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General Climatic Conditions and Adaptive Strategies for the Alpine Economies (8th-19th centuries)

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“Oeconomia Alpium III”

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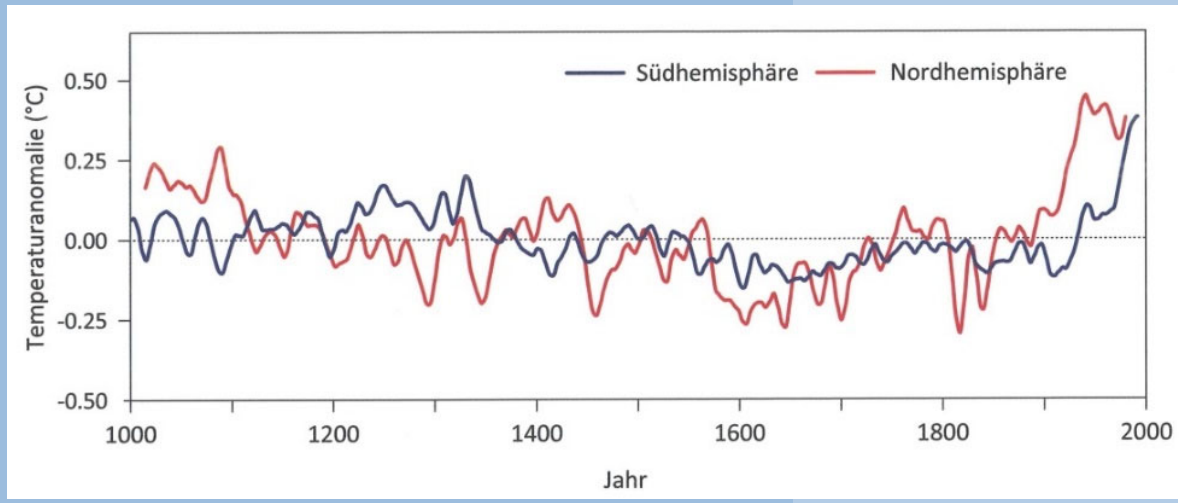

Content

- General information
  - Long-time climatic developments
  - Short-time climatic extremes
  - Weather- and climate-induced natural hazards
  - Specific Alpine peculiarities
    - Micro-climatic conditions
    - Seasonal variability
- Adaptive strategies for economic/daily life
  - Settlement, housing and mobility
  - Yearly working cycle (see my contribution to the Hall conference)
  - (Natural) disaster management
- Structure of the upcoming chapter for the handbook

Reconstructed long-time climatic development

- Medieval Warm Period / Medieval Climate Anomaly (750/900-1300)
- Little Ice Age (LIA) (1300-1850)
  - **1310s Dantean anomaly**
  - **1420-1570 Spoerer minimum**
  - 1540 Driest and presumably warmest summer of the last 500 years
  - 1587 Year without summer
  - 1628 Year without summer
  - **1645-1715 Maunder minimum**
  - 1708/09 Coldest winter of the last 500 years
  - 1757 One of the warmest summers of 1500-2000
  - 1783 Laki eruption
  - **1790-1830 Dalton minimum**
  - 1815 Tambora eruption followed by a year without summer 1816

Reconstructed long-time climatic development

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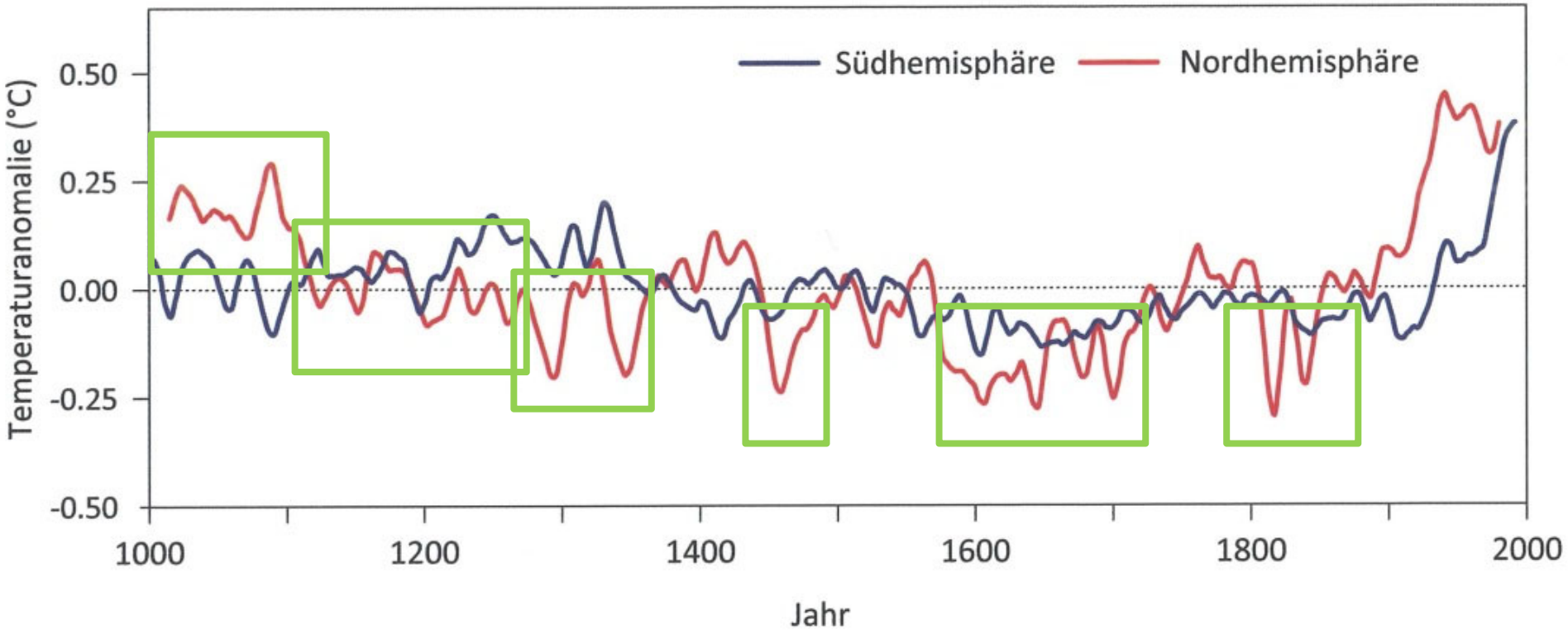


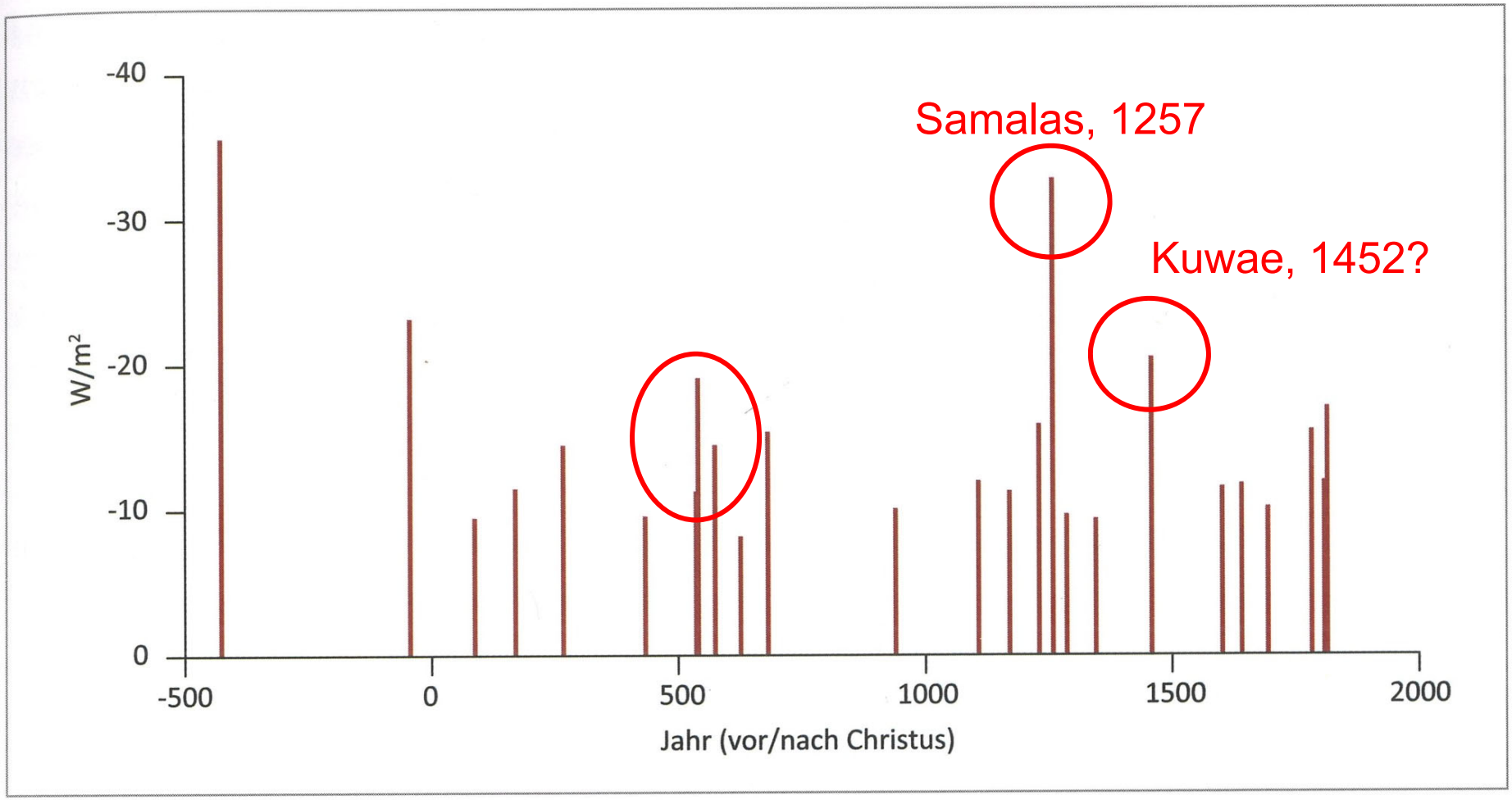
Source: Wanner 2016: 146, based on different time series from various proxies

Large volcanic eruptions

- 1257: Samalas, Indonesia (Volcanic Explosivity Index: 7)
- Around 1452/53: Kuwae, Vanuatu (6+)
- 1600: Huaynaputina, Peru (6)
- 1640: Komaga-Take, Japan (5)
- 1641: Parker, Philippines (5)
- Further volcanic eruptions in 1660, 1663, 1667, 1673, 1680, 1707
- 1783: Laki, Iceland (4) and Asama, Japan (4)
- 1815: Tambora, Lesser Sunda Islands/Indonesia (7)
- 1883: Krakatau, Westjava (6)

- New SNF Ambizione Research Project on volcanic impact on societies in the Swiss Alps and in Scandinavia (2022-2026)

Large volcanic eruptions



Source: Wanner 2016: 141, based on Sigl 2015

The Tambora eruption of 1815 and its impact on society

- Explosion of Mount Tambora (Sumbawa, Lesser Sunda Islands, Indonesia) on 10 April 1815
  - Hardly anything known on the explosion itself (modern models only)
  - No eye-witnesses survived
  - Colonial officers on neighbour islands report about a huge dust bowl
- Global atmospherical circulation brings ash particles to most regions in the world
  - Evidence from ship's logbooks
- Most affected areas
  - Northeast USA (New England States)
  - British Isles
  - **Switzerland, Southern Germany**
  - India
  - China

The Tambora eruption of 1815 and its impact on society

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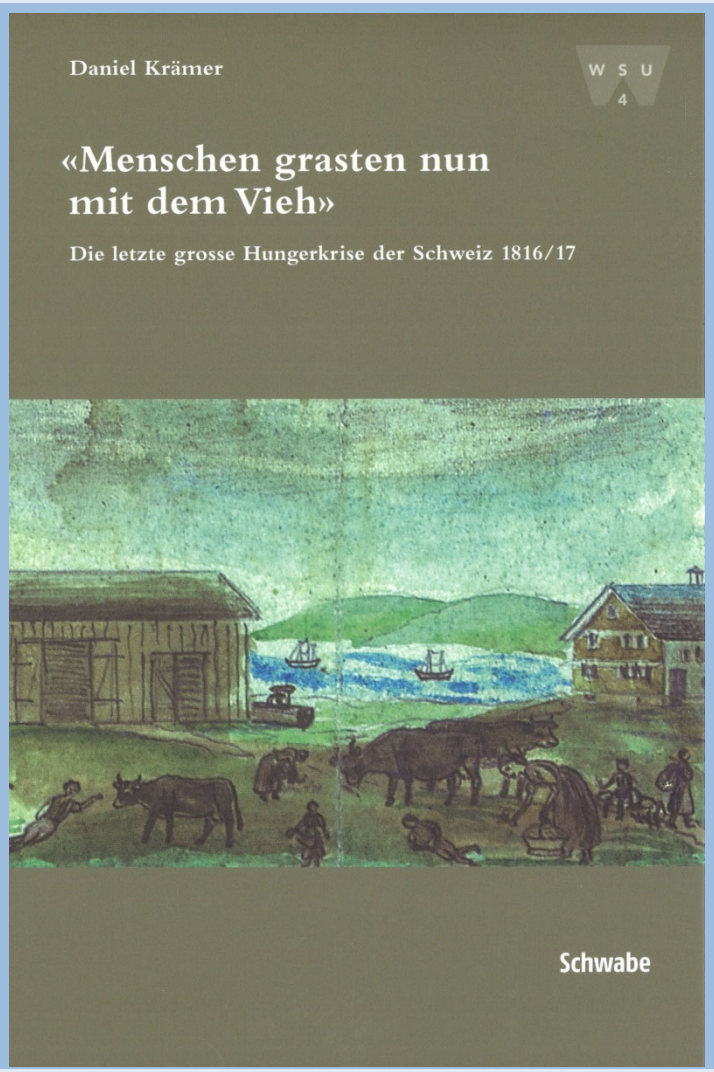

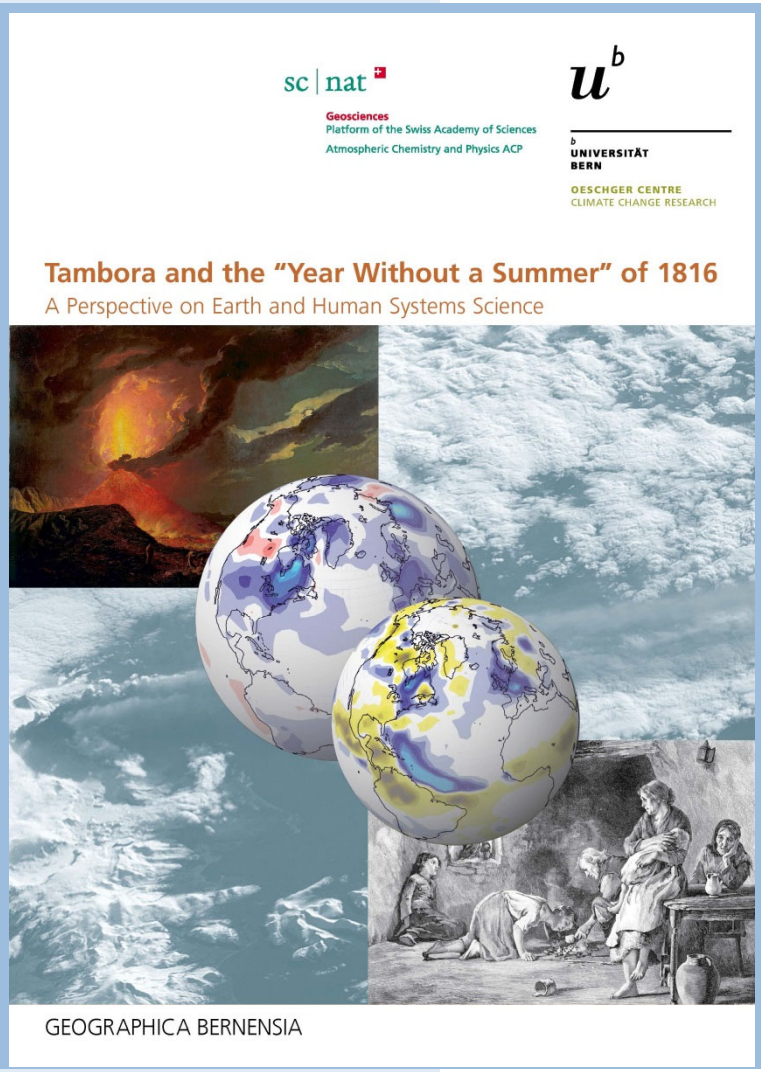

The Tambora eruption of 1815 and its impact on society

- Situation in Switzerland
  - Very wet and cool summer 1816
  - Grain harvest failure
  - Much snow remaining in the higher Alpine pasture areas
  - Series of disastrous avalanches in the following winter of 1816/17
  - Floods after snow melt in 1817
- Malnutrition in 1817
  - Switzerland dependent from grain import
  - Grain export embargoes in Southern Germany
  - Early industrialized areas (North-eastern Switzerland, Jura) suffer most
- Long-time effects of malnutrition
  - Higher mortality, lower birth rate
  - Impoverishment, emigration

The Tambora eruption of 1815 and its impact on society

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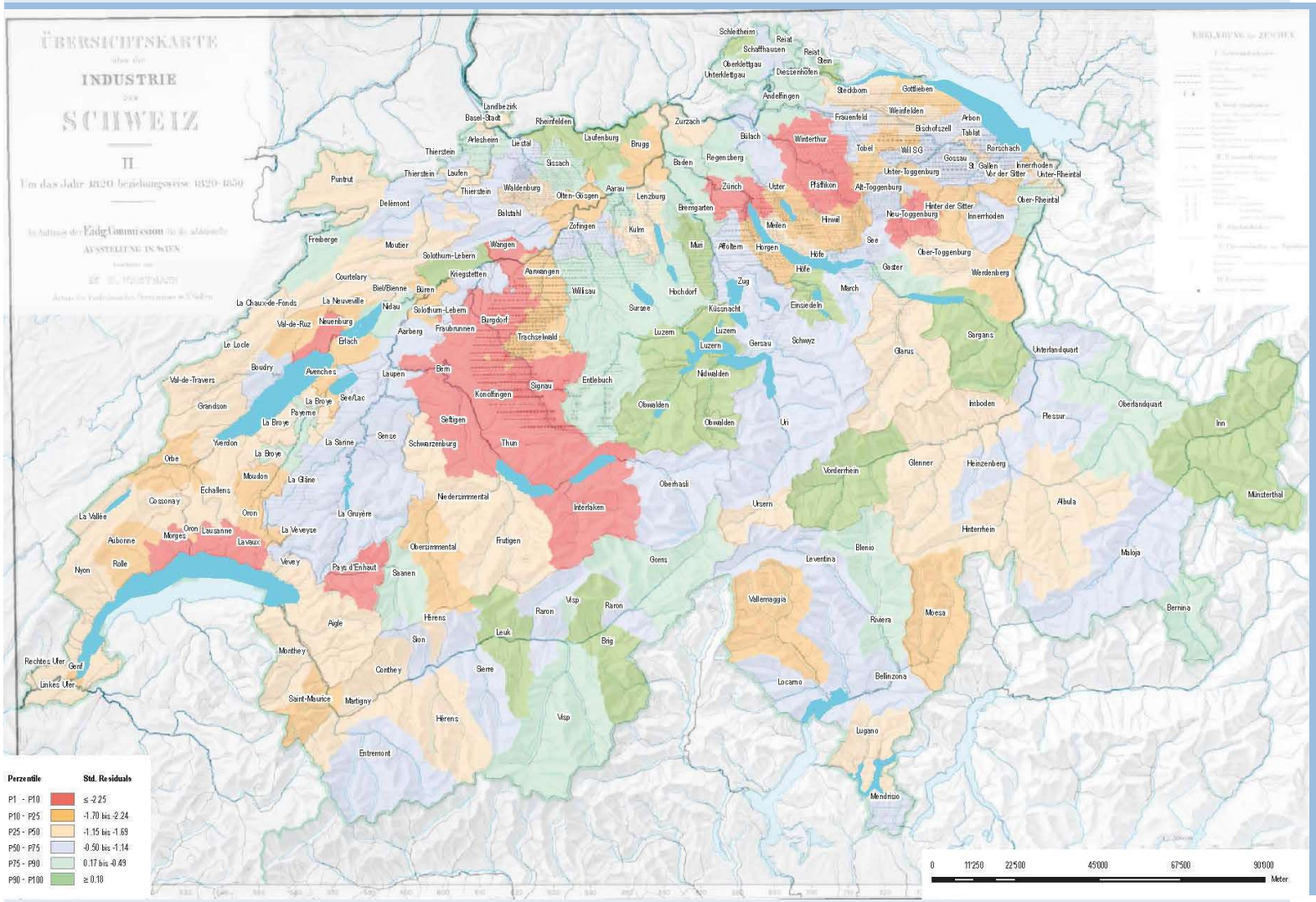

Malnutrition map for 1817. Source: Krämer 2015

The Tambora eruption of 1815 and its impact on society

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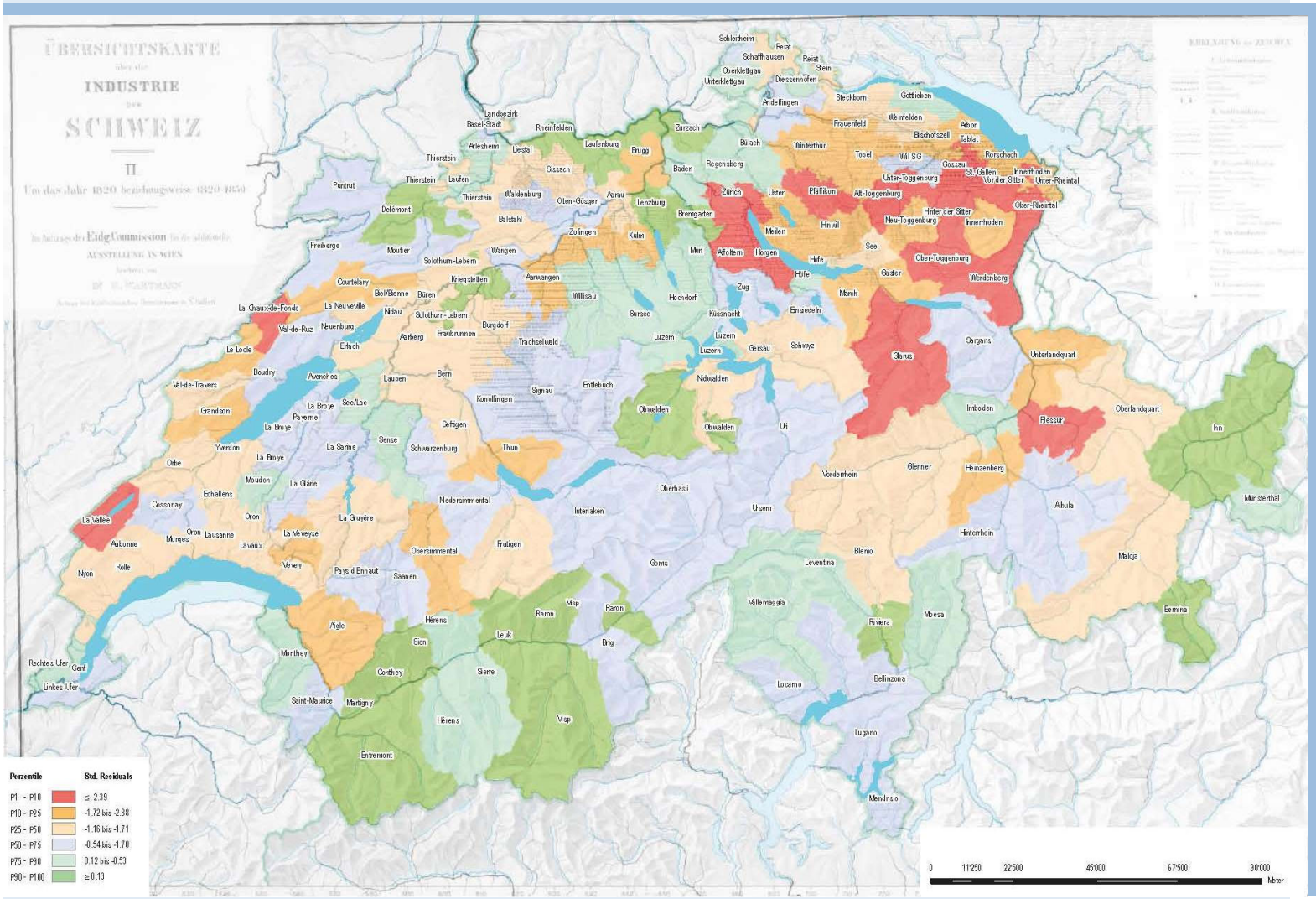

Malnutrition map for 1818. Source: Krämer 2015

Weather- and climate-induced natural hazards
Supra-regional and local events

- Floods (see my contribution to the Brig conference)
  - Large-scale floods
  - Thunderstorms and flash-floods
  - Marshland deriving from frequent flooding
- Droughts
- Hailstorms
- Storminess
  - Continental storm events (mostly westerlies)
  - Inner-Alpine storm phenomena (Foehn storms etc.)
- Forest and urban fires
- Avalanches
- Landslides and mudslides related to extreme weather conditions

Adaptation strategies to environmental and climatic challenges

- Risk cultures in pre-industrial times
  - Cities along rivers integrate the frequent floods into their economic life
  - Protection of protected forests (e.g. Andermatt)
  - Inhabitants of avalanche-prone pass routes develop cooperative structures and special skills in rescuing buried victims
- Structural adaptation to dominant weather patterns and natural hazards
  - Settlements optimized to be as flood-/avalanche-proof as possible
  - Houses along rivers adapted to flood risk
  - Development of new types of houses in alpine areas (Ebenhöch houses)
  - Orientation of houses and roofs according to dominant wind direction
- Trial and error principle
  - Late medieval Walser settlements in high alpine terrain

Avalanches
Basic types

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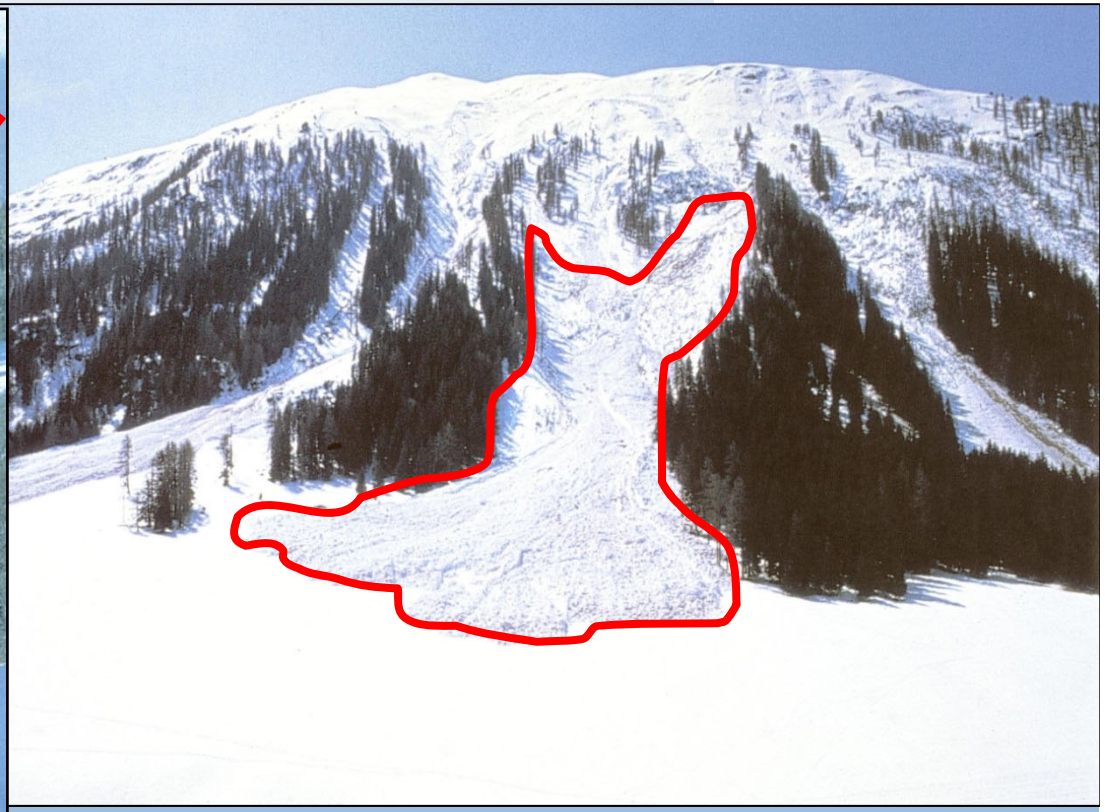
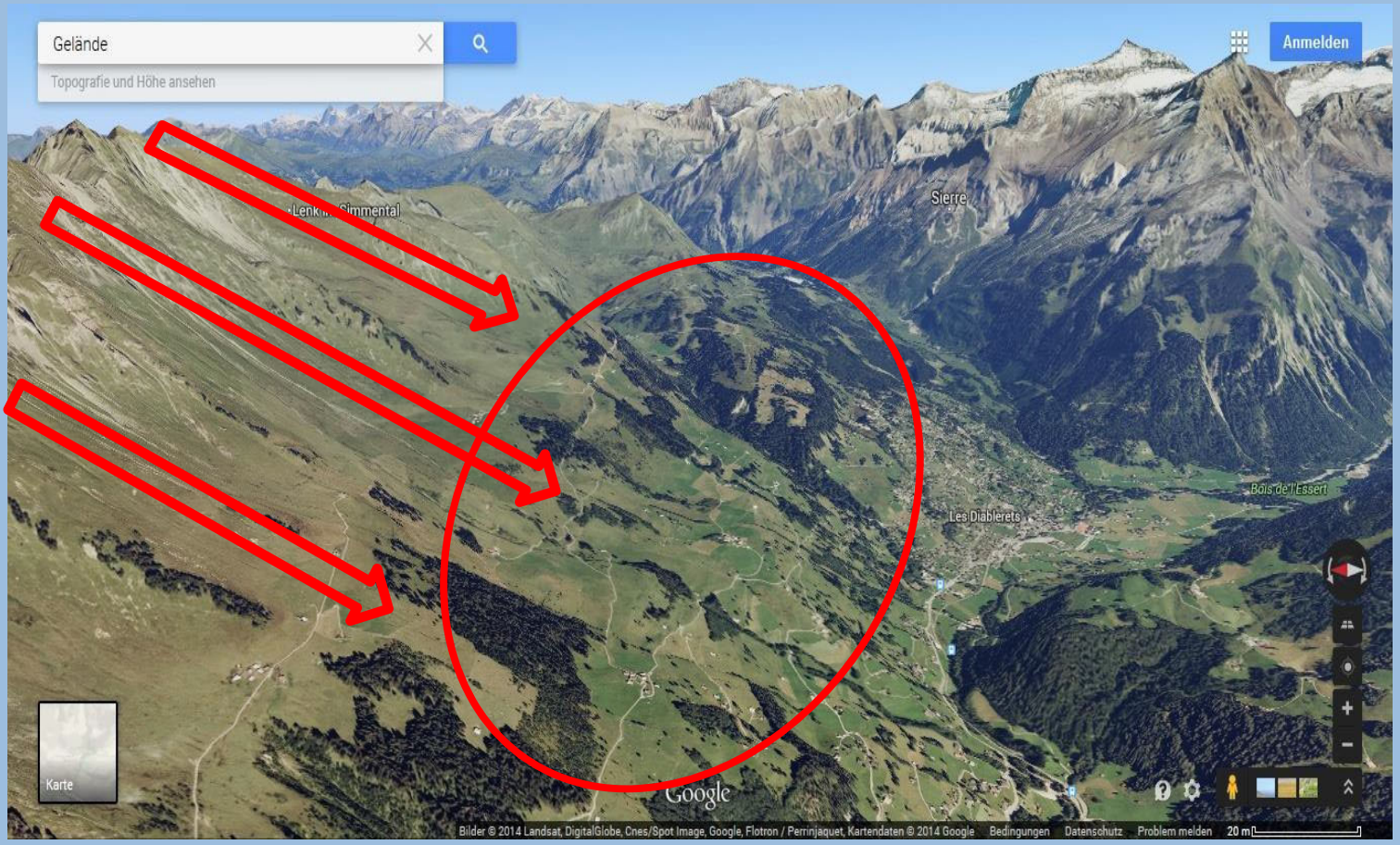


Slab avalanche

Powder snow avalanche

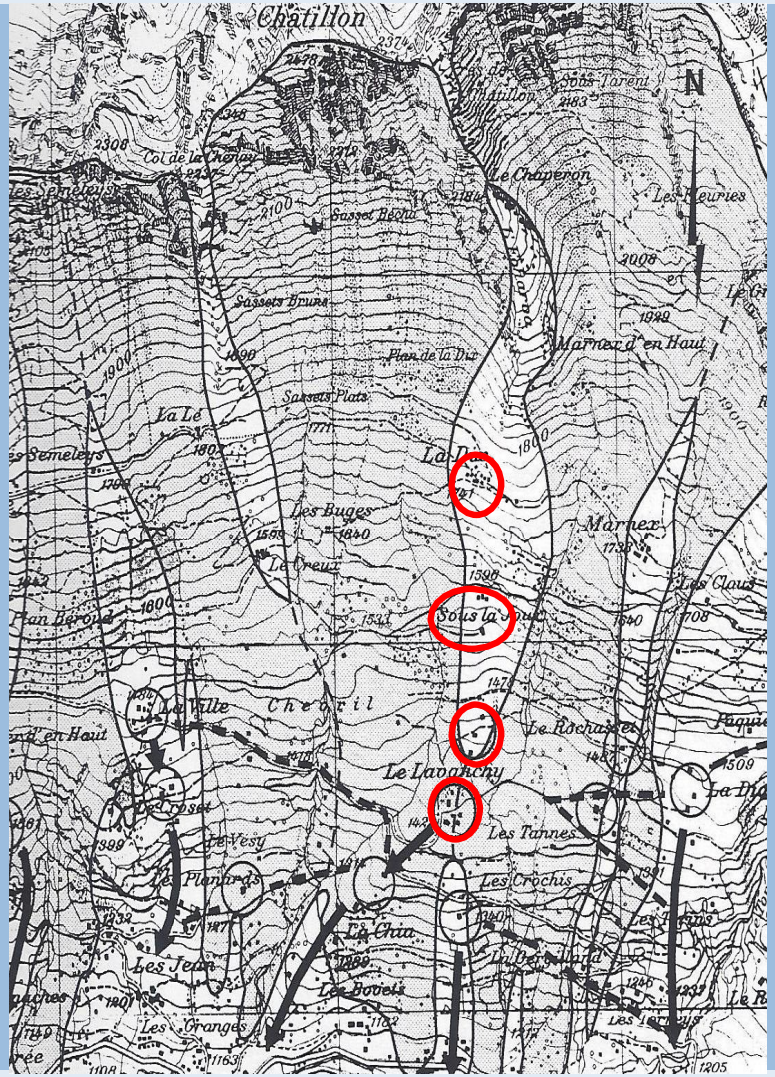
Photos: SLF

Local knowledge of endangered zones
Vallée des Ormonts (Vaud, Switzerland)

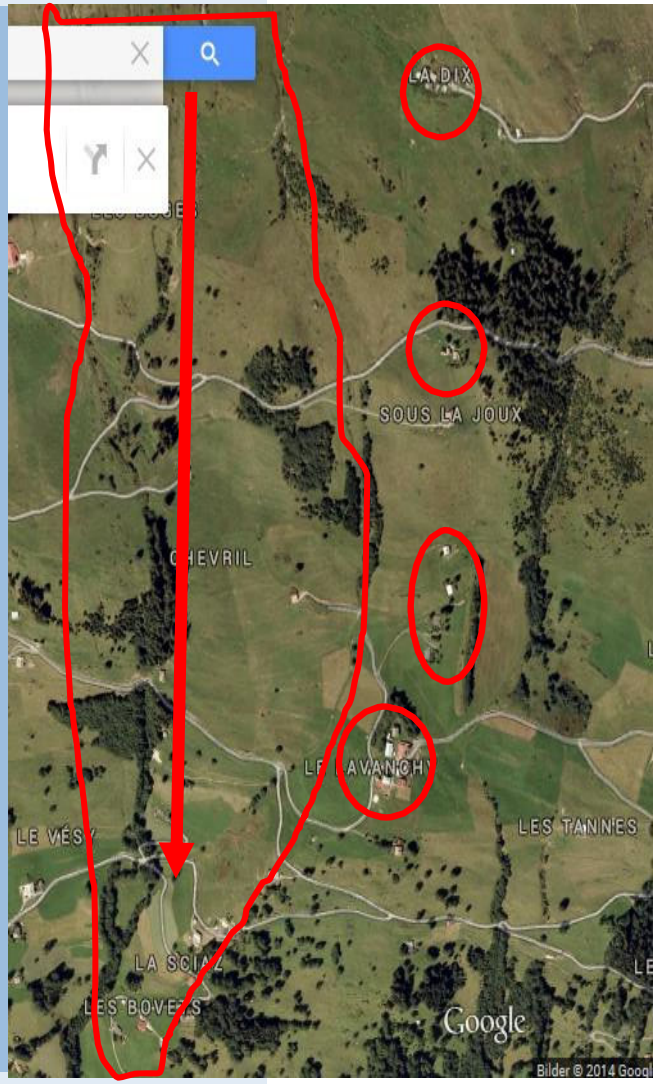


Google Maps, 07.04.2014

Local knowledge of endangered zones
Vallée des Ormonts (Vaud, Switzerland)



Source: Schoeneich, Busset-Henchoz: 2002: 59.



Google Maps, 07.04.2014

Avalanches in the Alps
Ebenhöch houses in the Cantons Grisons and Valais

Ebenhöch houses in St. Antönien im Prättigau (Grisons, Switzerland). Photo: SLF

Avalanches in the Alps
Splitting chocks, protective walls

Davos (Grisons), splitting chock of the Frauenkirche (after 1602). Photo: Christian Rohr

St. Antönien (Grisons), protective wall against avalanches. Photo : SLF

The protective forest of Andermatt
Documented and protected since 1397

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Andermatt around 1900, coloured photo

Structure of the chapter for the handbook (1)

- Climatic and weather preconditions
  - Long-time climatic developments and short-time climatic extremes
  - Weather- and climate-induced natural hazards
  - Specific Alpine peculiarities
    - Micro-climatic conditions
    - Seasonal variability
- Environmental preconditions
  - Water regimes
  - Vegetation
    - Forests
    - Pastures
    - Agricultural farmland
  - Mountains between resource use and “uselessness”
    - Mineral resources (in coordination with the chapter on mining)
    - Environmental factors influencing travel, trade and tourism

Structure of the chapter for the handbook (2)

- State of the art (in interdisciplinary perspective)
  - Historical studies
  - Natural sciences (climatology, hydrology, plant sciences, etc.)
  - Alpine archaeology and anthropology
- Sources and their origins
  - Archives from nature
  - Human-made sources (written, pictorial, material evidence, anthropogenic adaptation of the environment)
- Adaptive strategies for economic/daily life
  - Settlement, housing and mobility
  - Yearly working cycle (agriculture, pasture and transhumance, trade and travel, early tourism)
  - (Natural) disaster management
  - Resource management (water, forests, pastures, mining; in coordination with the neighbour chapters)

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Thank you for your attention!

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