Dealing with uncertainties in avalanche modeling: a practitioner's perspective

Martin Proksch*, Pascal Venetz, Damian Steffen, André Burkard

geoformer igp AG, Brig, Valais, Switzerland

IMC 2019 Innsbruck, 11.09.2019

Foto: Willy Werlen

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A practitioner's perspective

Avalanche consulting:

- ✓ for highways, railways, construction sites, government, private entities, etc.
- ✓ Interpretation of model (chain) results
- ✓ Dealing with uncertainty

Practical constrains (time + budget):

- ➢ Expert judgement
- ➢ No probabilistic approaches
- ➢ Follow the guidelines

The clients constrains:

- ○ No expensive solutions (very often)

Foto: Willy Werlen

A practitioner’s perspective

Practical constrains:

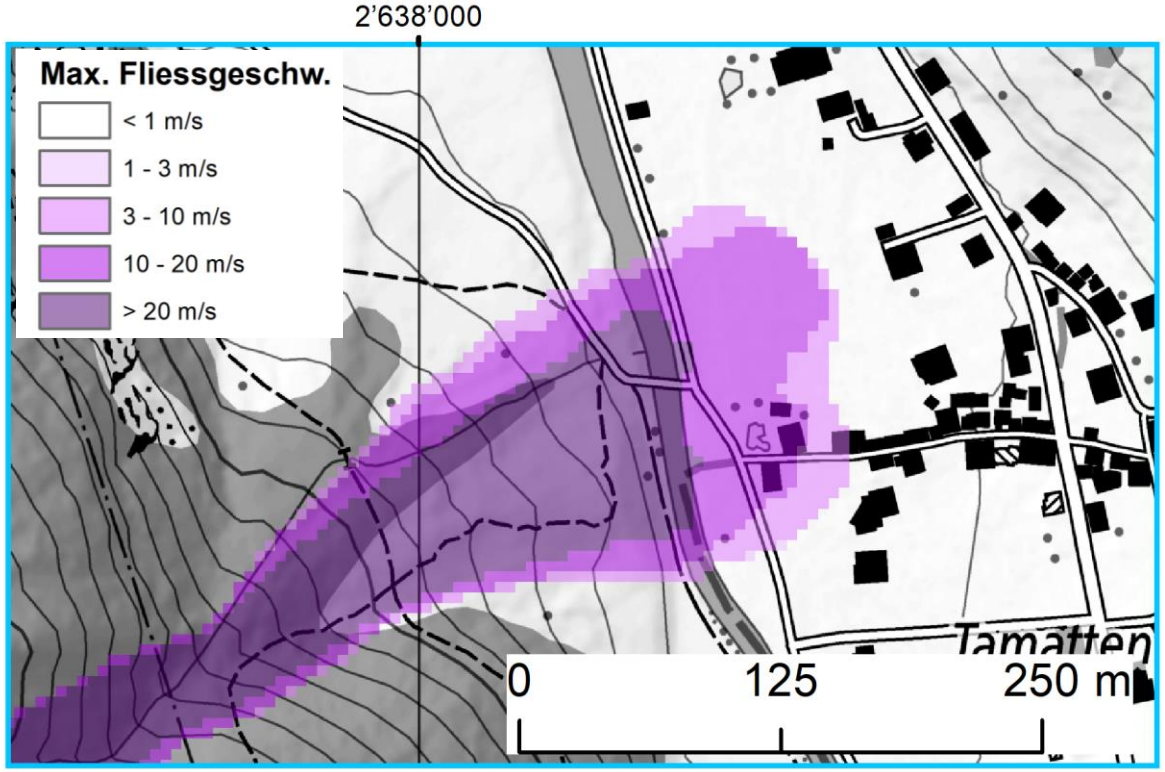
- ***Expert judgement***

A practitioner’s perspective

Practical constrains:

- ***Expert judgement***

Model:

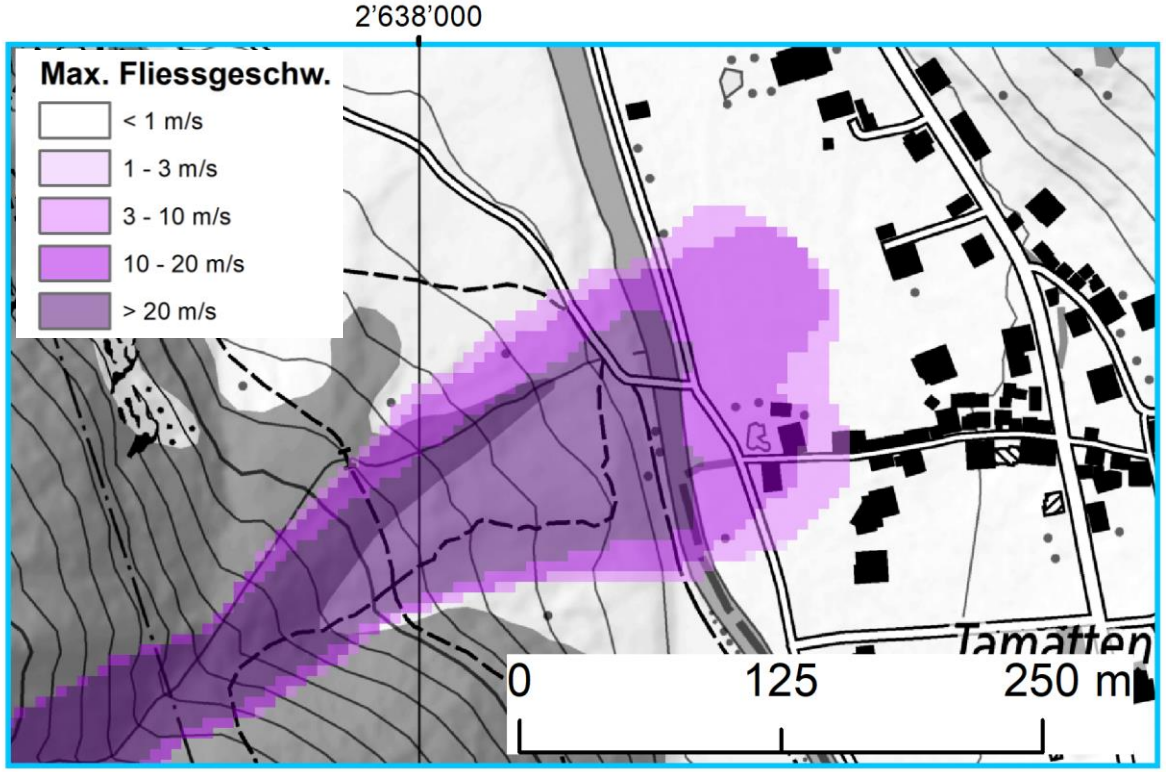


A practitioner's perspective

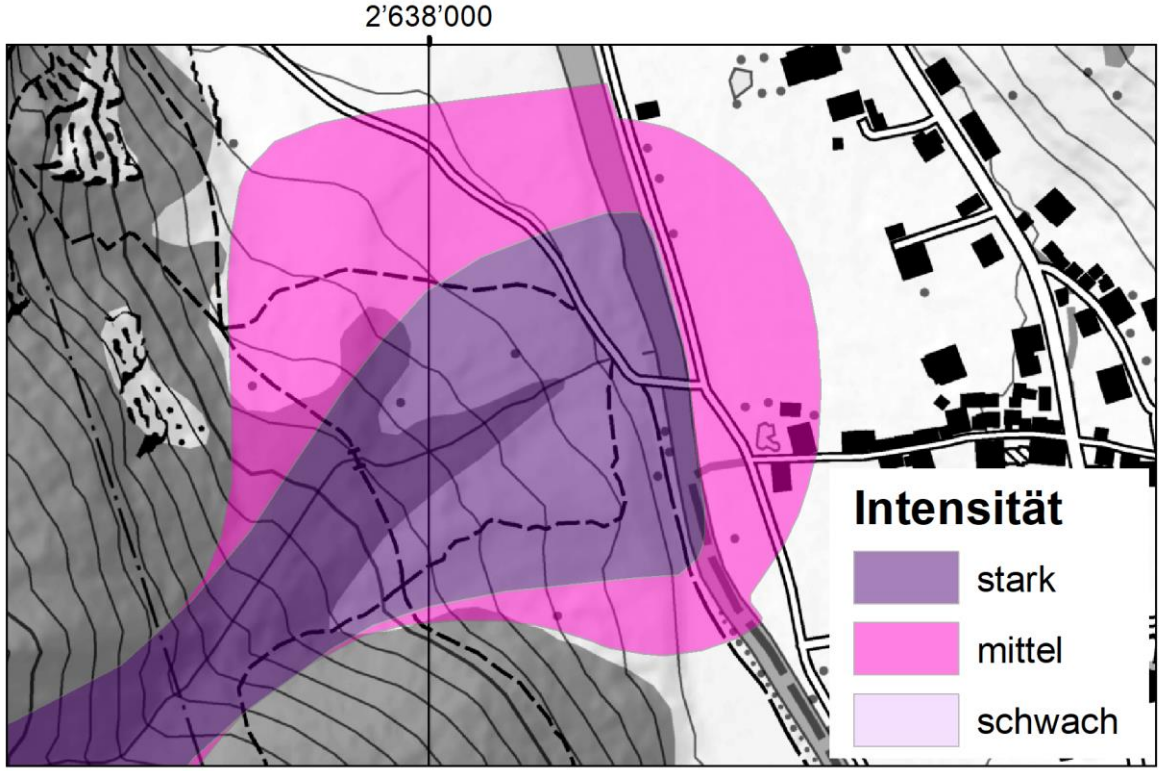
Practical constrains:

- ***Expert judgement***

Model:



Result (Intensity):



A practitioner’s perspective

The clients constrains:

- ***Expensive solutions?***

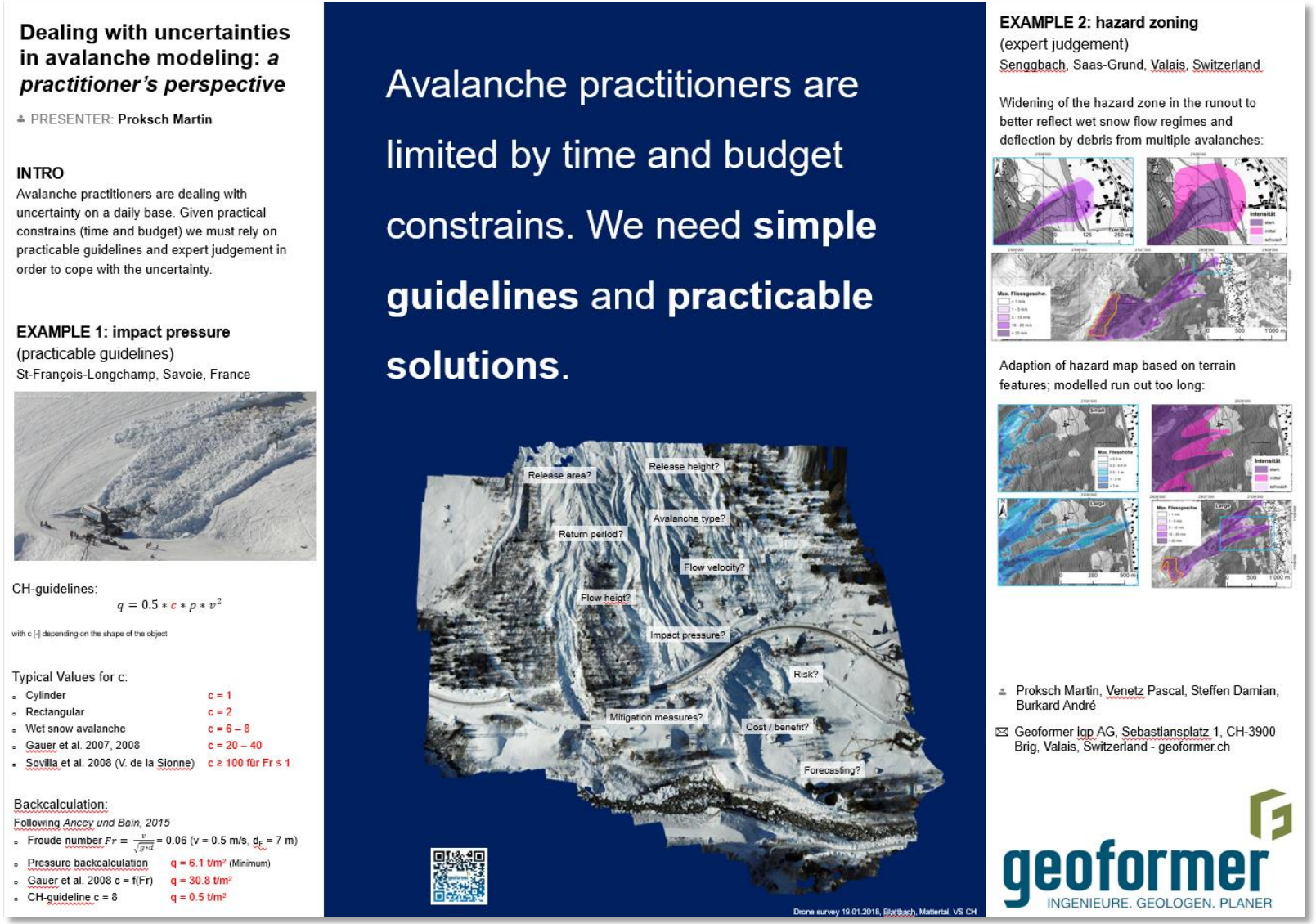
A practitioner’s perspective

The clients constrains:

- ***Expensive solutions?***

A practitioner's perspective – Poster!

Today, 15:15



Dealing with uncertainties in avalanche modeling: *a practitioner's perspective*

PRESENTER: **Proksch Martin**

INTRO

Avalanche practitioners are dealing with uncertainty on a daily base. Given practical constrains (time and budget) we must rely on practicable guidelines and expert judgement in order to cope with the uncertainty.

EXAMPLE 1: impact pressure
(practicable guidelines)
St-François-Longchamp, Savoie, France

CH-guidelines:

$$q = 0.5 * c * \rho * v^2$$

with c [-] depending on the shape of the object

Typical Values for c:

- Cylinder c = 1
- Rectangular c = 2
- Wet snow avalanche c = 6 – 8
- Gauer et al. 2007, 2008 c = 20 – 40
- Sovilla et al. 2008 (V. de la Sionne) c ≥ 100 für Fr ≤ 1

Backcalculation:

Following *Ancey und Bain, 2015*

- Froude number $Fr = \frac{v}{\sqrt{g*d}}$ = 0.06 (v = 0.5 m/s, d_p = 7 m)
- Pressure backcalculation q = 6.1 t/m² (Minimum)
- Gauer et al. 2008 c = f(Fr) q = 30.8 t/m²
- CH-guideline c = 8 q = 0.5 t/m²

Avalanche practitioners are limited by time and budget constrains. We need **simple guidelines** and **practicable solutions**.

Release area?
Release height?
Avalanche type?
Return period?
Flow velocity?
Flow height?
Impact pressure?
Risk?
Mitigation measures?
Cost / benefit?
Forecasting?

Drone survey 19.01.2018, Blattbach, Mattertal, VS CH

EXAMPLE 2: hazard zoning
(expert judgement)
Senggbach, Saas-Grund, Valais, Switzerland

Widening of the hazard zone in the runout to better reflect wet snow flow regimes and deflection by debris from multiple avalanches:

Adaption of hazard map based on terrain features; modelled run out too long:

Proksch Martin, Venetz Pascal, Steffen Damian, Burkard André

Geoformer igp AG, Sebastiansplatz 1, CH-3900 Brig, Valais, Switzerland - geoformer.ch

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