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# northern Italy – a turning point in water management and The severe flood of 1868 in southeast Switzerland and in prevention policies?

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Acqua Roma – Nourisher of Life and Bearer of Meaning

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# Outline

- General considerations
  - Historical hydrology
  - Disaster perception
- The flood of 1868
  - An interdisciplinary research project at the Oeschger Centre
  - Historical sources
  - Reconstruction
  - Disaster management
  - Political consequences
  - Further research
- Conclusions

## **Historical hydrology**

- Main issues of natural and engineering sciences
  - Reconstruction of extreme historical events (peak discharge, affected areas)
  - Generation of data to calculate the recurrence probability of extreme floods
  - Definition of endangered areas towards floods
- Social and cultural studies
  - Study of regional and supra-regional adaptation strategies
    - Settlement places
    - Building techniques, flood protection in general
    - Memory cultures
  - Examination of the economic and social impact on society
  - Analysis of historical coping and adaptation strategies (including inappropriate behaviour) to support present-day and future decisions

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# From natural hazards to (natural) disasters



- Parameters to perceive a natural hazard as disaster (Rohr 2007)
  - The helplessness of the people trying to cope with the damage with the available means
  - The inability of individuals to explain and understand the event
  - The material and personal suffering
  - The unexpectedness of the event, which depends on how prepared a society is for one-time or recurrent threats
  - Whether there is a series of natural hazards within a short period of time, which can raise the vulnerability of the afflicted people
  - The symbolic connotations and patterns of interpretation, such as connections to natural disasters described in the Bible
  - The general predicament, such as a simultaneous economic, religious and climatic crisis (e.g. during the sixteenth century in Europe)

### The flood of 1868 Interdisciplinary research project at the Oeschger Centre

- 150 years anniversary in 2018
- Contributing disciplines
  - Climatology
  - Hydrology
  - Forestry Studies
  - Geology
  - Environmental and Climate History
  - Political Science
- Publication addressed to a wider public (Geographica Bernensia)
  - Available online and in print
  - German, English, French and Italian version



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1868 – the flood that changed Switzerland: Causes, consequences and lessons for the future



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### The flood of 1868 Historical sources

- Written sources
  - Local and supra-regional newspapers
    - Gazzetta Ticinese
    - Gazzetta Piemontese (predecessor of La Stampa)
    - Bozner Zeitung
  - Contemporary scientific treatises (e.g. Coaz 1869, Arpagaus 1870)
- Instrumental measurements and other weather observations
  - Swiss national meteorological network (today MeteoSwiss) established in 1863
  - Basic data for climatological and hydrological modelling today
- Pictorial and epigraphical evidence
  - Drawings, early photographs
  - Maps of the inundated areas
  - Flood marks

### The flood of 1868 Reconstruction

- Heavy rain in late September and early October 1868
  - Massive low pressure weather coming from the western Mediterranean
  - Highest water level of Lago Maggiore in historical times
- Afflicted areas
  - Southern and eastern cantons of the Swiss Federation (Valais, Ticino, Grisons, St. Gall, Uri, Glarus)
  - Southwestern part of the Hapsburg Monarchy (Northern and Southern Tyrol, Trentino)
  - Northern part of the Kingdom of Italy (Piedmont, Lombardy)
- Extreme damage
  - According to C. Pfister (2009) the most expensive catastrophe in Switzerland between 1800 and 1987
  - 51 people killed

### The flood of 1868 Reconstruction



The Weather situation with PV (potential vorticity) streamer on 3 Oct. 1868. Shades of colour show the vertical movement (red means elevation) of the air masses in the middle troposphere (500 hPa). Source: Brönnimann et al. 2018: 9.

Rome, 15 October 2019

### The flood of 1868 **Reconstruction**





Rome, 15 October 2019

260

### The flood of 1868 Reconstruction





The flood of 1868 in the Alpine Rhine Valley near Au (SG), anonymous watercolour painting, private collection, 1868. Source: Copy of the State Archive, St. Gall

### The flood of 1868 Reconstruction

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The flood of 1868 in Verbania, Lago Maggiore (left), town arcades with flood mark of 4 Oct. 1868 (right), photographs. Source: Brönnimann et al. 2018: 7.

### The flood of 1868 Disaster management in Switzerland



- Existing flood prevention ineffective
  - Dams mostly broken
  - Bridges and roads flooded and/or destroyed (help reaches the afflicted areas only several days later)
- High level of solidarity within Switzerland and from abroad
  - Organized by the Swiss Federal Government to improve national coherence
  - Wave of donations (money, food, clothes)
  - Distribution works only partly
- Reconstruction of dams and other water protection starts shortly after the flood
  - "Wuhrmillion" (one million of Swiss Francs for protective measures)
  - Narrow-embankment protection system

### The flood of 1868 Disaster management





Etching by Ed. Mockly, Geneva 1868. Source: Schweizerisches Bundesarchiv / Summermatter 2012: 208; Rohr 2018: 30.

### The flood of 1868 Disaster management

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### APPELLO

del Comitato luganese di Soccorso alle vittime dell'alluvione del 27-28 spirante settembre

### TUTTI I CITTADINI, CONFEDERATI E FILANTROPI.

Alla notizia dei disastri che colpirono la Leventina e le altre valli superiori, la Municipalità di Lugano, facendosi interprete dei sentimenti della intiera popolazione e nell'intento di organizzare e raccogliere pronti ajuti a quegli infetici fratelli, ha eletto noi sottoscritti a costituire un Comitato di soccorso.

Grati di tale fiducia non esitiamo ad assumere il generoso mandato; e ci rivolgiamo su bito con pari confidenza ai nostri Concittadini e Confederati che sono dentro e fuori del paese nalio e a tutti gli uomini sensibili ai dolori del proprio simile.

La sciagura che opprime Leventina e Blenio non ha paragone nella nostra storia; eppure non ne conosciamo ancora tulta l'estensione. Jeri scra appena ci giungevan le notizie di Bodio, or ora bello e florido villaggio, or precipitato nello squallore: tutto il pingue territorio devastato, case, cascine e bestiami travolti dalle acque, e dieciotto vittime umane! Ed oggi solo, tre giorni dopo, ci è dato sapere la rovina di Corzoneso, dove altre ventitre persone perirono coll'intiero casale di Casserio. A Malvaglia altre cinque vittime umane, a Semione altre cinque. Appeal for aid by the newly founded Aid Committee of Lugano for the support of flood victims in the Leventina and Blenio valleys, merged with a status report from the worst-hit region. Source: Gazzetta Ticinese, 1 Oct. 1868: 897.

### The flood of 1868 Political consequences in Switzerland



- Flood protection and forestry affairs still in the competence of the single cantons
- The deforestation paradigm
  - Swiss Forestry Association ("Schweizerischer Forstverein") leads a decade-long debate on the consequences of deforestation in the mountains (published in the "Swiss Journal of Forestry")
  - Deforestation seen as the main reason for floods in the valleys
  - Only the flood of 1868 makes this issue a task for federal and cantonal politicians
- Political consequences
  - Flood prevention and forestry affairs become tasks of the Federal State (Amendment of Art. 24 of the Swiss Federal Constitution, 1874)
  - Swiss Federal Forestry Act on high-Alpine forests (1876)
  - Swiss Federal Hydraulic Engineering Act (1877)

### The flood of 1868 The situation outside Switzerland – Further research



- Detailed research only for the Swiss part of the flood of 1868
- Newspaper from Southern Tyrol and Piedmont show the high potential for further studies
  - How did the new Kingdom of Italy react on the floods?
  - Did the Hapsburg administration judge this event only as a regional one without major consequences for flood management in general?
  - Vulnerability of newly built railway routes (e.g. Brenner route from Innsbruck to Verona, opened in 1867)
  - Improvement of the climatological models (currently based on data of the Swiss national meteorological network)

### Conclusions

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- The flood of 1868
  - Well-examined case study, at least for Switzerland
  - Worst-case, transcending the boundaries of cantons and states

### Consequences

- Scientific discourse on the impact of deforestation becomes an issue of politics as well
- Fundamental changes in forestry and flood management legislation
- Wave of solidarity in Switzerland strengthens the coherence of the Federation
- Political consequences for the new Kingdom of Italy and for the Hapsburg Monarchy still to be examined

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### Thank you for your attention!

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