

Analysis and mapping of natural hazards using common photography

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Short history:

2010 At WSL start of the monoplottting project with the aim of developing a user friendly software to do 3D cartography with oblique photographs.

2011 WSL Monoplottting Tool version 1.x

2017 WSL Monoplottting Tool version 2.x

wsl.ch/monoplottting 

2023 image2world versione 3.x

i2w.ch 

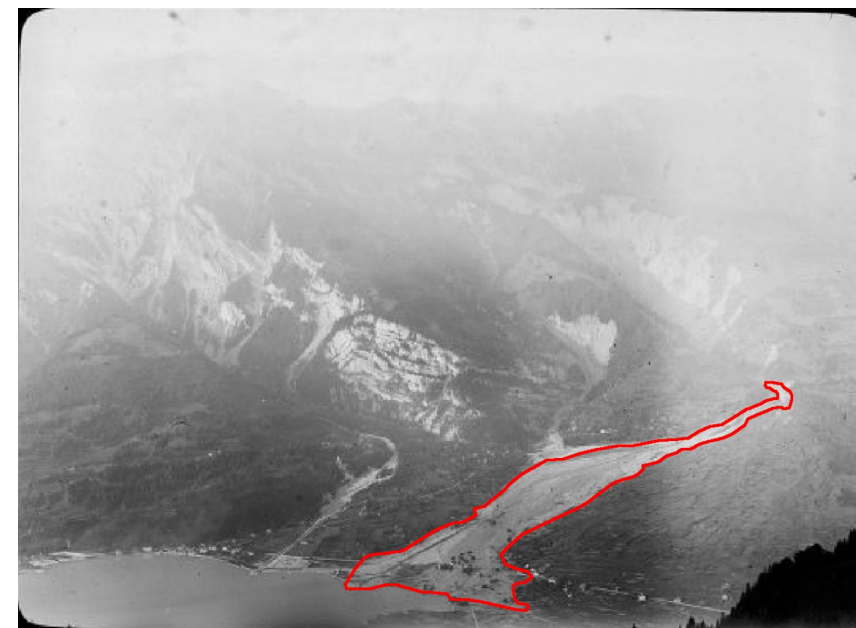
Landslide in Brienz/Schwanden (Canton Bern, Switzerland, 1896)

Situation:

- May 26: 300,000 m³ landslide created natural dam
- May 31: dam breach with first major debris flow
- June 12: second debris flow

Cartography of the area affected by debris flows:

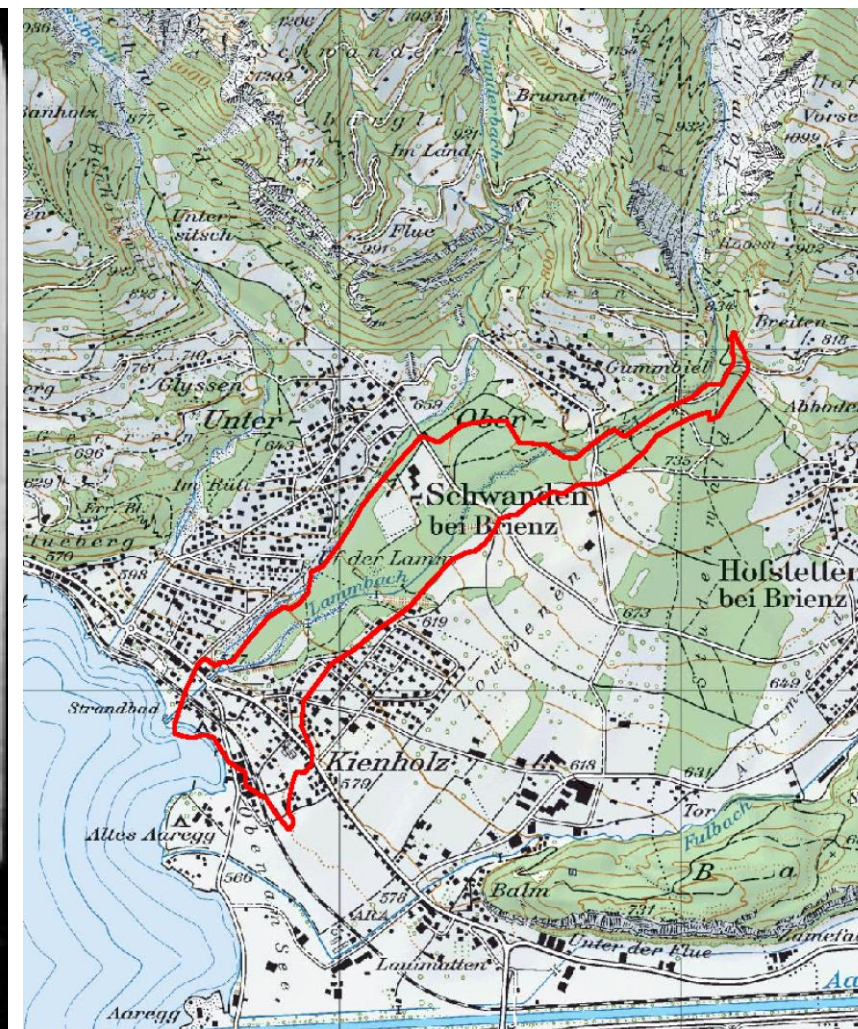
- Rough estimate based on existing event descriptions
- Precise cartography by georeferencing an ETH Library image



Landslide in Brienz/Schwanden (Canton Bern, Switzerland, 1896)



Debris flow on the 1896 photograph (ETH Library).



Cartography of the area affected by the flow (swisstopo).

Landslide in Brienz/Schwanden (Canton Bern, Switzerland, 1896)



Debris flow on the 1896 photograph (ETH Library).



Cartography of the area affected by the flow on the 2012 orthophoto (*swisstopo*).

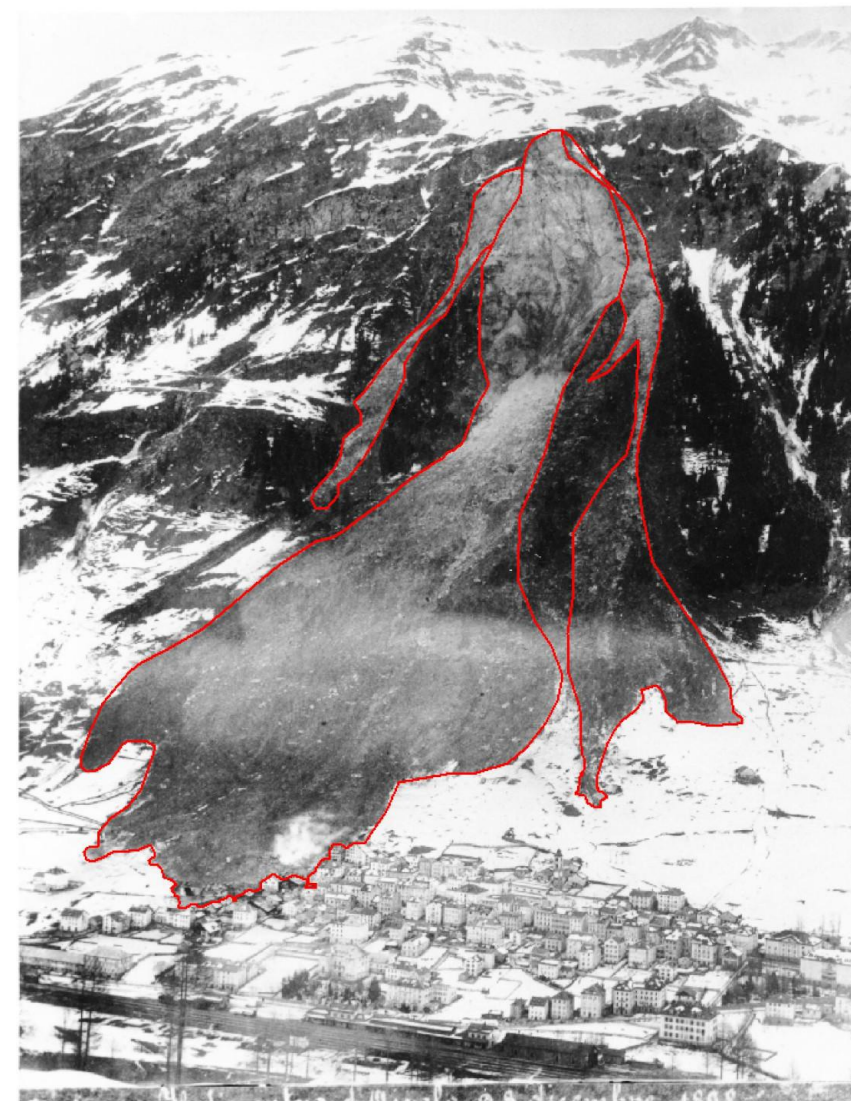
Rockslide of Sasso Rosso in Airolo - Valle Leventina (Canton Ticino, Switzerland, 1898)

Situation:

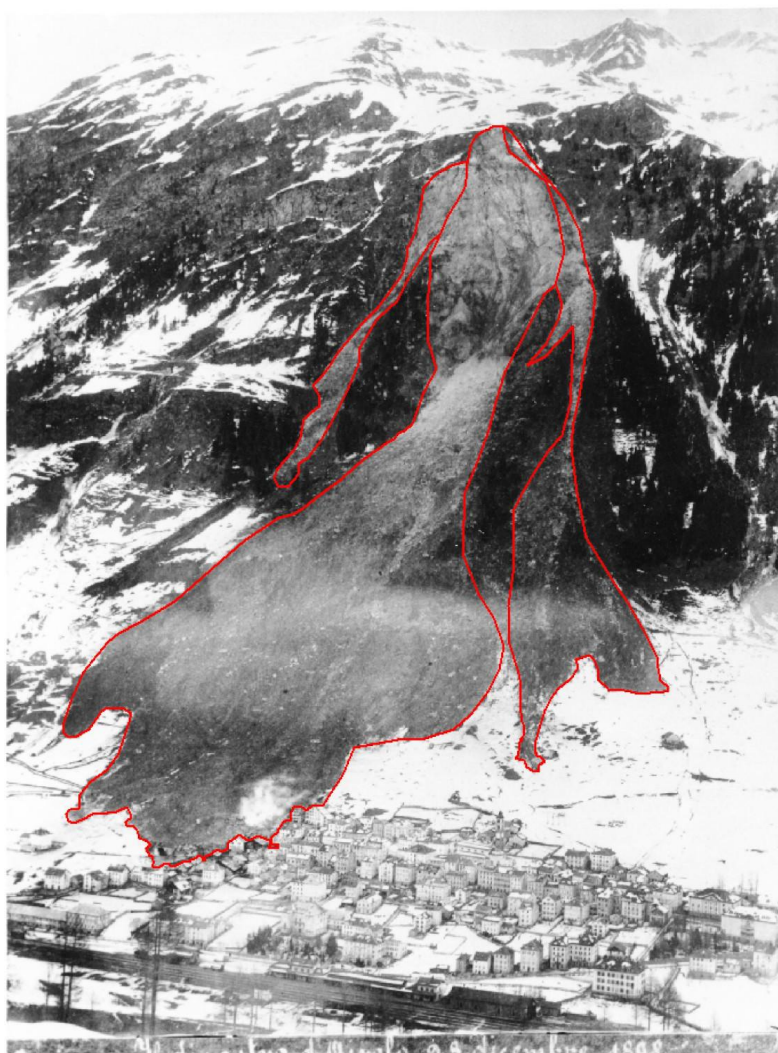
- Summer 1898: first significant slope movements
- December 1988: three slides of increasing size
- December 27: more slides with a total volume of 500,000 m³

Cartography of the area affected by debris flows:

- Precise cartography by georeferencing images of the event
- The affected area of debris covered about 425,000 m²



Rockslide of Sasso Rosso in Airolo - Valle Leventina (Canton Ticino, Switzerland, 1898)

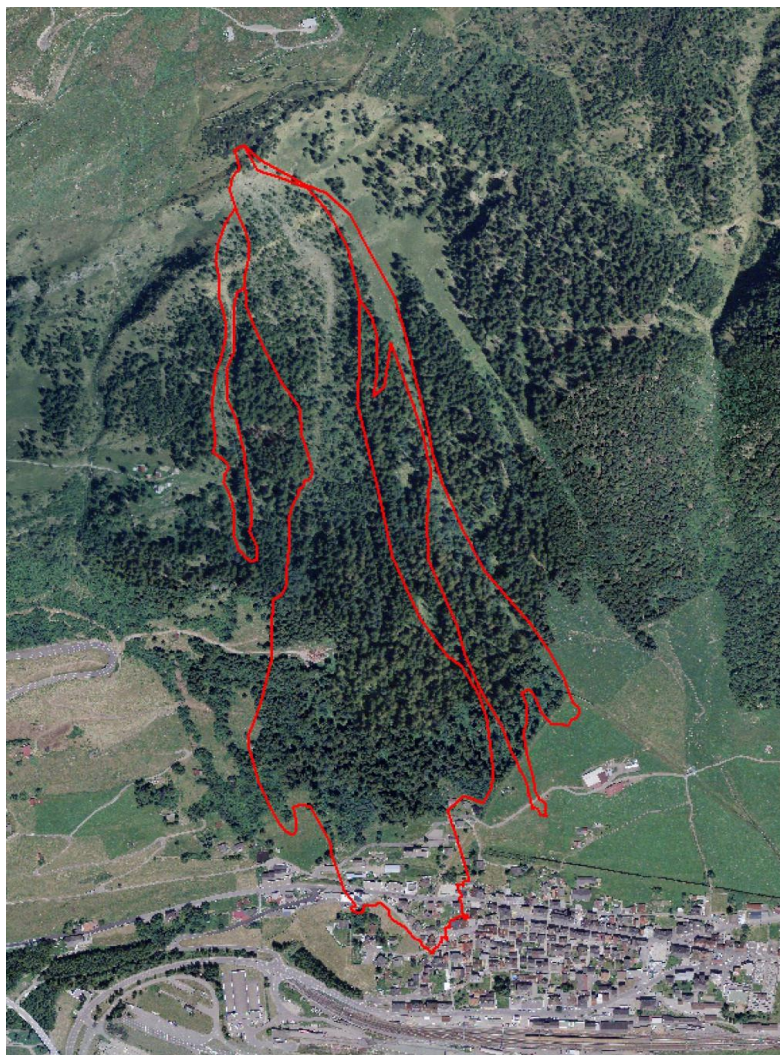


Complete photograph of the rockslide.



Partial photograph on the rockslide area.

Rockslide of Sasso Rosso in Airolo - Valle Leventina (Canton Ticino, Switzerland, 1898)



Cartography of the area affected by the flow (*swisstopo*).



Projection of the rockslide perimeter on an oblique terrestrial image of the area prior to the event.

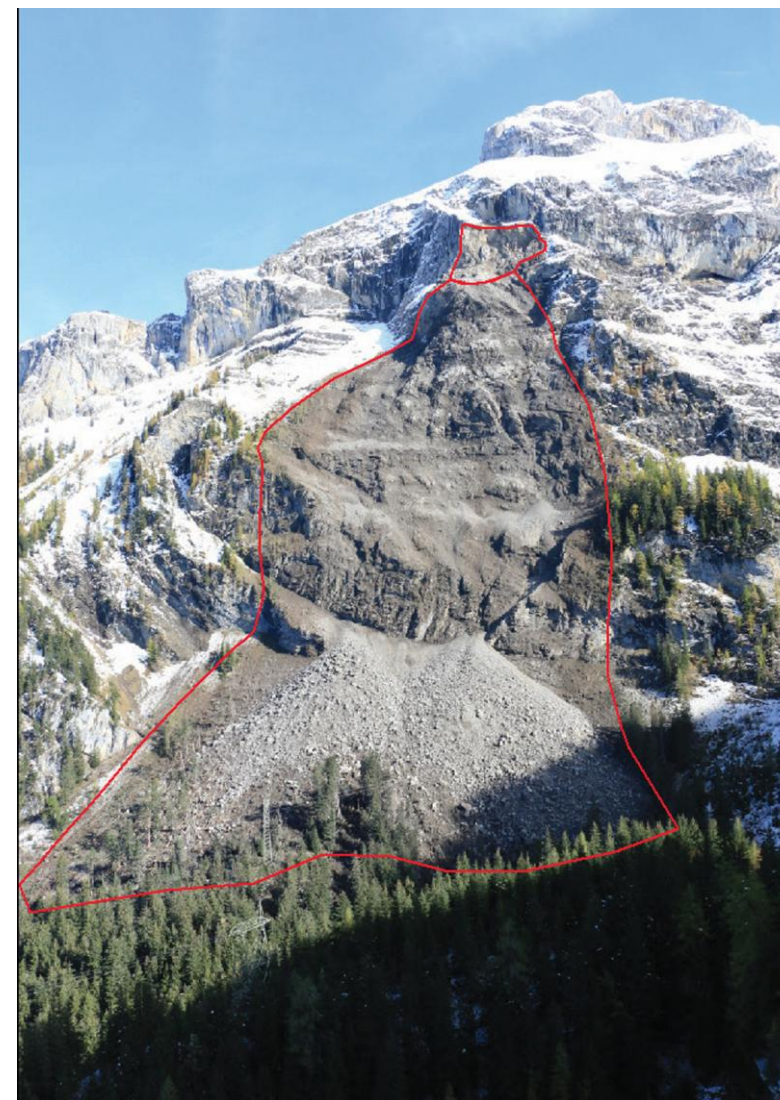
Rockslide of Spitzhorn in Gstaad (Canton Bern, Switzerland, 2017)

Situation:

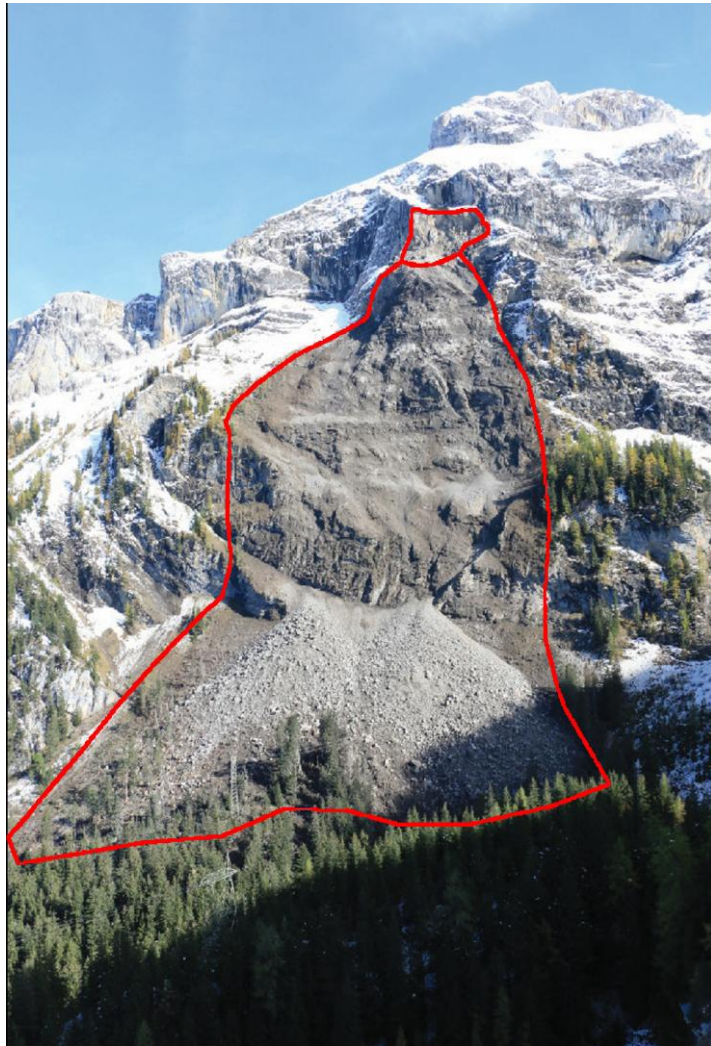
- October 2017: minor slides followed by a single main rockfalls
- Total volume of 50,000 m³

Cartography of the area affected by debris flows:

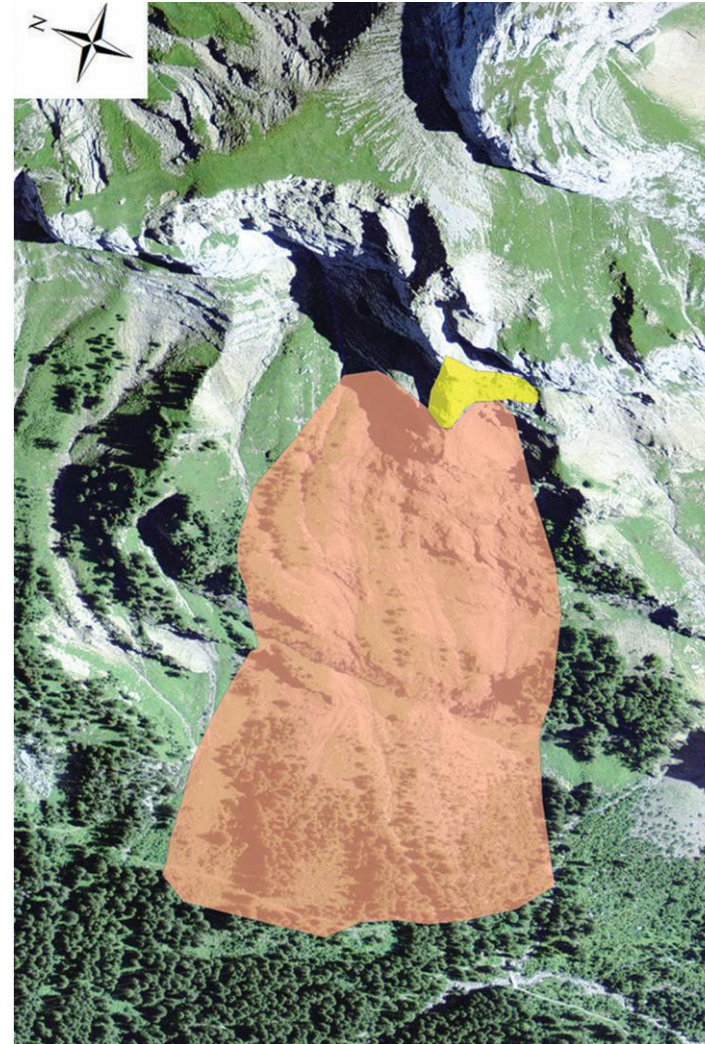
- Precise cartography by georeferencing images of the event
- Identification of the detachment and the transit/deposit zone



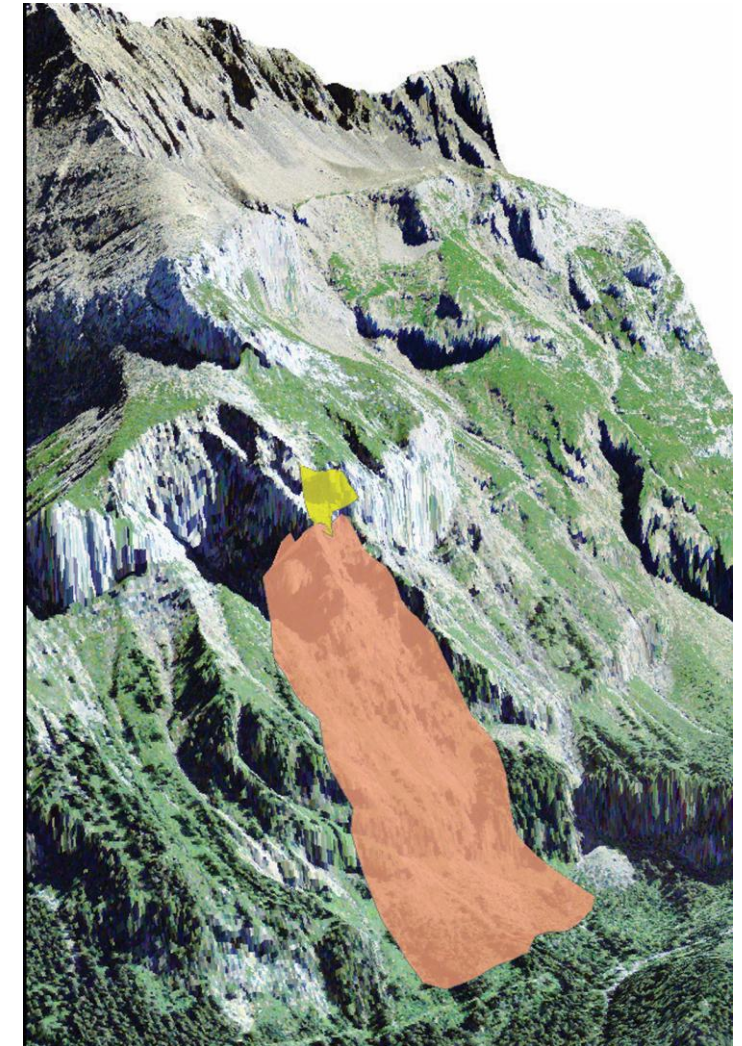
Rockslide of Spitzhorn in Gstaad (Canton Bern, Switzerland, 2017)



Digitalization of the detachment and transit/deposit zone on the original oblique image.



Projection of the detachment (yellow) and transit/deposit (orange) zone on the 2017 orthophoto (*swisstopo*).



Projection and 3D viewing of the digitalized zones in ESRI ArcScene.

Snow Bridges in Adelboden (Canton Bern, Switzerland, 2018)

Situation:

- January 24: helicopter mission after end of heavy snowfall
- Detection of partial blanketing of the snow bridges
- Reduced protective function

Cartography of the area:

- Precise cartography of the visible parts of the snow bridges
- Comparison with existing cartography
- Identification of covered parts of snow bridges

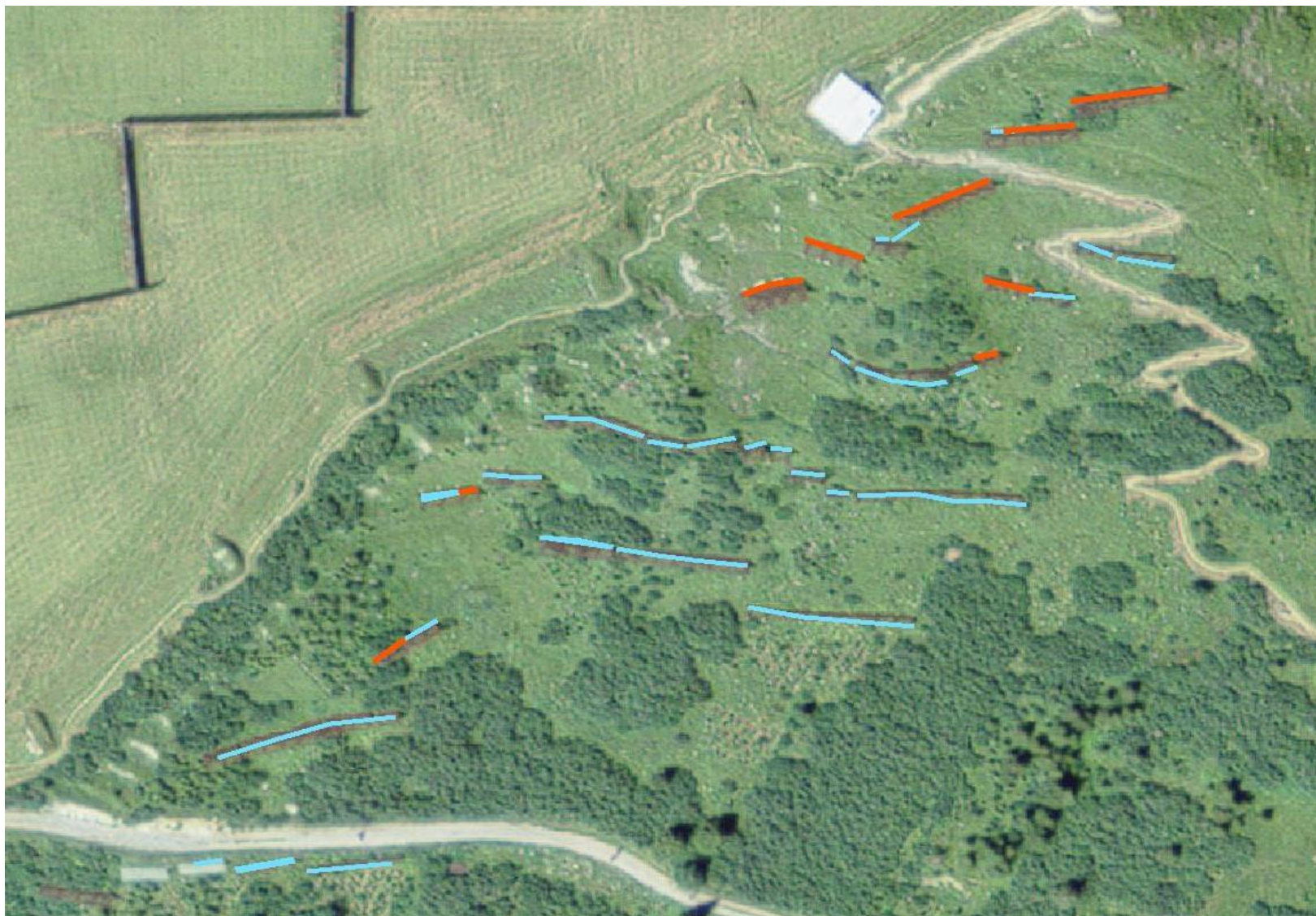


Snow Bridges in Adelboden (Canton Bern, Switzerland, 2018)



Partial blanketing of the snow bridges, documented during a helicopter mission on January 24, 2018.

Snow Bridges in Adelboden (Canton Bern, Switzerland, 2018)



Mapping the visible parts of the bridges (blue) made it possible to identify the parts covered by snowfall (red), which could potentially fail in their protective function.

Flood in Fontana - Valle Maggia (Canton Ticino, Switzerland, 2024)

Situation:

- June 29-30: violent thunderstorm
- Precipitation up to 200/250 mm
- Unprecedented landslides and flooding
- June 30: publication of individual NADIR photos by *swisstopo*

Cartography of the area (test):

- *image2world* orthorectification of a *swisstopo* NADIR photo
- Immediate (1/2 hour) and precise (accuracy < 1m) result



Flood in Fontana - Valle Maggia (Canton Ticino, Switzerland, 2024)



Orthophoto of 2021 (*swisstopo*).



Orthorectification by *image2world* of a *swisstopo* NADIR image immediately after the event (June 30, 2024).



RIMMA2025 - 28 - 31 January 2025, University of Bern

Features of *image2world*

Images:

- Historical or current landscape photos
- Terrestrial or aerial photos
- Oblique or NADIR photos

Features:

- Georeferencing oblique photos
- Orthorectification of NADIR photos (*Rapid Mapping*)
- Digitizing 3D objects directly on the photo
- Native *ESRI Shapefile* support



[Rapid Mapping](#) – [Orthorectification](#) – [Rephotography](#) – [Natural hazards](#) – [Landscape study](#) – [Toponymy research](#)

Since its invention in the first half of the nineteenth century, photography has assumed a leading role as a means for documenting the real world.

Thanks to the monophotogrammetry *image2world* allows historical or current, terrestrial or aerial photographs to be used for the quantitative study of the landscape in a wide range of areas.

Some research in the main fields of application are presented in the following examples.

Rapid Mapping

Orthorectification can contribute relatively quickly to the geolocation and reconstruction of event dynamics, and thus also to the organization of search and rescue operations.

Fontana – 2024

During the night from Saturday 29 to Sunday 30 June 2024, a violent thunderstorm swept through the upper Maggia Valley, in the Swiss Alps of Ticino. Precipitation exceeded 120 mm, locally 200 mm, with the epicenter in Bignasco, where 250 mm were recorded. In about one hour, as much water fell locally as normally falls in the whole month of June.

This storm combined with the river already swollen by the late spring snowmelt and the heavy rains of recent weeks, and the saturated soils that no longer allow infiltration, caused unprecedented landslides and flooding throughout the upper Maggia Valley, leaving devastation in its wake.

image2world georeferenced the landslide by orthorectifying a *swisstopo* photograph taken immediately after the event. The impressive image shows how the landscape has radically changed. The systematic documentation and recording of these events is a very effective way to better understand the phenomena, improving the institutional infrastructure and preventing future damage.

The comparison of before and after the event gives a detailed overview of the catastrophe.



The landslide in Fontana in Val Bavona (Ticino, Switzerland): orthorectification of an aerial photograph taken by *swisstopo* immediately after the event superimposed on *swisstopo*'s 2021 orthophoto.

Working with *image2world*

1. Purchase software:

- Buy the software *image2world Std / Pro*
- Learn how to use the software
- Agreement required for institutional or commercial use

2. Purchase services:

- Download the free version *image2world Lite*
- Request one of the service offered:
 - Georeferencing
 - Orthorectification
 - Reprojection
- Just use it

3. Purchase support or training:

- Email, online or onsite

The screenshot shows the image2world website interface. At the top right, there are icons for a shopping cart, email, user profile, and a language selector (currently set to Italian). The main navigation bar includes 'Software', 'Services', and 'Assistance'. Below this, the 'Software' section is highlighted. The text states that prices are for non-profit personal use and that professional/commercial users should contact the company. A 'Technical requirements' section lists: Windows 10 or higher (64-bit), mid-to-high-end processor, 8 GB RAM, HD display, and sufficient disk space. The pricing table is as follows:

Version 3.0.5			Price			
			Student		Regular	
	<i>image2world</i>	Lite	-	-	-	
	<i>image2world</i>	Std	100 CHF		200 CHF	
	<i>image2world</i>	Pro	200 CHF		500 CHF	
<i>Commercial and institutional use</i>						
	<i>image2world</i>		Contact us			

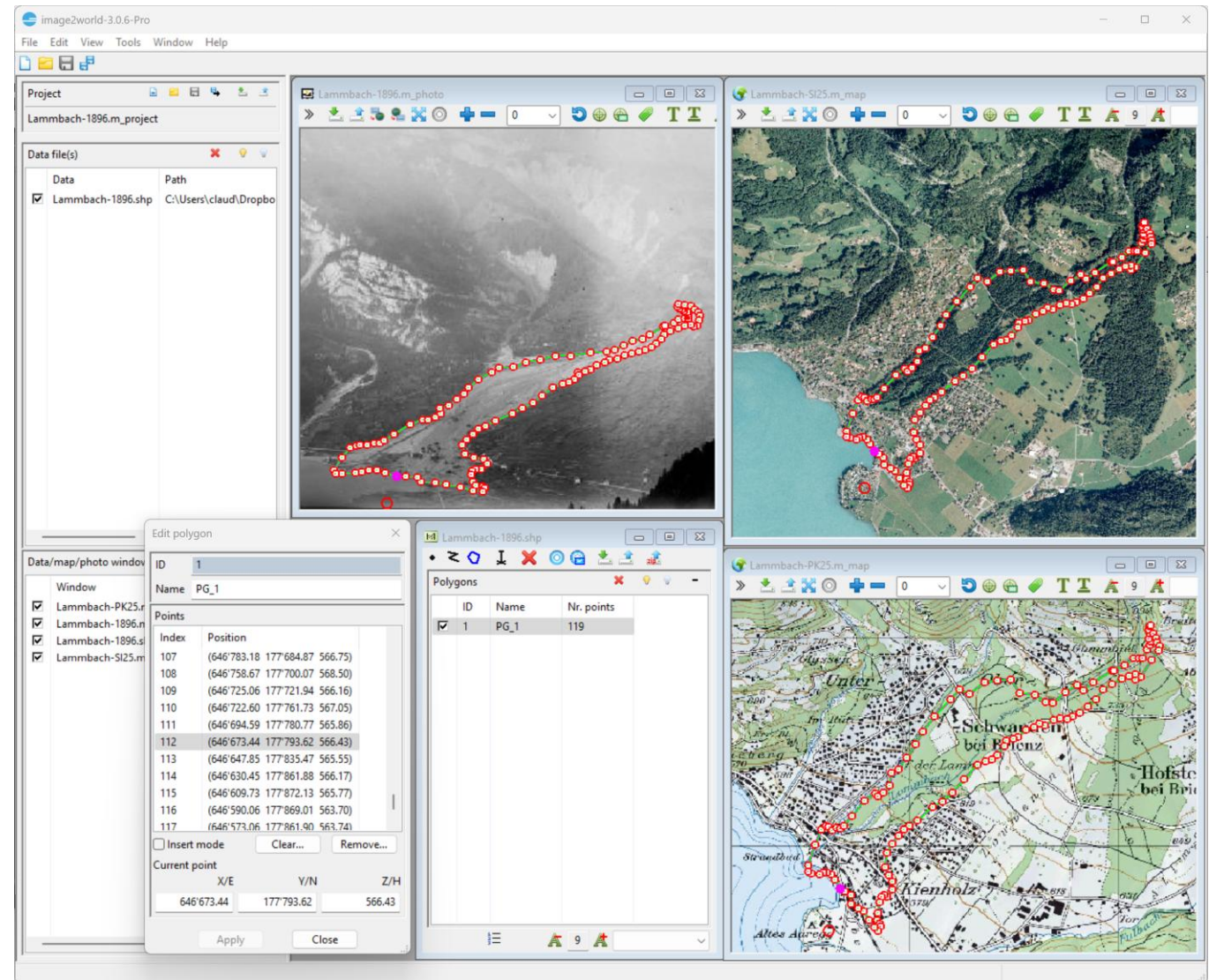
image2world:

easy,

cheap,

effective

way to do 3D cartography!



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image2world GmbH – i2w.ch

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Thank you!

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