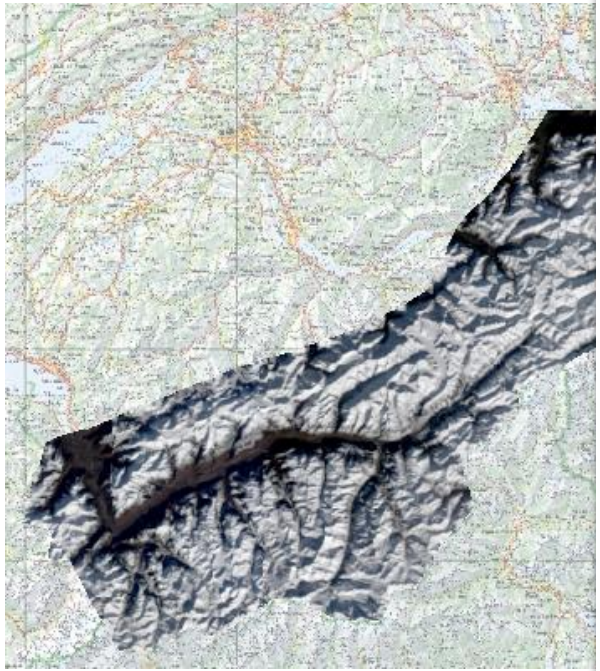
Flugzeuge: Luftbilddaten
→ Flugdienst swisstopo

Helikopter: Luftbilddaten
→ Flugdienst swisstopo

Rapid Mapping 2018: Lawinenwinter

Spot 6, 24.01.2018, 1.5 m
12’000 km² One Day Tasking
18’000 Lawinen





The Cryosphere, 13, 3225–3238, 2019
https://doi.org/10.5194/tc-13-3225-2019

The Cryosphere
EGU
Open Access

Where are the avalanches? Rapid SPOT6 satellite data acquisition to map an extreme avalanche period over the Swiss Alps

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[2]Federal Office of Topography swisstopo, Wabern, 3084, Switzerland
*These authors contributed equally to this work.

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Received: 24 May 2019 – Discussion started: 27 June 2019
Revised: 24 September 2019 – Accepted: 24 October 2019 – Published: 4 December 2019

Abstract. Accurate and timely information on avalanche occurrence is key for avalanche warning, crisis management and avalanche documentation. Today such information is mainly available at isolated locations provided by observers in the field. The achieved reliability, considering accuracy, completeness and reliability of the reported avalanche events, is limited. In this study we present the spatially continuous mapping of a large avalanche period in January 2018 covering the majority of the Swiss Alps (12 500 km²).

We tested different satellite sensors available for rapid mapping during the first avalanche period. Based on these experiences, we tasked SPOT6 and SPOT7 for data acquisition to cover the second, much larger avalanche period. We manually mapped the outlines of 18 737 individual avalanche events, applying image enhancement techniques to analyze regions in the shade as well as in brightly illuminated ones. The resulting dataset of mapped avalanche outlines, having unique completeness and reliability, is evaluated to produce maps of avalanche occurrence and avalanche size. We validated the mapping of the avalanche outlines using photographs acquired from helicopters just after the avalanche period.

This study demonstrates the applicability of optical, very high spatial resolution satellite data to map an exceptional avalanche period with very high completeness, accuracy and reliability over a large region. The generated avalanche data are of great value in validating avalanche bulletins, in completing existing avalanche databases and for research applications by enabling meaningful statistics on important avalanche parameters.

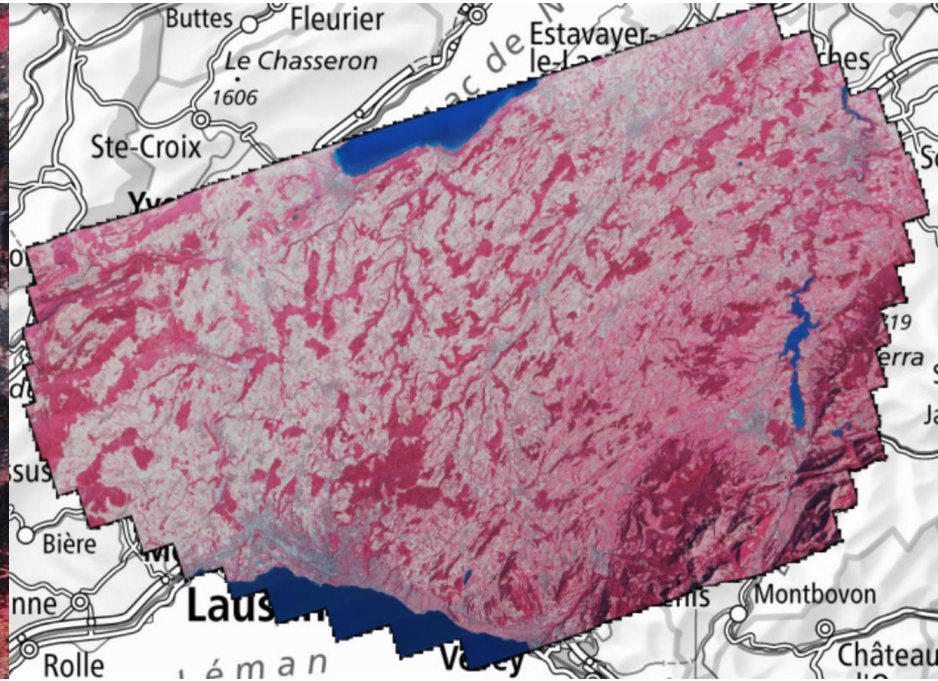
1 Introduction

Information on the occurrence and runout of snow avalanches is a key parameter for the development of effective hazard mitigation approaches for settlements and traffic infrastructure (Rudolf-Miklau et al., 2014; Bühler et al., 2018). Evidence of the locations and dimensions of avalanches is applied in hazard zone mapping for the evaluation of protection measures and for the validation and further development of numerical avalanche simulation software such as SAMOS (Sampl and Zwinger, 2004) or RAMMS (Christen et al., 2010). Therefore, the number, size and release depth of avalanches with accurate location information are most important. For avalanche warning, comprehensive information on avalanche activity is important for the evaluation of the avalanche bulletin, the European avalanche danger scale (Meister, 1994) and further developments of avalanche danger assessment tools such as the matrix of the European Avalanche Warning Services (EAWS; Müller et al., 2016) or the conceptual model of avalanche hazard (Statham et al., 2017). Even though such information is of very high value for different applications, it is not available today with satisfactory completeness and quality.

Currently, avalanche occurrences are usually only reported if they cause obstructions to public infrastructure, damage to personal property or are witnessed by local observers. In Switzerland all avalanches reported to the WSL Institute for Snow and Avalanche Research SLF that involve people or caused damage to property are stored in a database (Techel et al., 2015). Avalanches artificially released in ski resorts are often well documented, mainly for avalanche danger estimation, with nearest-neighbor models (Gassner et al.,

Rapid Mapping 2022: Waldbrand / Trockenheit

09.02.2022, 10 cm, Monte Gambarogno



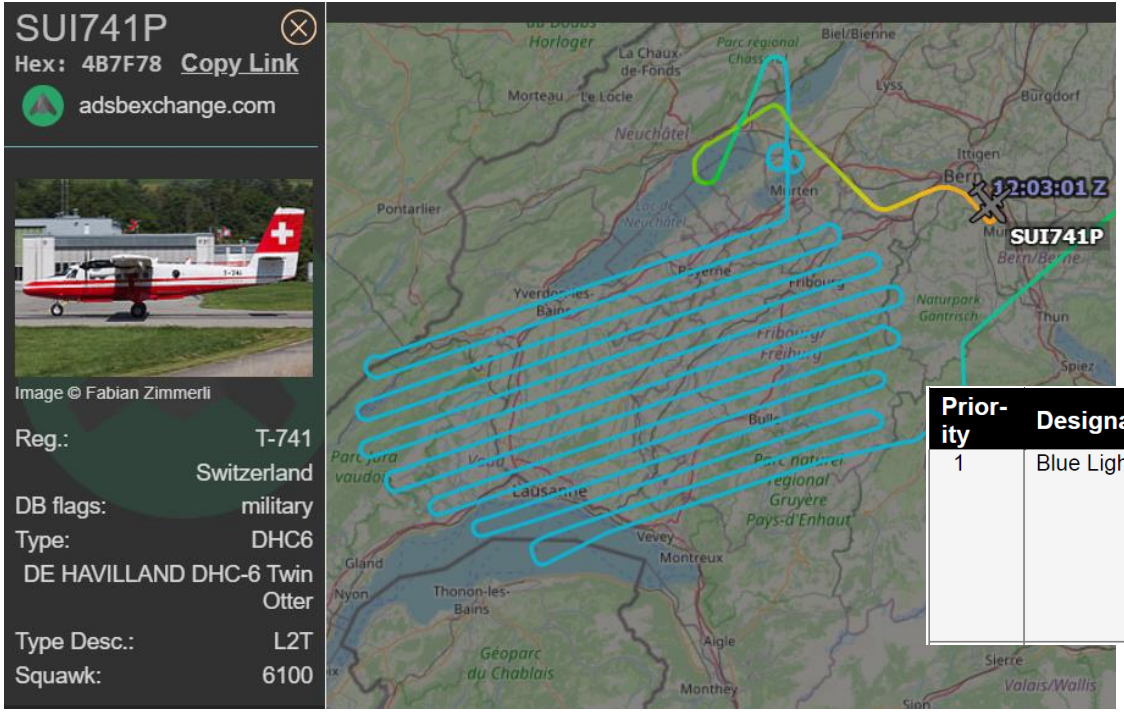
13.08.2022, 25 cm, 2’360 km^2

Rapid Mapping 2017: Bergsturz

23.08.2017,
Bergsturz
Bondo


Bondo
© swisstopo

Blaulichtpriorität im Luftraum



Nach intensiven Verhandlungen mit dem Bundesamt für Zivilluftfahrt (BAZL): Höchste Priorität fürs Rapid Mapping.

Priority	Designation	Description
1	Blue Light	• MIL (Air Defense OPS) = Hot Missions • Air Transport and Air Reconnaissance OPS such as Police, Border Protection, SAR etc. requiring the highest priority • Disaster Mapping flights executed by swisstopo • Emergency medical flights (according to the definition in Doc 4444 – PANS ATM)

Die Landesvermessung als integraler Bestandteil der Umweltbeobachtung Schweiz