An updated LIA glacier length record for the central and western European Alps based on historical data

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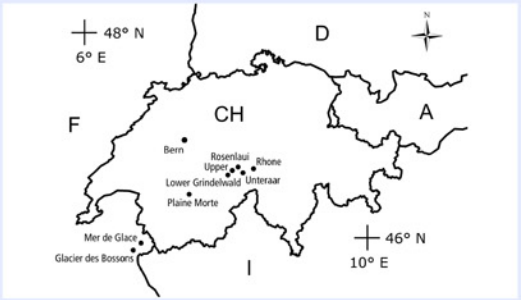
Introduction

At the end of the 19th century, the first accurate measurements of glacier length fluctuations were carried out. Unfortunately, the preceding time of the Little Ice Age (LIA) is not documented by instrumental data, and interdisciplinary approaches that use both historical and physical methods are needed to reconstruct the behaviour of glaciers back in time.

Study sites



Methods

The analysis and interpretation of historical documents (drawings, paintings, prints, photographs, maps, written accounts) allows the determination of former glacier extents. Regarding pictorial documents, three conditions have to be fulfilled in order to obtain reliable former glacier extents [1]:

1. The dating of the pictorial document has to be known or reconstructed.
2. The glacier and its surroundings have to be represented realistically and topographically correctly (which implies certain qualities of the picture and skills of the corresponding author).
3. The artist's position in the field should be known.

Historical material is only available in any adequate quantity for those glaciers which drew the attention of travellers, scientists and artists through their reputation and scenic attraction. Besides, other evidence such as moraine findings, fossil trees in the glacier foreland and archaeological findings complete the task [2, 3].

Rhone Glacier in 1824; drawing watercolour by Samuel Birmann; Kunstmuseum Basel.

Rhone Glacier in 1856; photopgraph by Frédéric Martens; Alpine Club Library London.

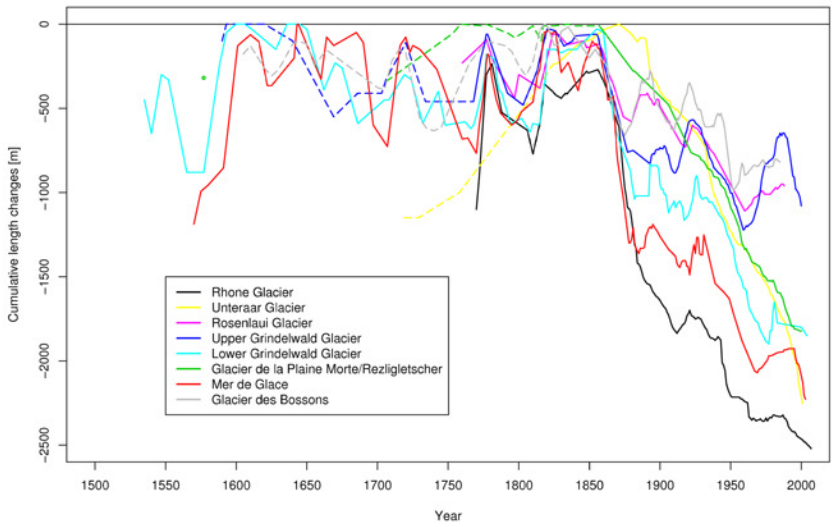
Rhone Glacier in 1998; photograph by Heinz J. Zumbühl.

Glacier de la Plaine Morte in 1776/77; oil painting by Caspar Wolf; Aargauer Kunsthaus Aarau.

Rosenlaui Glacier in 1856; oil painting by John Brett; The Tate Gallery London.

Front of the Glacier des Bossons; oil painting by Jean-Antoine Linck; Conservatoire d'art et d'histoire, Annecy.

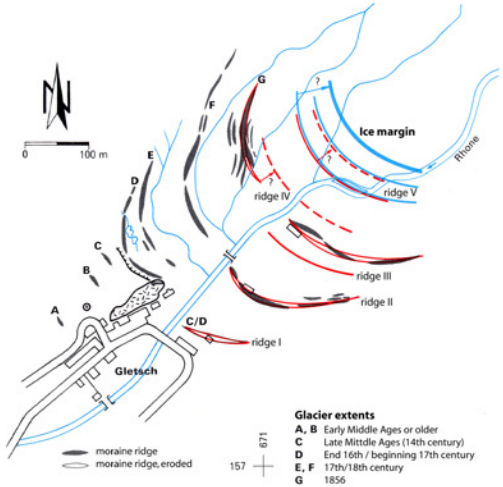
Glacier length record for the central and western European Alps based on historical data



Cumulative glacier length changes relative to the maximum extent during the LIA.

Sources:
[1], [2], [3], [5], [6] modified, [7]

Rhone Glacier forefield according to S. Birmann



Outlook

The analysis of historical sources and the hereby derived quantitative data are the prerequisite to study the connection between climatic driving factors and glacier changes. Using high-resolution climate reconstructions (temperature, precipitation), it can be showed that different configurations of climate variables lead to a glacier advance/retreat [3, 4].

References

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Acknowledgements

This work is supported by the Swiss National Science Foundation, grant 200021-116354.