Alpine flood variability and past climate changes: a view from paleorecords

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Introduction

Changes in flood hazard with global warming

"*There is*

limited to medium evidence available to assess climate-driven changes

… (and) ***low agreement in this evidence****…*"

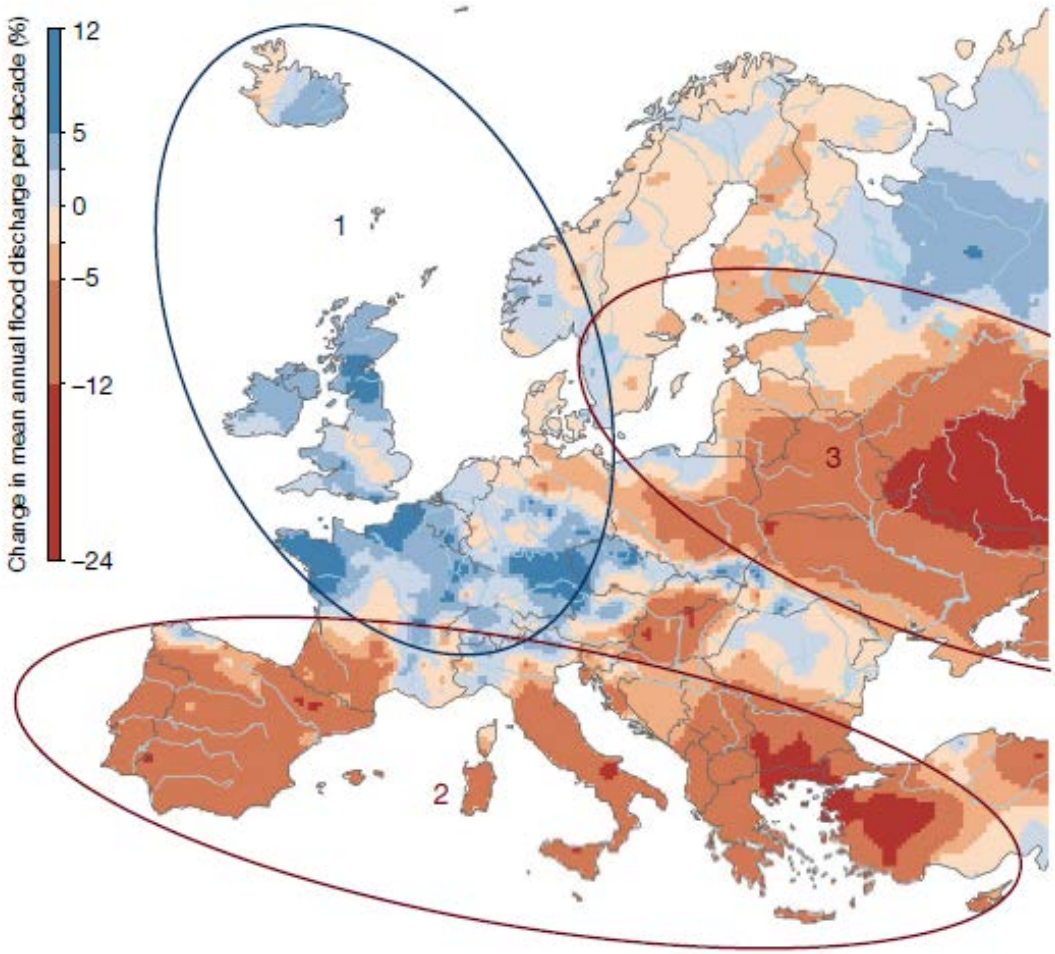
IPCC, 2013

Introduction

Changes in flood hazard with global warming

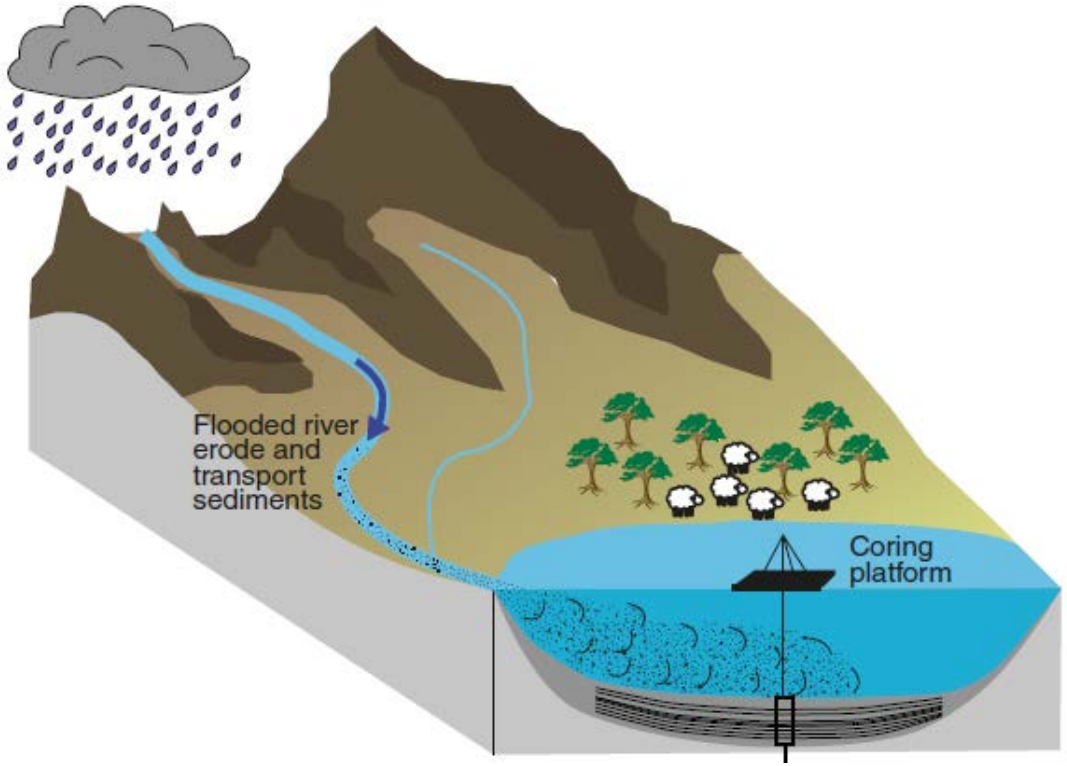
Most recent study:
- Consistent regional patterns
- Process-oriented patterns

(Strong) limitations
- Annual flooding
- Short-term variability (1950-2010)
- No clear pattern in the Alps



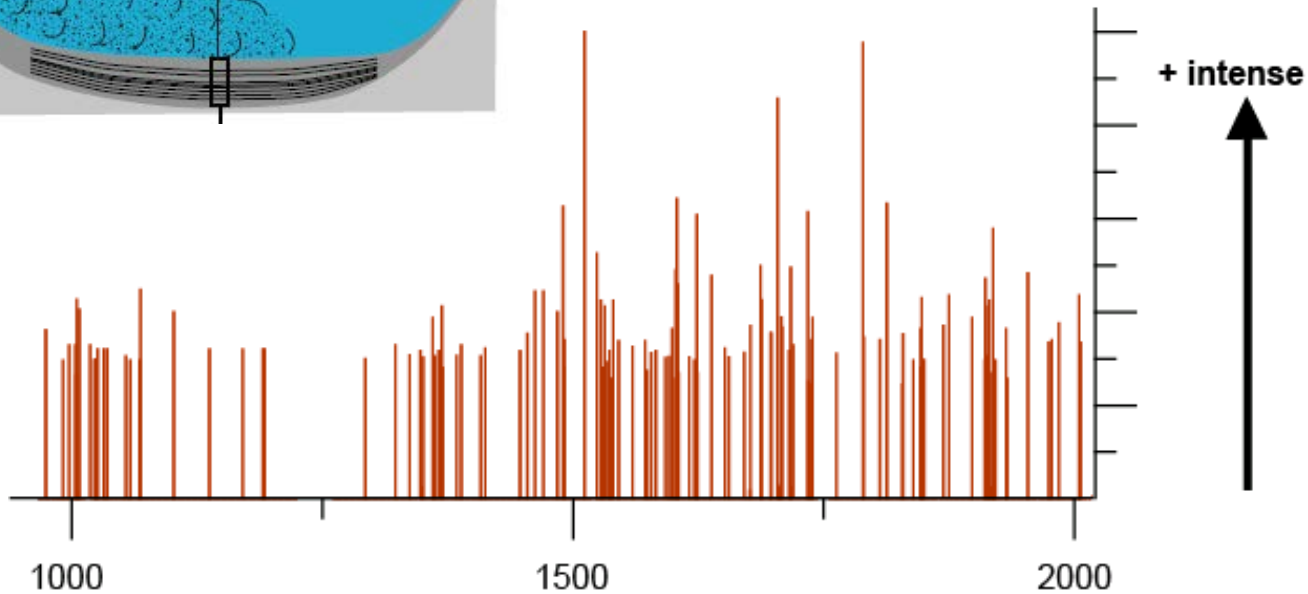
Blöschl et al., Nature, Aug. 2019

What evidence?



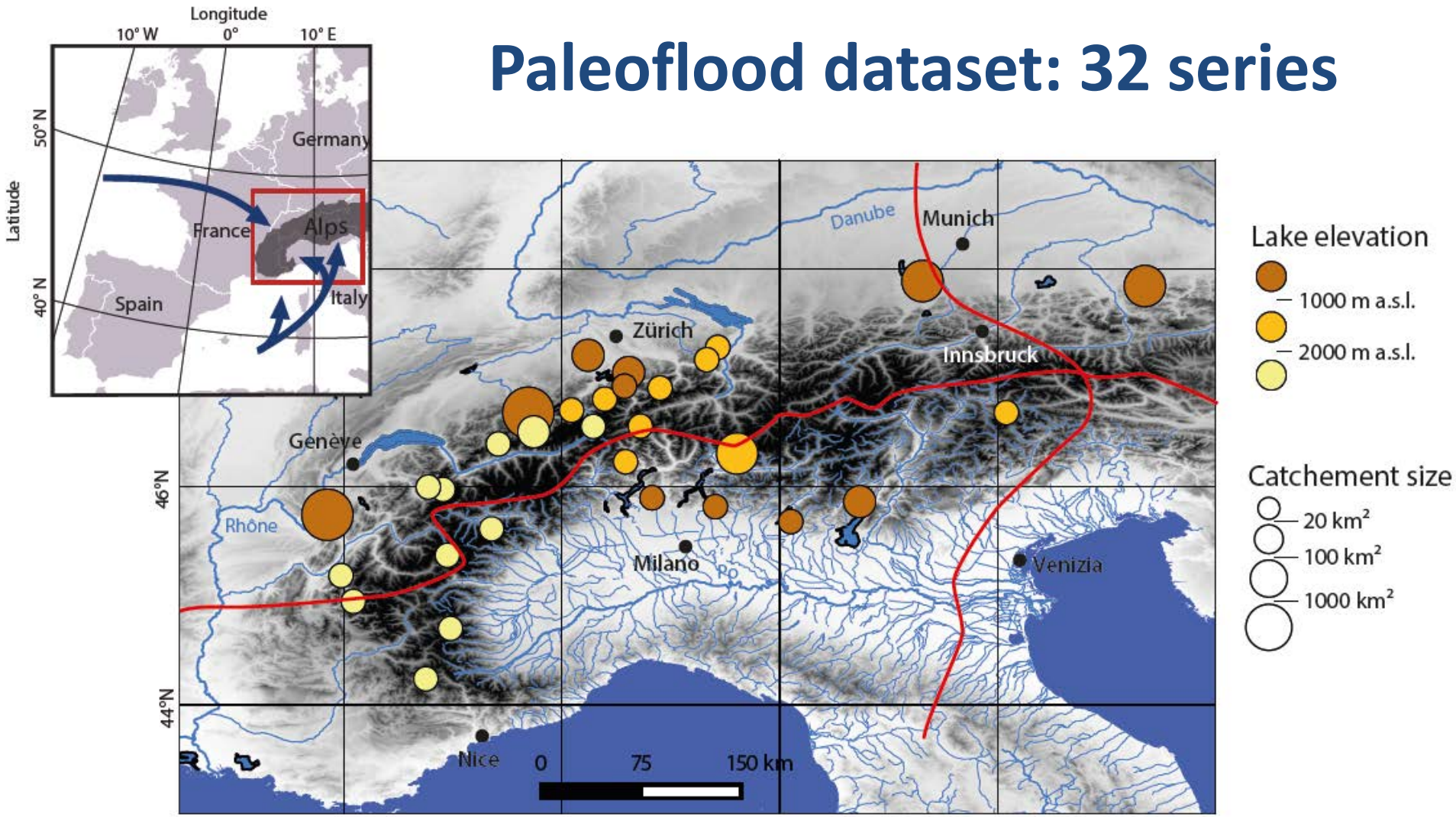
Natural archives: lake sediments

Wilhelm et al., Water Security, 2018
Wilhelm et al., WIREs, 2019



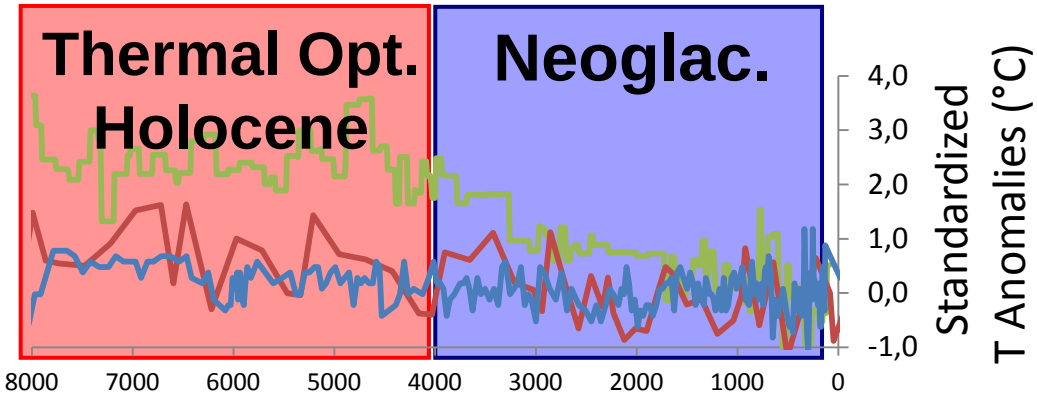
Available dataset

Paleoflood dataset: 32 series



Analysis

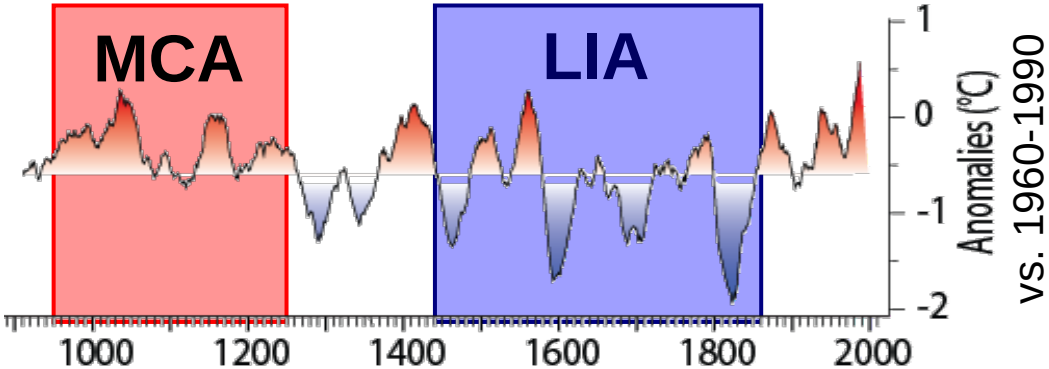
1. How did the flood frequency evolve during past warm and cold periods?



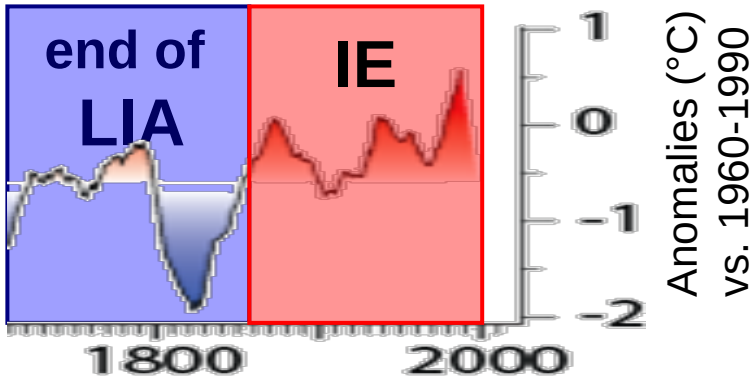
Affolter et al., Sci Adv. 2019; Samartin, NG, 2018; Heiri et al., 2014, H

3 time windows:

- 3 different time lengths
- 3 different contexts of temperature forcing

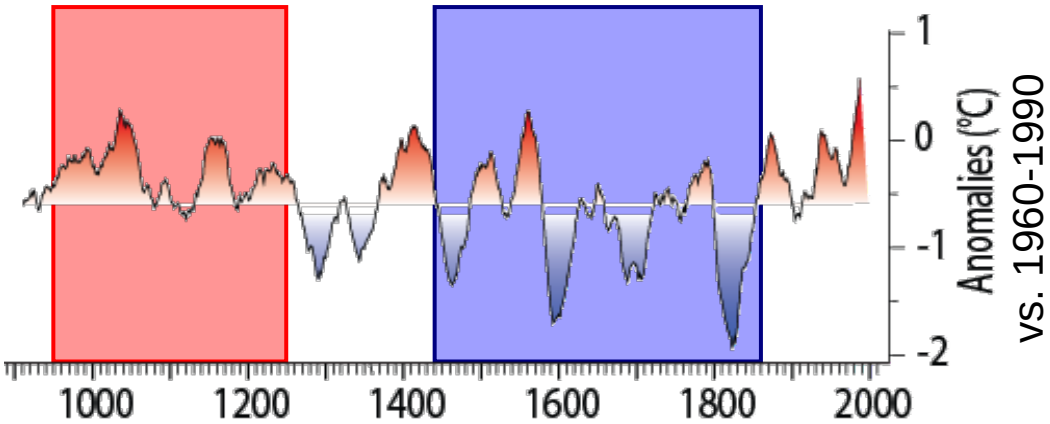


Buentgen et al., Sci. 2011



2. How did the flood magnitude evolve during past warm and cold periods?

Occurrence of 100-yr return period floods during the **MCA** vs. the **LIA**



1 time window
Limited dataset

Conclusion

During warmer periods

Lower flood frequency

-> over the whole Alps
-> NOT dependent on the studied period
-> NOT dependent on the time scale
(millennial to centennial)

Lower OR Higher occurrence of 100-yr floods

-> dependent on the triggering precipitations (convective vs. frontal systems)
-> /!\ relying on a small sample