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Protective forests towards avalanches in the Swiss and Austrian Alps in a *longue durée* perspective

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Content

- Basic information on avalanches
- The Walser communities and their influence on Alpine landscape
- Reasons for deforestation in the Alps
  - Mining industry
  - Alpine forests as commons
  - The deforestation paradigm
- Examples for avalanches from Switzerland and Austria (late medieval and modern times)
- Risk management and avalanche protection from the late 19th century to present
  - Adaptation strategies (building techniques)
  - Protective forests
  - “Alpine landscapes of defence”
- Conclusions

Avalanches in the Alps

- Different types of avalanches
  - Snow avalanches (loose snow a., slab a., slush a.)
  - Powder snow avalanches
- Contributing factors
  - Terrain
  - Snow structure
  - Weather
  - Vegetation
- Most afflicted areas in the Alps
  - French Alps (Savoy)
  - Switzerland
  - Western Austria (including Southern Tyrol)

Types of avalanches

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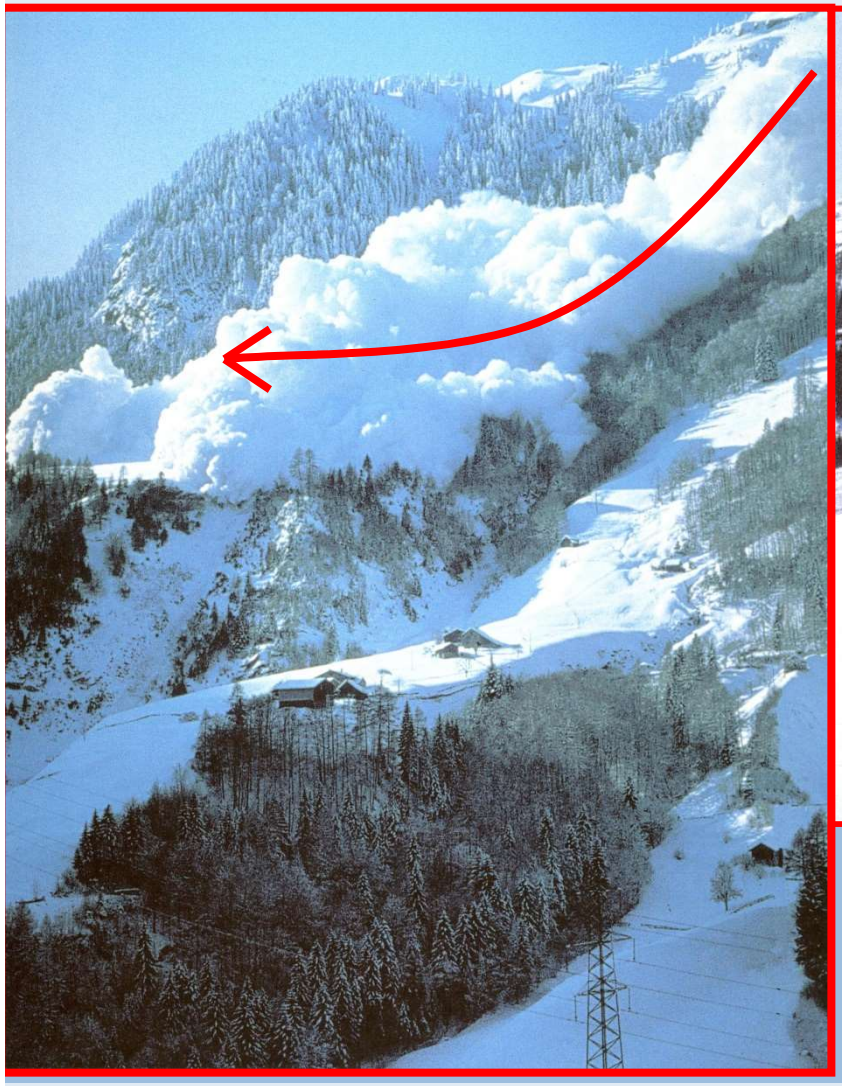
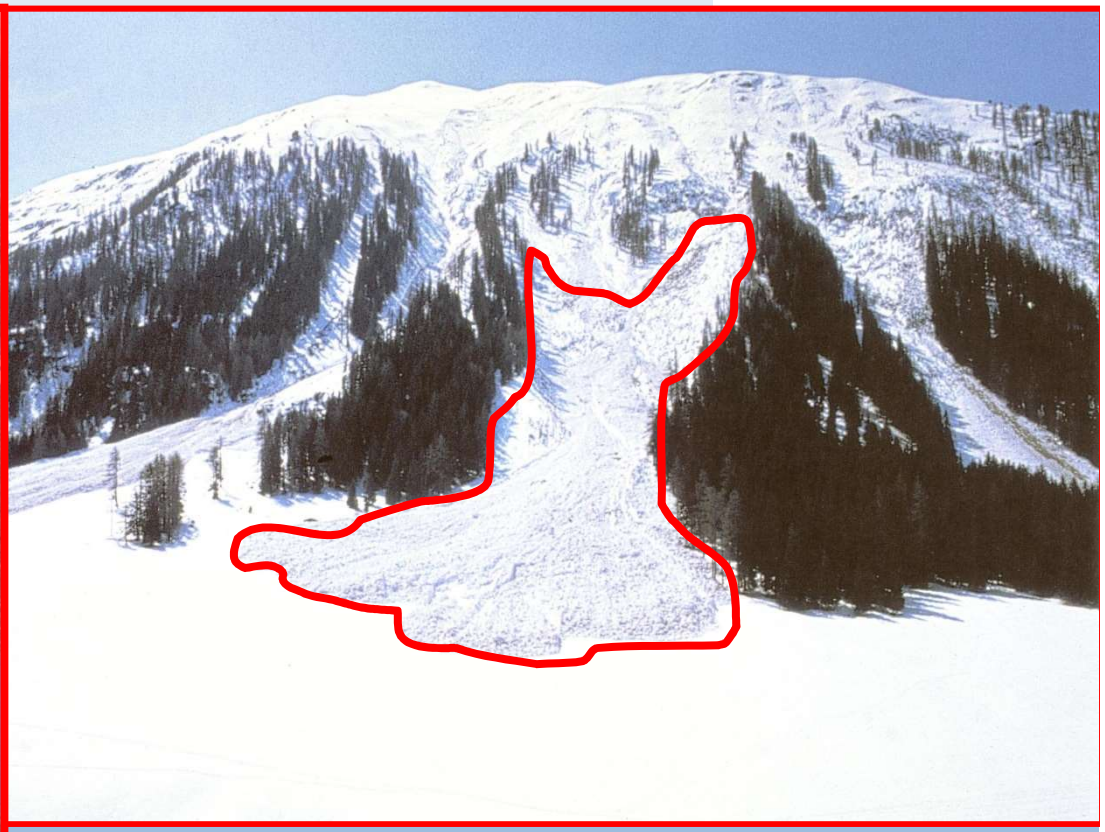
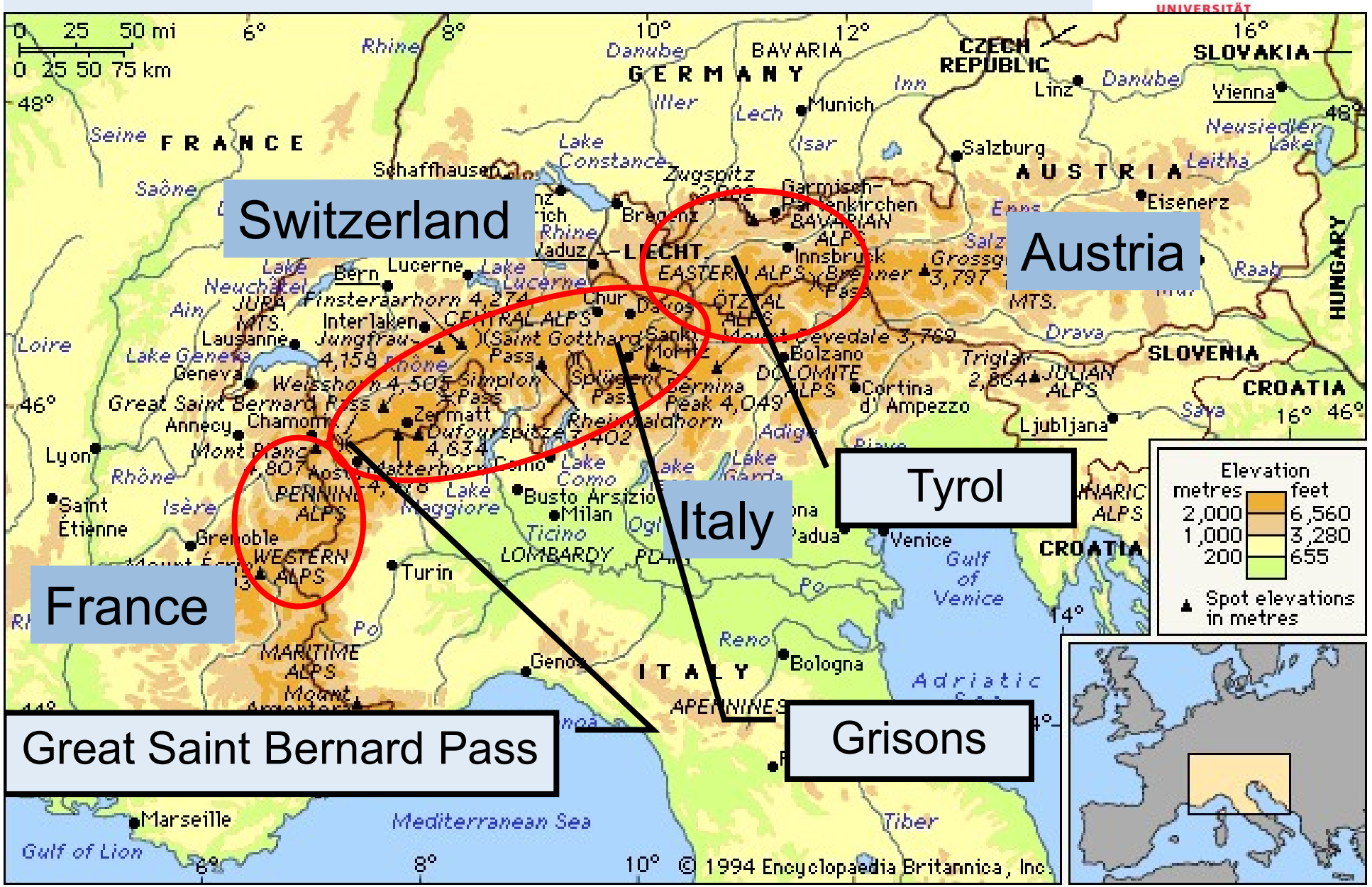




slab avalanche

powder snow avalanche

The Alps


Switzerland
Austria
Tyrol
Italy
France
Great Saint Bernard Pass
Grisons
Elevation
metres
feet
2,000
6,560
1,000
3,280
200
655
Spot elevations in metres
© 1994 Encyclopaedia Britannica, Inc.

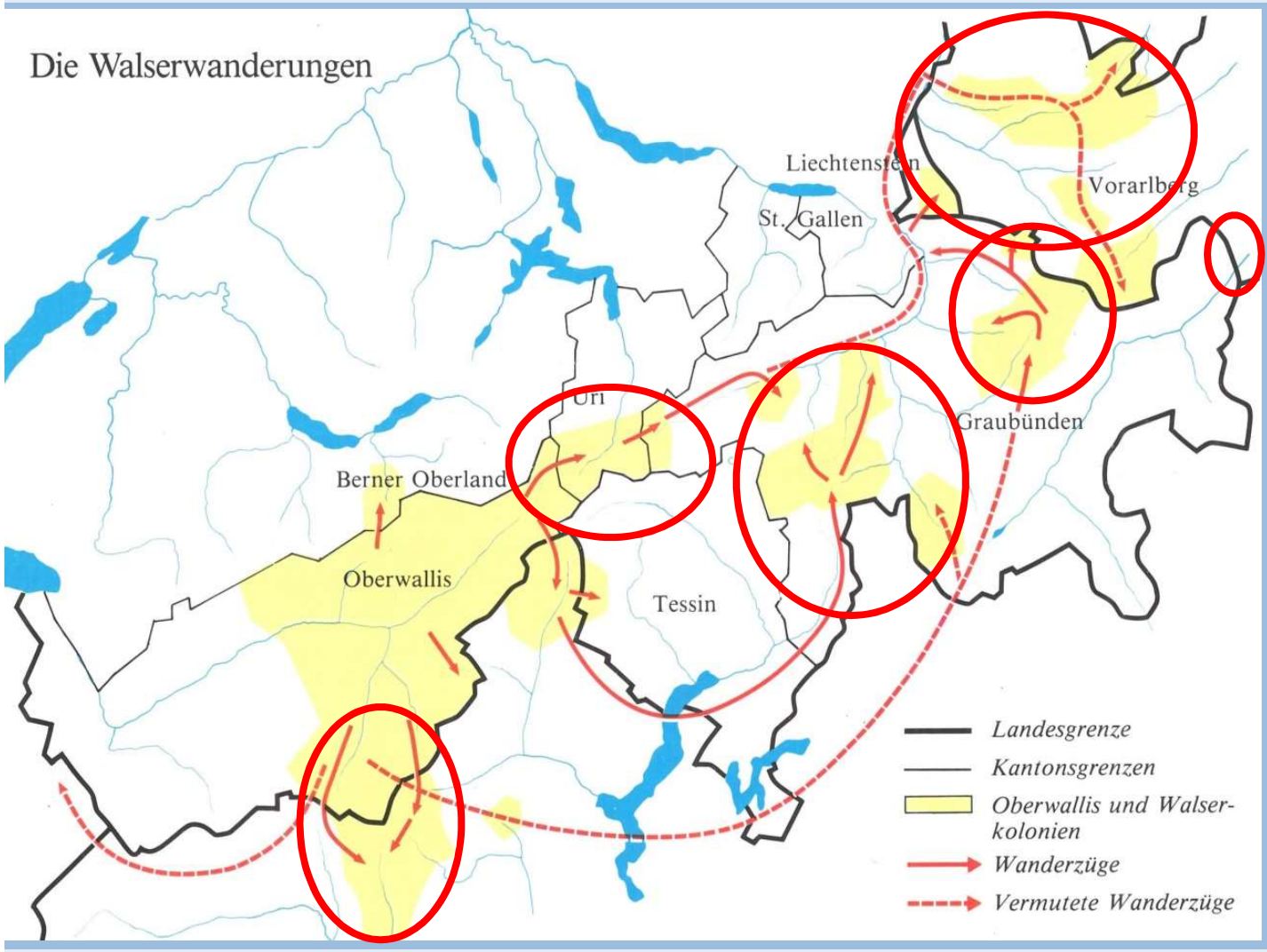
Why do we have so little knowledge about historical avalanches?

- Hardly any records about avalanches before 1700
- Obviously hardly any settlements in areas with a high risk of avalanches (except the Walser communities from the 13th/14th century onwards)
- Types of affliction
  - Travellers crossing the Alps in winter
  - Miners working in high Alpine mining districts
  - Powder snow avalanches reaching settlements
- Low literacy in the afflicted areas
- Archaeological research on Alpine chalets only in the beginning

Settlement activity of the Walser communities

- Expansion of the Walser in the 13th and 14th centuries from the Upper Valais in all directions, but especially to the east
- Main reasons
  - Population pressure and the search for new pastures
  - Possibly droughts in the Upper Valais
- New settlement areas
  - Northern Italy, south of the Monte Rosa massif
  - Gotthard region (Uri)
  - Surselva, Vals area, Avers valley (western Grisons)
  - Prättigau, Davos region (eastern Grisons)
  - Large parts of the high alpine regions of Vorarlberg (Grosses and Kleines Walsertal, Montafon)
  - Paznaun valley (Galtür) in western Tyrol

Settlement activity of the Walser communities



The Walser migration activities in the late Middle Ages.
Map by Fibicher, Arthur: Walliser Geschichte, vol. 2. Sitten 1987: 234.

Settlement activity of the Walser communities

- Settlement activity partly above the tree line
  - Clearing in the high mountains to obtain pasture land
  - Archaeological evidence for clearing activity in upper Uri since the 12th century
- Structure of the settlements
  - Small scattered hamlets
- Adaptation to the increasing risk of avalanches
  - "Trial and error"
  - Optimization of settlement places
    - Houses in vertical lines between the well-known avalanche channels
    - Special building techniques
  - Triangular protective forests

Settlement activity of the Walser communities

The Walser village of Juf in the Avers Valley (Grisons), highest permanent settlement in the Alps (2124 m). Photo by Christian Rohr (2022)

Settlement activity of the Walser communities
Legal status

- Regional feudal lords favour the new Walser settlements
  - Expansion of their territories into high alpine regions
- Numerous Walser settlements are granted the so-called “Walser rights”, a typical colonists’ legal status
  - Personal freedom
    - No ties to the feudal land
    - No servitude
    - No restrictions on marriage
  - Right to form their own judicial communities (lower jurisdiction under a self-elected magistrate)
  - Right of free inheritance of land
  - Moderate interest payments and military service for the feudal lord
- Corresponding documents preserved since the 13th century
  - Davos (1289), Alpe Ragaz (1364)
  - Tannberg and Mittelberg (Kleinwalsertal) lose these rights in 1453

Reasons for deforestation in the Alps

- Mining activity in the Eastern Alps
  - Gold, silver and iron ore
  - Salt mining (including salterns)
- Forests as common pool resource
  - Partly uncontrolled cutting activities
  - Cattle breeding
- The “deforestation paradigm”
  - Scientific forestry since the 1820s
  - Reforestation as main issue
  - “Deforestation in the Alps leads to avalanches and floods in the plains”
  - Federal forest legislation introduced in Switzerland only in 1876 after the “worst case” flood of 1868

Examples for avalanches in premodern times
The destruction of Mittewald, Tyrol (1456/1689)

- Small village in the Tyrolean Ausserfern Valley hit by a powder snow avalanche (1456)
  - Most of the people (22) killed
  - Village totally destroyed
- Village transferred some hundred meters to a new place after 1456
  - New village is called Laehn (= avalanche / slope with frequent avalanches)
- Another destruction of the new village in 1689
  - 21 people killed, 25 rescued after some days
  - 11 houses totally destroyed

Examples for avalanches in premodern times
The destruction of Mittewald, Tyrol (1456/1689)

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Ex voto tablet remembering the avalanches in 1456 and 1689. Anonymous painter, around 1730. Photo by Christian Rohr

Examples for avalanches in premodern times
Miners killed at the Schneeberg, Southern Tyrol (1580)

- Gold and silver mines in the Southern Tyrolean Alps since the High Middle Ages
- Relatively dense population in the Upper Passeier Valley (Southern Tyrol)
- 1500: The village of Moos destroyed by an avalanche (28 people killed)
- Foot paths and entrances to the mines afflicted with avalanches (1580,1693)
  - 2370 m altitude, no forests for protection
  - Rescue teams killed as well

Examples for avalanches in premodern times
The most important avalanche disasters in the Grisons before 1951/1954

- 1459, January: Trun, Disentis, Surselva (25 people killed, St. Placidus church destroyed, in total 100-120 people killed)
- 1602: Davos (Our Lady's church destroyed, 13 people killed)
- 1689, January: St. Antönien, Saas im Prättigau (80 people killed, 37 houses and many other buildings destroyed)
- 1720, February: Ftan, St. Antönien, Davos (approx. 40 people killed, many buildings destroyed)
- 1749, February: Rueras, Zarcuns, Disentis, Surselva (75 people killed, approx. 120 buildings destroyed)
- 1808, December: Selva (7 people killed, 50 buildings destroyed)
- 1817, March: Engadin, Surselva (many avalanches with people hit)
- 1888, February/March: Hinterrhein
- 1935, February: St. Antönien
- 1951, January: Vals, Davos, Klosters, St. Antönien et al. (73 killed)

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Examples for avalanches in premodern times
The most important avalanche areas in the Grisons

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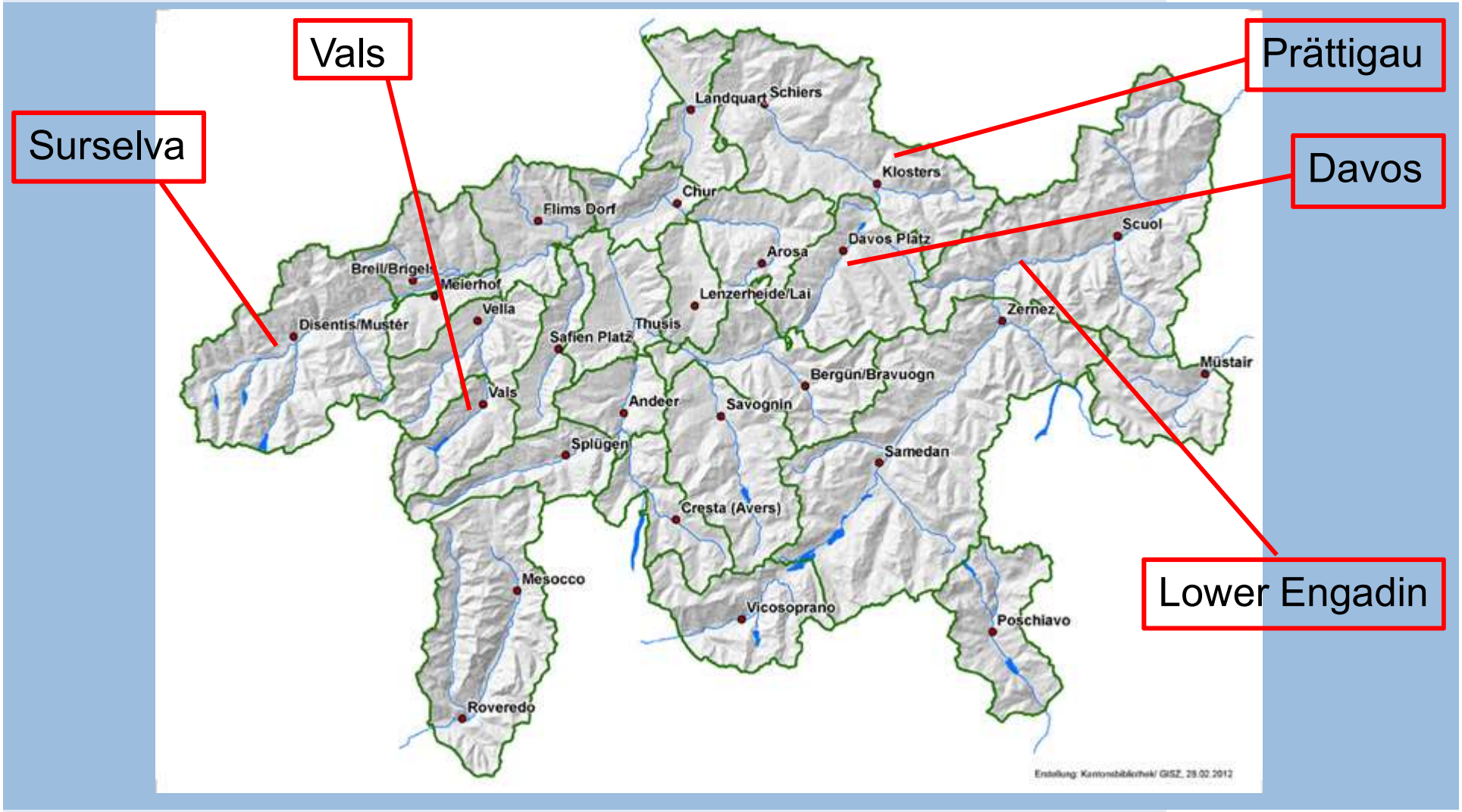

Examples for avalanches in premodern times
The most important avalanche disasters in Vorarlberg until 1951/1954

- 1497: 13 people killed and high losses of cattle caused by avalanches in the Grosses Walsertal valley (St. Gerold, Valentschina)
- 1556: 9 people killed by avalanches in Riezlern (Kleinwalsertal valley), more victims in Riezlern in 1567 and 1578
- 1689, 2-6 February: Catastrophic winter, focus of the destruction in the Montafon and Kleinwalsertal valleys
- 1720, January: Avalanches in St. Gallenkirch (Montafon valley)
- 1793, March: 4 people killed in St. Gallenkirch-Rüti
- 1817, March: Catastrophic winter, 6 people killed in St. Gallenkirch-Rüti
- Further destructive avalanches in 1870, 1883, 1887/1888, 1921/1922 (first Alpine skier among the victims), 1930, 1935
- 1954, January: 56 killed in Blons (Grosses Walsertal valley)

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Examples for avalanches in premodern times
The disastrous avalanches of 1817 in the Grisons and in Vorarlberg

- Catastrophic winter with numerous avalanches in the Grisons and in Vorarlberg
- Events coincide with a severe climate and hunger crisis
  - Extreme period of Little Ice Age ("Dalton minimum")
  - "Year without a summer" 1816 after the eruption of Mount Tambora in Indonesia
  - Hunger crises even gets worse in 1817-1818
  - Avalanches of winter 1817 followed by floods in the same year
- Detailed reports on this critical period
  - Retrospective diary by Bartholomä Marlin (written down in 1855)
  - Administrative sources
  - Parallel reports from neighbouring Swiss cantons
  - *Ex voto* commemorative tablets (Rüti chapel near St. Gallenkirch, Montafon valley) and inscription with the year on a nearby stone

Examples for avalanches in premodern times
The disastrous avalanches of 1817 in the Grisons and in Vorarlberg

Inscription with the year to commemorate the avalanche of 1817, Rüti

Ex voto commemorative tablet, Rüti chapel (St. Gallenkirch, Vorarlberg), 1817

Risk management in late medieval and early modern Switzerland and Austria

- Protection
  - Restrictions to cut high-Alpine forests
  - Protective buildings for settlements and mining districts (splitting chocks, etc.)
  - New house types (e.g. „Ebenhöch“ houses in Switzerland) since around 1500
  - Dangerous settlement places avoided
  - First plans to relocate endangered villages
- “Cultures of active memory”
  - *Ex voto* tablets
  - Names of afflicted settlements refer to avalanches, e.g. the village of Mittewald/Lähn in Tyrol (destroyed 1456 and 1689)
  - Avalanche chronicles and letters
  - Picture postcards and photographs for sale

Risk management in late medieval and early modern Switzerland and Austria
Ebenhöch houses (Grisons and Upper Valais)

St. Antönien, Grisons. Photo by SLF Davos

Risk management in late medieval and early modern Switzerland and Austria
Splitting chocks, protective walls (Grisons)

Davos, Frauenkirch (after 1602). Photo by Christian Rohr (2016)

St. Antönien, protective wall against avalanches. Photo by SLF Davos

Risk management in late medieval and early modern Switzerland and Austria
Adaptation of settling places based on local knowledge

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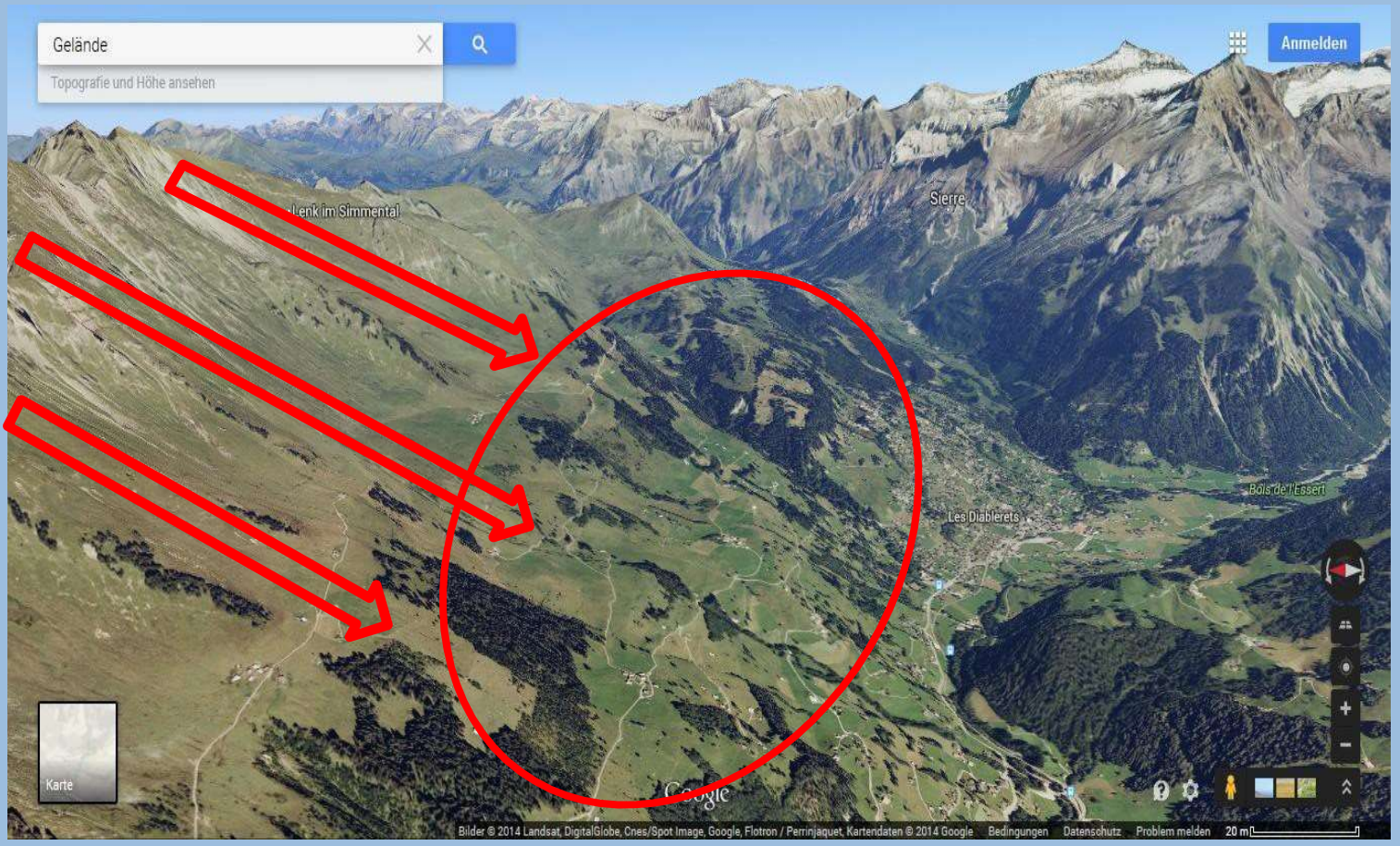
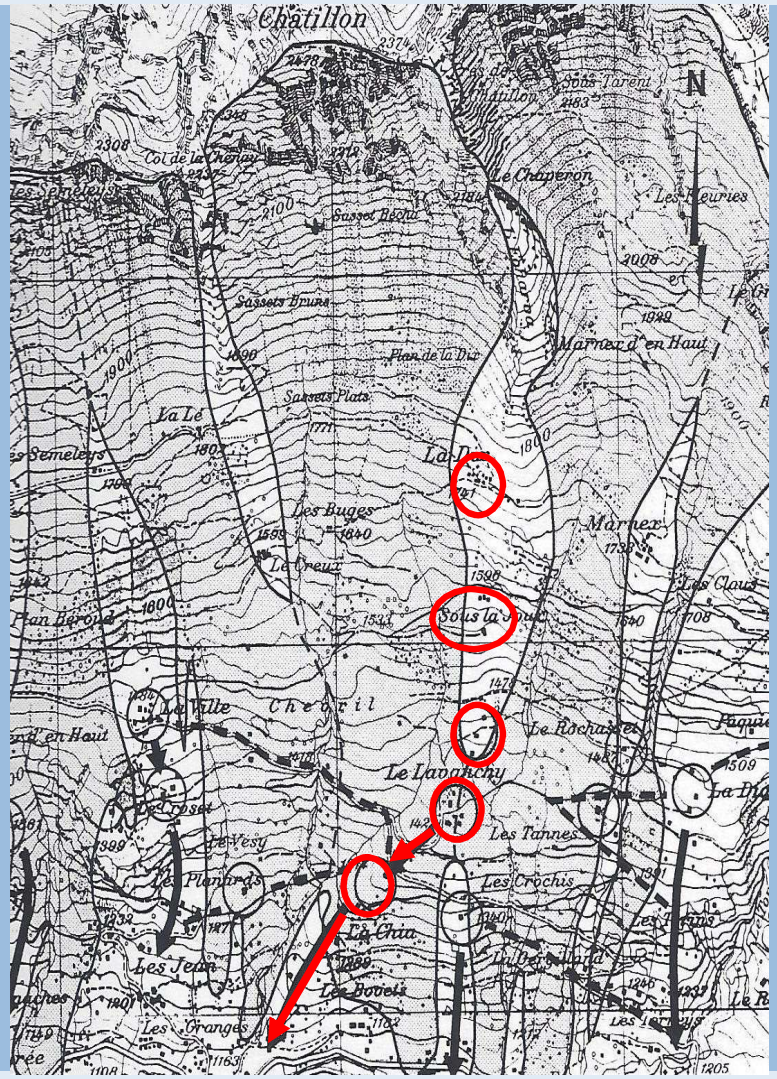
Vallée des Ormonts, Western Alps (Canton of Vaud)



Google Maps, 07.04.2014

Risk management in late medieval and early modern Switzerland and Austria

Adaptation of settling places based on local knowledge



Map left: Schoeneich; Busset-Henchoz: 1998: 59.

Right: Google Maps, 07.04.2014

Risk management in late medieval and early modern Switzerland and Austria

The protective forest of Andermatt (Uri)

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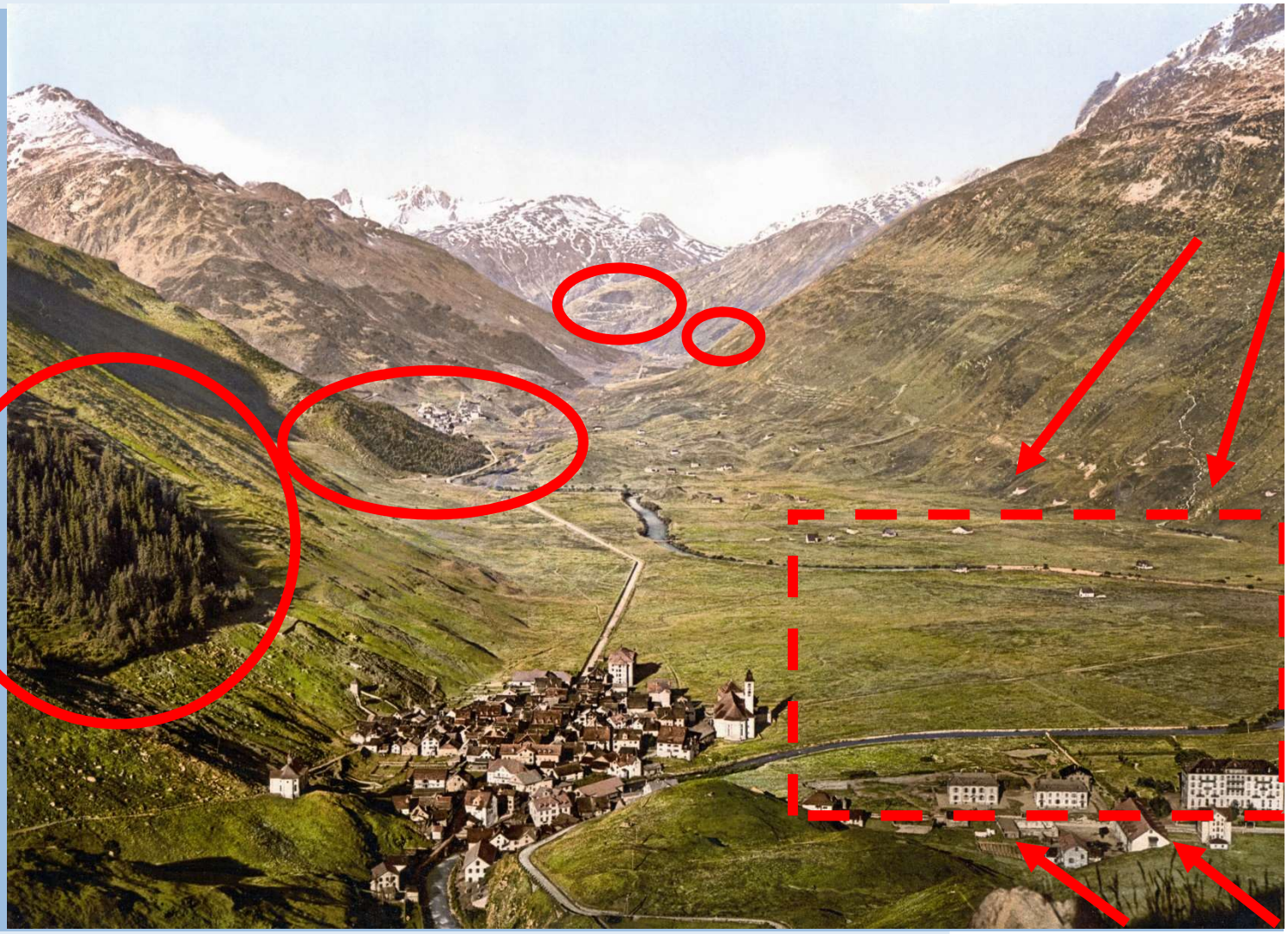
Andermatt around 1900, hand-coloured photograph. The protective forest is documented an protected by charters since 1397.



Risk management in late medieval and early modern Switzerland and Austria
Failed protective measures in Andermatt (Uri), 1951

Andermatt, January 1951. Source: SLF Davos, Latern-ser/Ammann 2002

Alpine “landscapes of defence”
Reforestation to protect the alpine railway network

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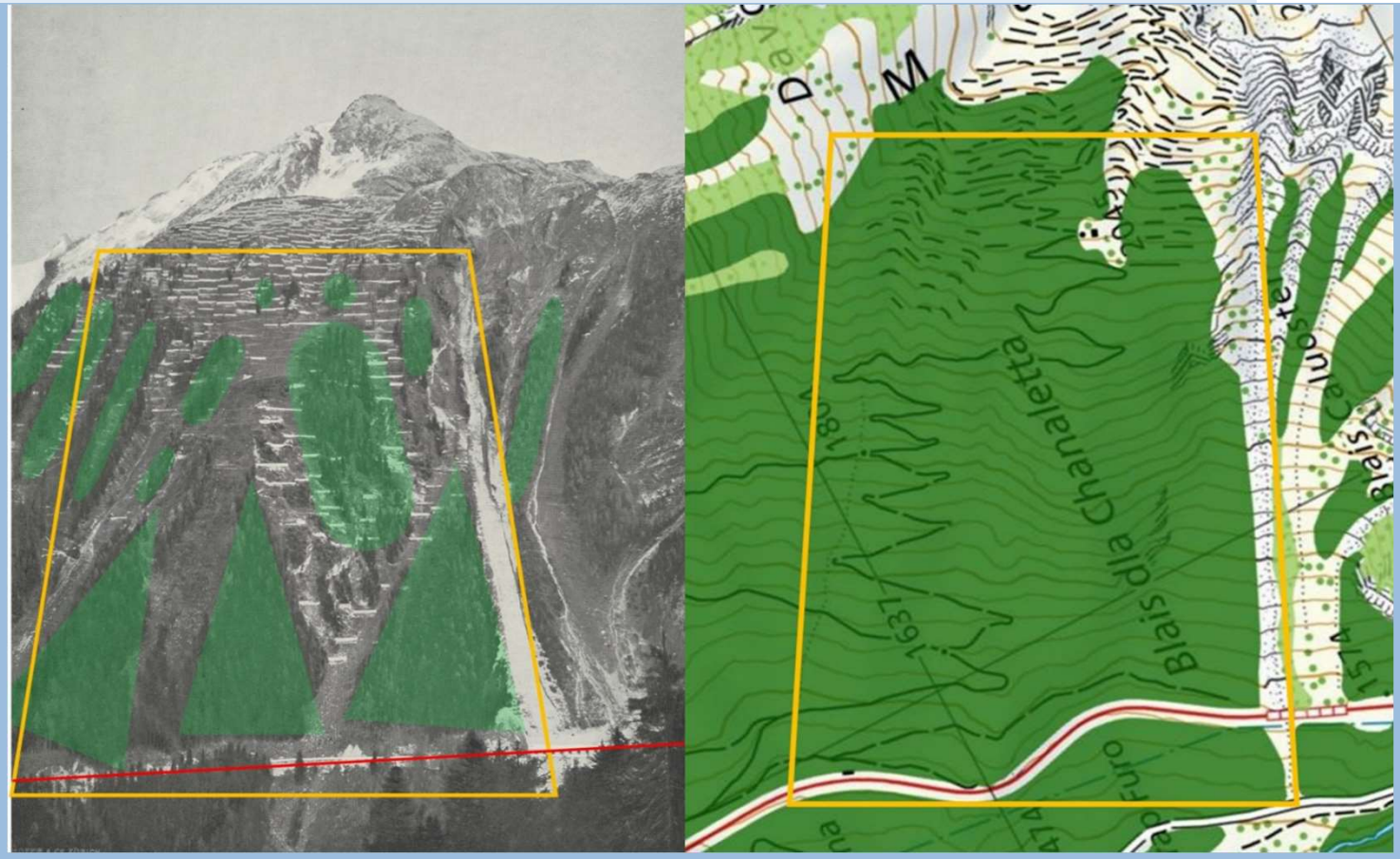
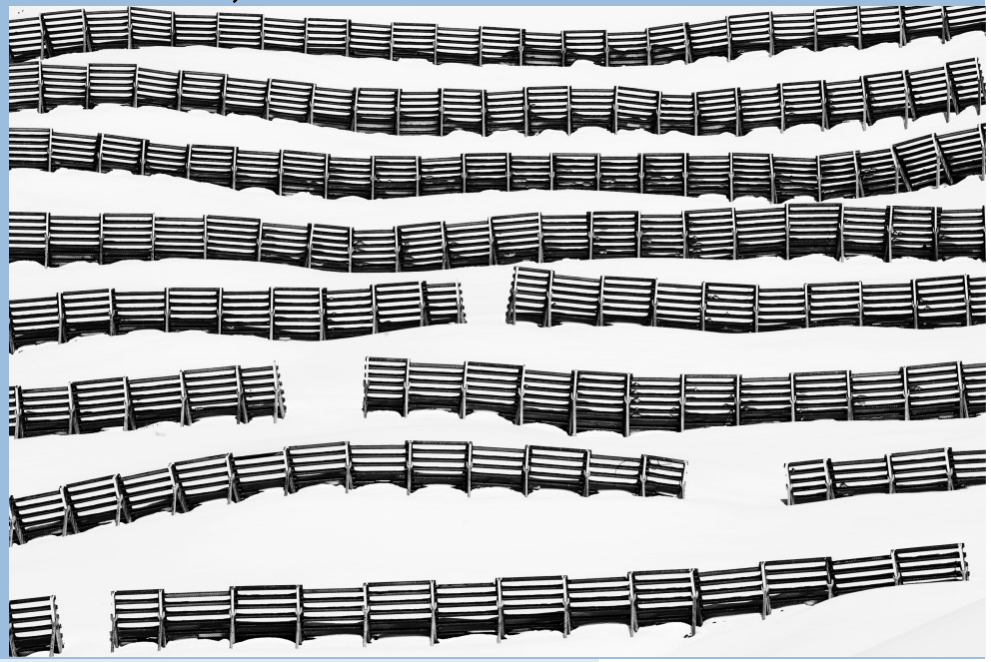


Protective forest and avalanche defence system Muot near Bergün, Grisons
Source: Flütsch 2022 according to Hennings 1908: plate 18 and swisstopo.

Alpine “landscapes of defence”
Avalanche protection after 1951

St. Antönien, protective buildings against avalanches on top of the mountains. Photographs by Kaspar Thalmann, Alpines Museum der Schweiz, Bern.



Conclusions

- Ongoing deforestation in the Alps since the Middle Ages
  - Walser settlements based on pasture economy
  - Clearing activities raise the risk of avalanches
  - Common pool management concerning forest use only partly effective (protective forests)
  - Sustainability awareness mostly restricted to mining areas in the Eastern Alps
- Changing attitudes in the course of the 19th century
  - Emerging forest science in Switzerland since the 1820s
  - “Deforestation paradigm” develops from a scientific discourse to a key issue on the political agenda
  - Implementation requires forest legislation on a federal level
  - Reforestation to build up “Alpine landscapes of defence” for the protection of the Alpine railway network

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Thank you for your attention!

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