Susceptibility maps
# for natural hazards

Terranum

Introduction

Susceptibility maps depict at a regional scale areas that can be exposed to natural hazards. Those maps are therefore an essential tool for land-use planners to identify inhabited areas, infrastructure and communication networks potentially threatened by natural hazards.

More specifically, susceptibility maps:

– localise over an entire territory potential source and propagation areas for the different natural hazards.
– are mainly based on simple, robust and affordable numerical models.
– support cost optimization and increase efficiency for more detailed local investigations by identifying and prioritizing sectors at risk.

Our range of expertise includes landslides, shallow landslides, rockfalls, rock and snow avalanches, debris flows, but also flooding and superficial water runoff.

Benefits of our susceptibility maps for natural hazards
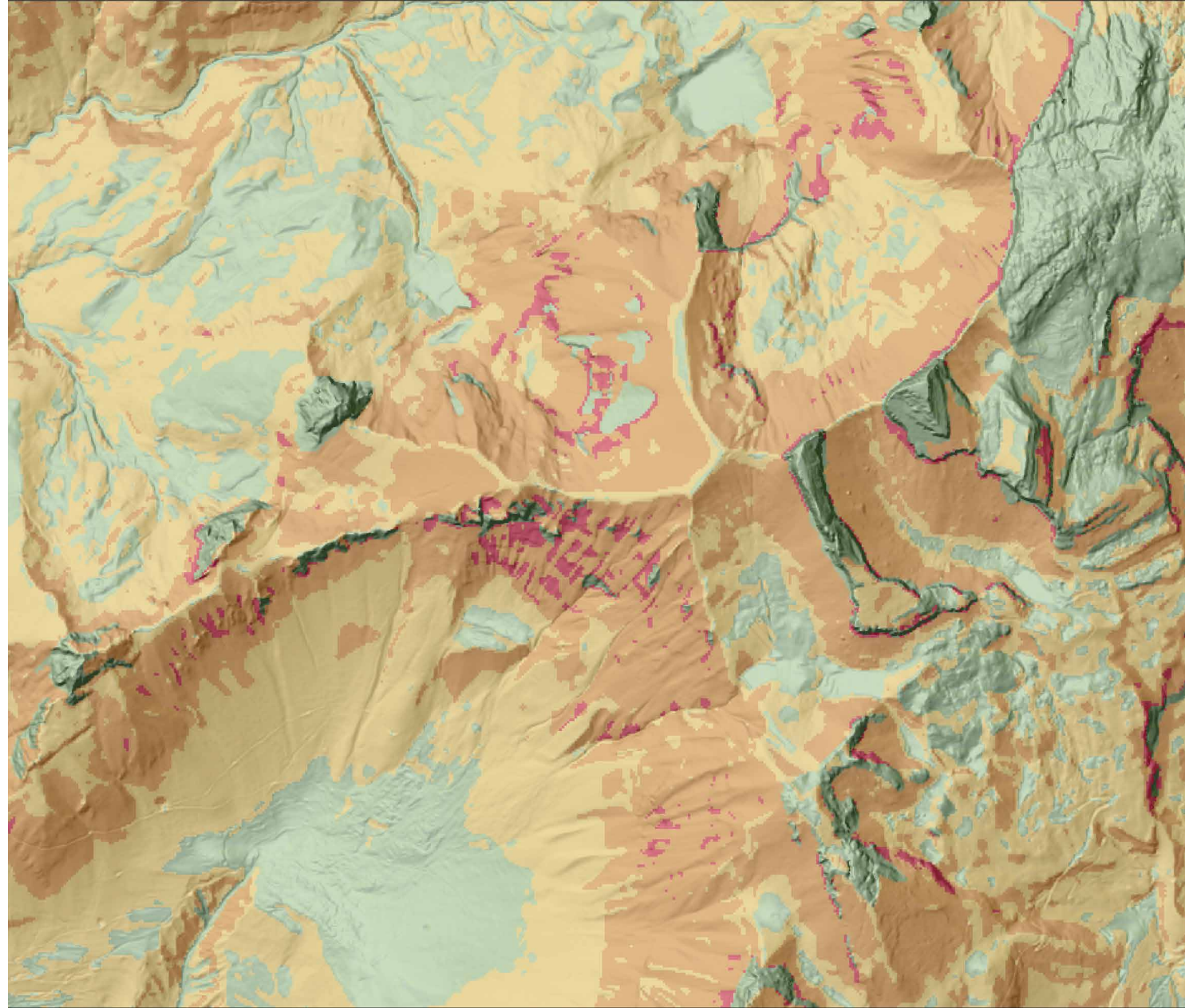
1.   Recent base data

New GIS data are regularly produced with enhanced resolution, accuracy and precision. Those recent, highly detailed numerical products get reflected in our susceptibility maps by a finer and more reliable detection of landslide source areas and runout computation, or in flooding models.

> Rockfall source areas detected using the same approach with a 25 m DEM (in yellow) and a 5 m DEM (in red).

5 m DEM–based source detection
25 m DEM–based sources detection
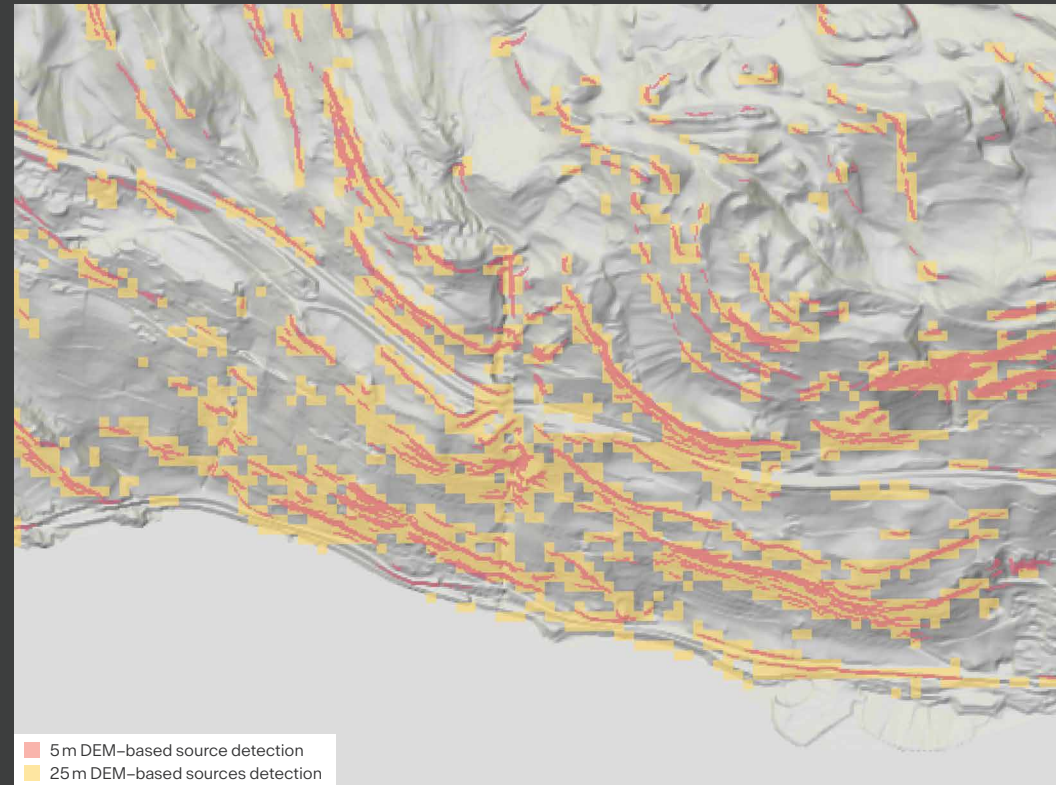
2. Advanced methods and numerical models

Our methods and numerical models for detecting source areas and modelling their runout areas are under continuous development to perfect their reliability and accuracy. One of the main outcomes is the significative improvement of the study scale, increasing from 1:50 000 ten years ago to 1:15 000 or even 1:10 000 nowadays.
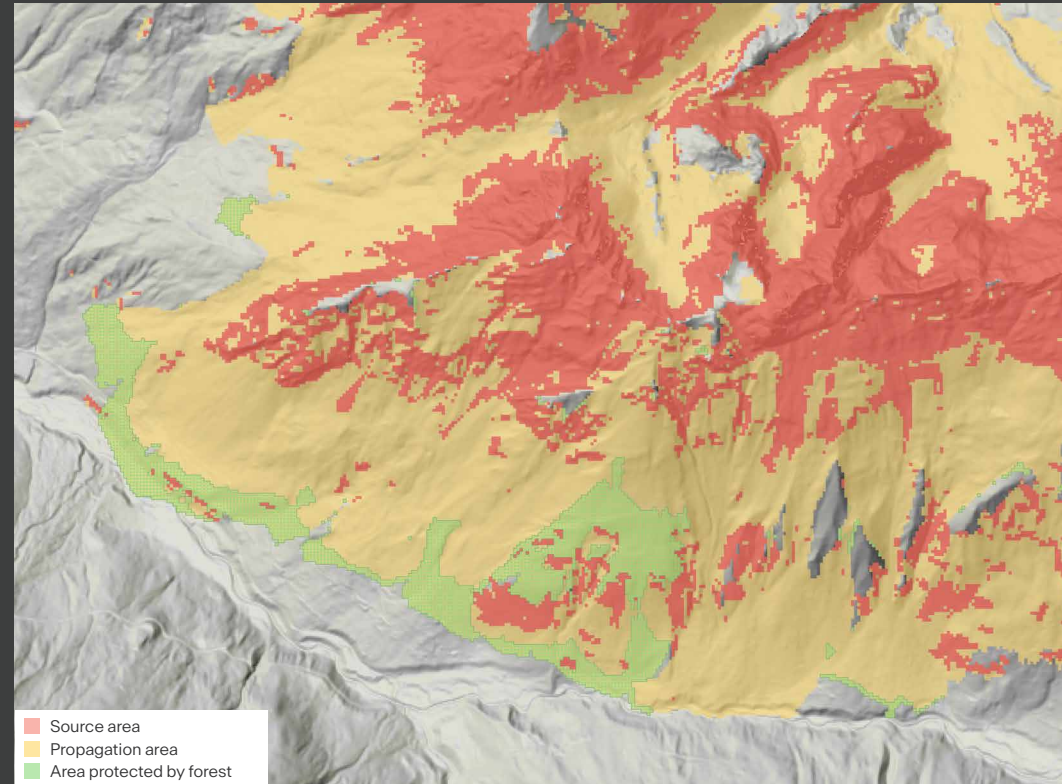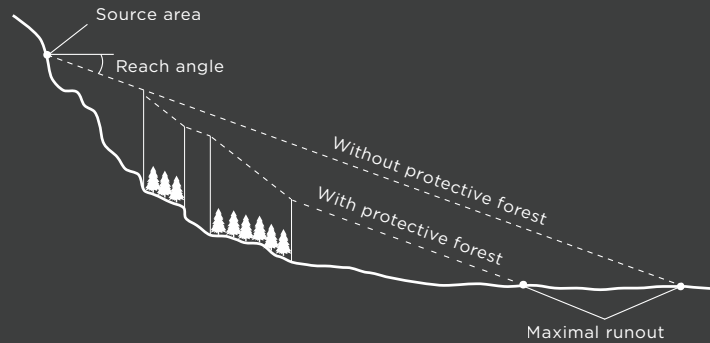
> Rockfall runout areas computed with the models Conefall and Flow-R based on identical source areas and parameters. Up to date with recent academic research, Flow-R nowadays maps more realistic propagations than the older model Conefall.

■ Source area
■ Flow-R model
■ Conefall model
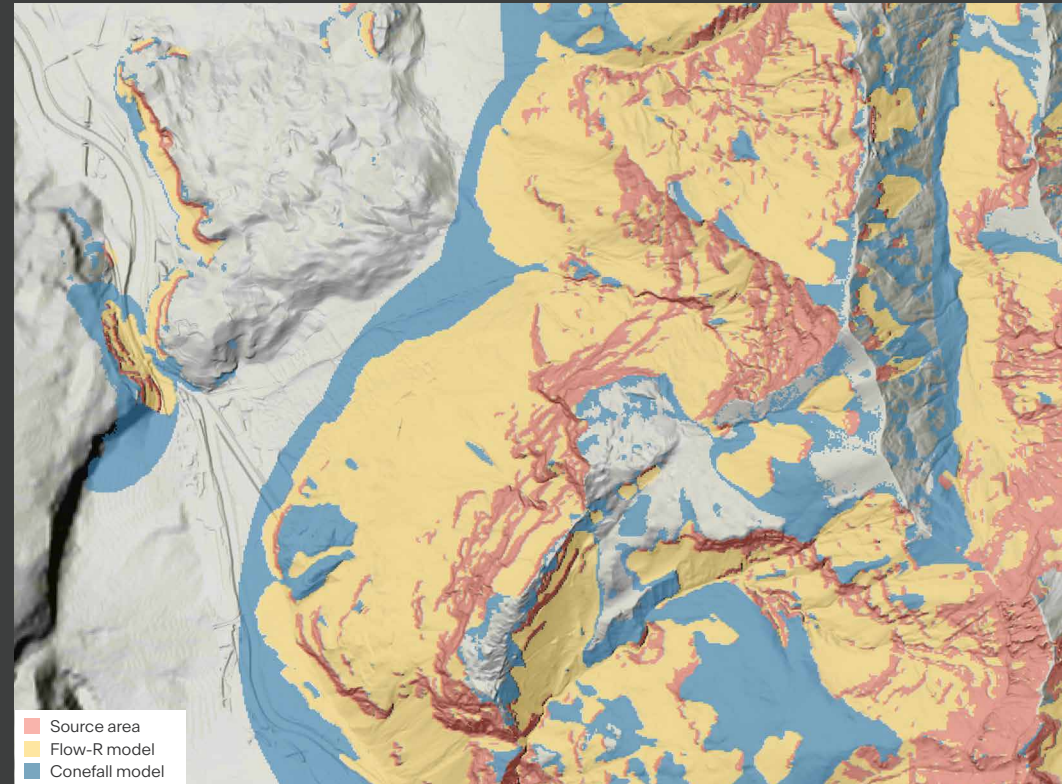
3. Consideration of protective forests

It is nowadays possible to consider the protective effect of forests in different rupture or propagation scenarios. This allows for the mapping and assessment of the direct consequences of protective forests on the reduction of potentially exposed areas.

> Example of the role of protective forest on the runout distance of rockfalls (local variations of the travel angle).

Source area
Reach angle
Without protective forest
With protective forest
Maximal runout

Source area
Propagation area
Area protected by forest

4. Multiple scenarios

Compared to traditional binary studies, our susceptibility maps can be classified into several susceptibility levels by combining different rupture and runout scenarios. These susceptibility levels distinguish thereby extreme from rare and current events, which greatly improves the daily maps' use in natural hazard and risk management.

> Example of a rockfall susceptibility map with susceptibility levels depicting current or extreme rockfall events.

Current events
■ High Susceptibility
■ Medium Susceptibility

Extreme events
■ Low Susceptibility
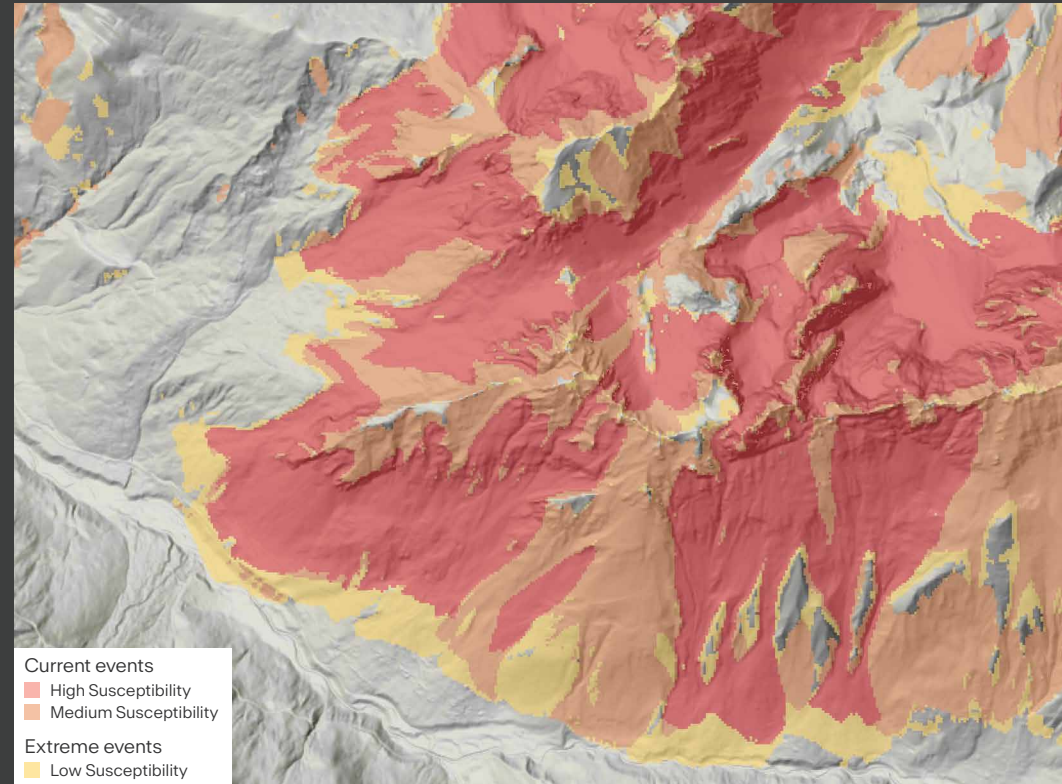
5. Positive feedback

Our susceptibility maps' acceptance and use by authorities and land-use planners are enhanced as they define areas threatened by extreme indicative events, but also more current events that are more challenging to manage on a daily basis.

Our products are robust and daily used in several Swiss cantons and other countries. They are based on reliable methods and models that were published in peer-reviewed journals and presented at many scientific congresses.

We gladly send our reference projects and publications.

Request for references

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