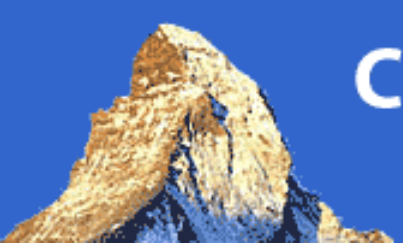
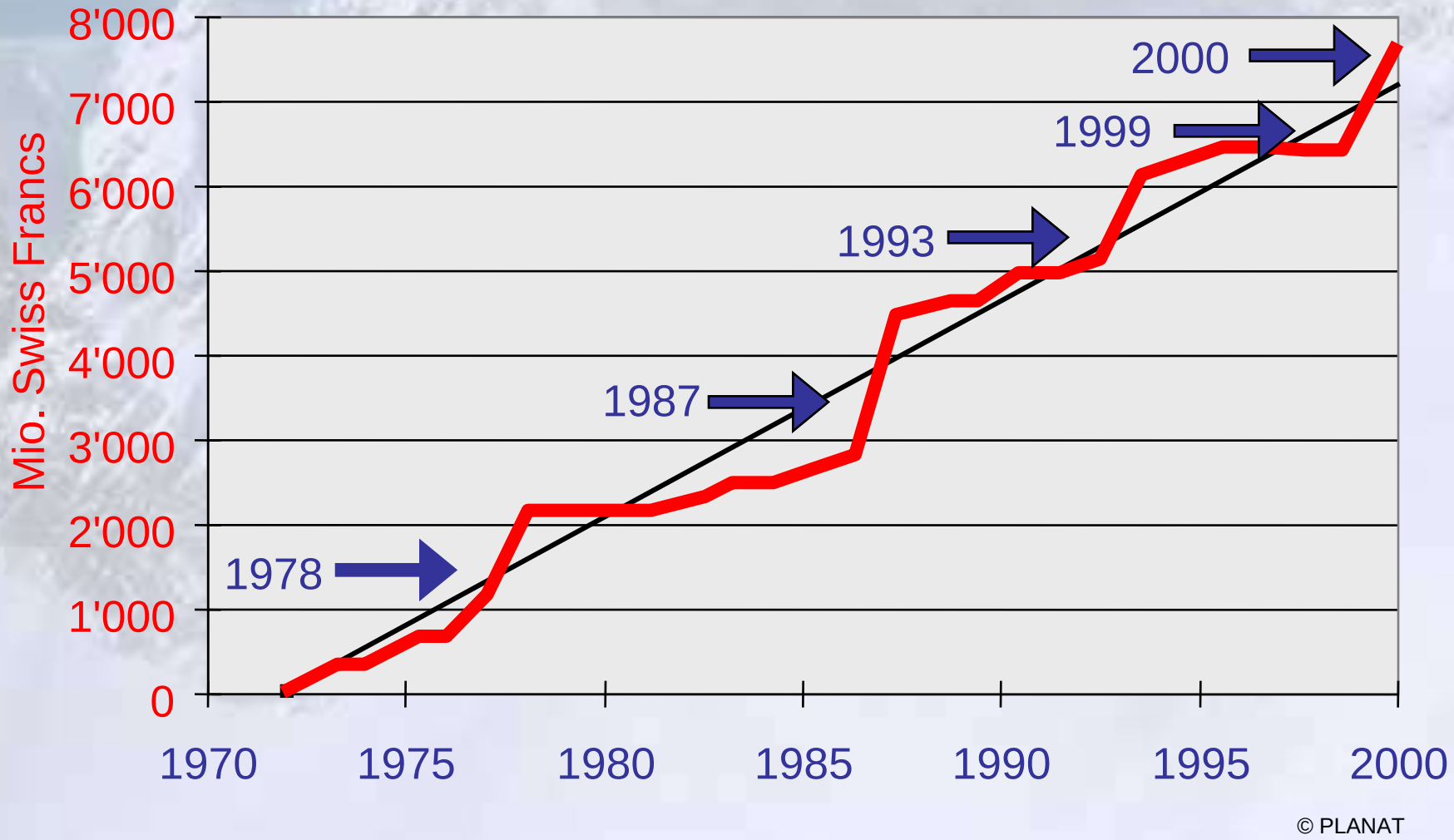


Swiss Hazard Maps: State of the Art and Potential Improvements

Melanie Kunz

Damage Caused by Natural Hazards in Switzerland



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Short Overview on Swiss Hazard Maps

History:

First hazard maps for snow avalanches after the winter 1951

Fundamental Laws:

- Federal Law on Water Constructions (Wasserbaugesetz, WBG)
- Federal Law on Forestry (Waldgesetz, WaG)
- Federal Law on Spatial Planning (Raumplanungsgesetz, RPG)

Considered Natural Hazards:

- Snow Avalanches
- Floods
- Mass Movements

Synoptic Hazard Map:

Visual combination of all hazard maps

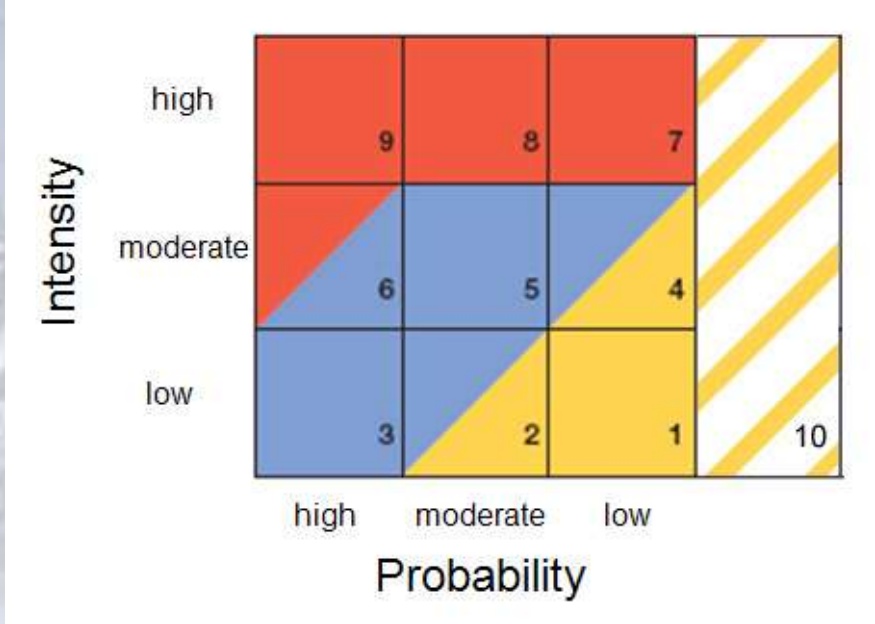
Scale:

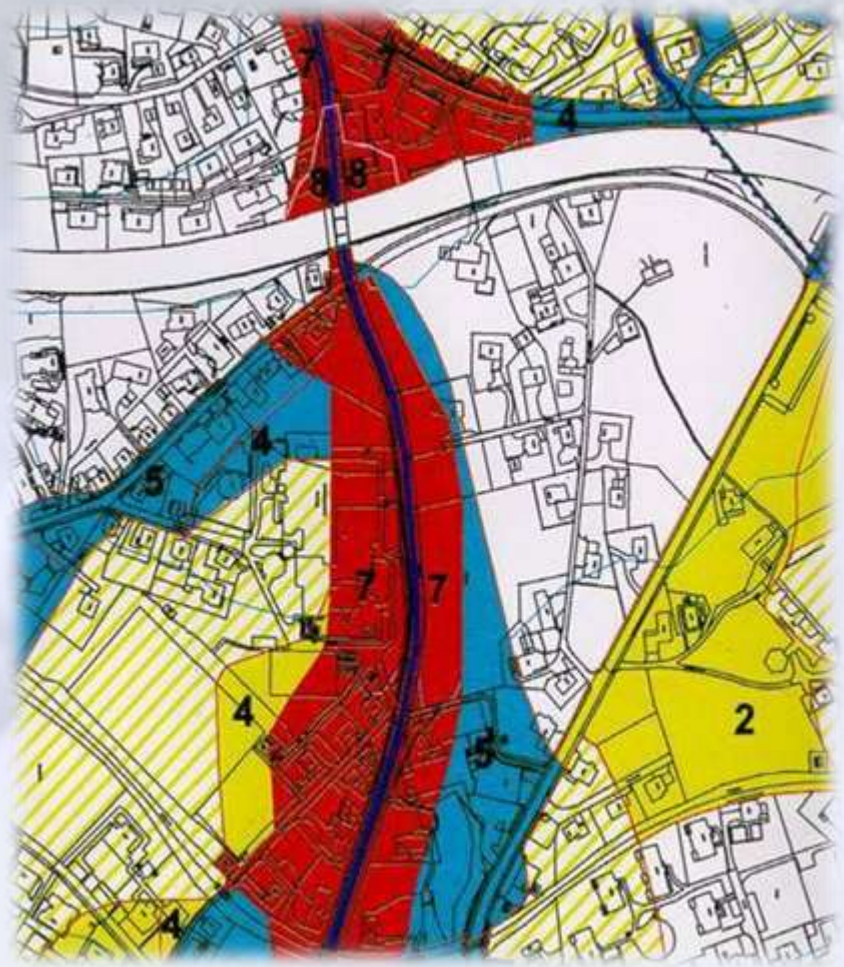
1:2‘000 to 1:10‘000

Level of detail:

Every single lot has to be assigned a hazard zone

Hazard Zones





Synoptic Hazard Maps

Labelling:

* Abbreviations of the damage causing processes
* Classes of the magnitude-frequency diagram

Coloured lines:

* Marking borders of damage causing processes

Red: Rock fall
Purple: Flood
Green: Landslide

Possible New Ways of Displaying a Synoptic Hazard Map

Interactive visualisation tool:

- Choosing layers
- Zooming
- Blending of layers → create new layers
- Display of Information on mouse-over

Option of adding extra features like

- Import of files containing additional information
- Display of intensities, damage potential, locations of protective structures, etc.

Facilitate **map reading** but also improve the **communication**

Visualisation of Uncertainty: What is Uncertainty?

Different sources:

- Collection uncertainty
- Derived uncertainty
- Visualisation uncertainty

Uncertainty comprises:

- Accuracy/error
- Statistical variation
- Noisy and missing data
- Etc.

Scales:

- Absolute
- Ordinal
- Nominal

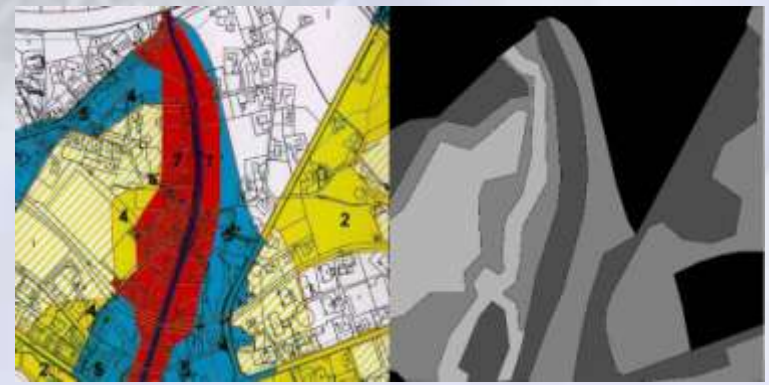
Visualisation of Uncertainty

One map containing all the information (maps combined)

Visualisation of uncertainty:

* Saturation
* Crispness (crisp boundary = reliable data)
* Resolution
* Transparency (fog)
* Dials, arrows, bars (extrinsic)

Hazard map and uncertainty are displayed separately (maps compared)



Visualisation of uncertainty:

* Colour
* Texture

Summary

Hazard map = **Important tool** for spatial planning

Digital, interactive solutions might **facilitate the interpretation** of synoptic hazard maps and therefore **improve the communication** between experts and other parties

Uncertainty visualisation = **explosive** topic, **research needed**

Interactive visualisation methods are promising

To Do List

* Disentanglement of the different levels of information in synoptic hazard maps
* New design for synoptic hazard maps and implementation (interactive)
* Investigation of the production process of hazard maps
* Identification of uncertainty sources
* Classification and assessment of uncertainties(if possible quantitatively)
* Creating of different uncertainty visualisation methods
* Determination and Implementation of the best method
* Assessment and implementation of user needs (e.g. of fire brigades, insurance companies, etc.)

Thank you for your attention!

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