

Was the last glaciation of the Black Forest (southern Germany) synchronous with the Alpine glaciation?

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Scientific context and approach

- During the last glaciation maximum, the southern Black Forest was covered by a 1000 km² large ice cap dominated by radial ice flow from Feldberg (Fig. 1)
- Due to multiple moraines (Fig. 1) inside the last local glacial maximum glacier extent, its limited size and the lack of significant topographic control, the ice cap of Black Forest is a valuable palaeoclimatic archive
- According to Monegato *et al.* (Fig. 2): growth of North American Ice Sheet → southward shift of the North Atlantic jet stream → advection of moisture from the Mediterranean Sea → enhanced ice build-up in the Alps

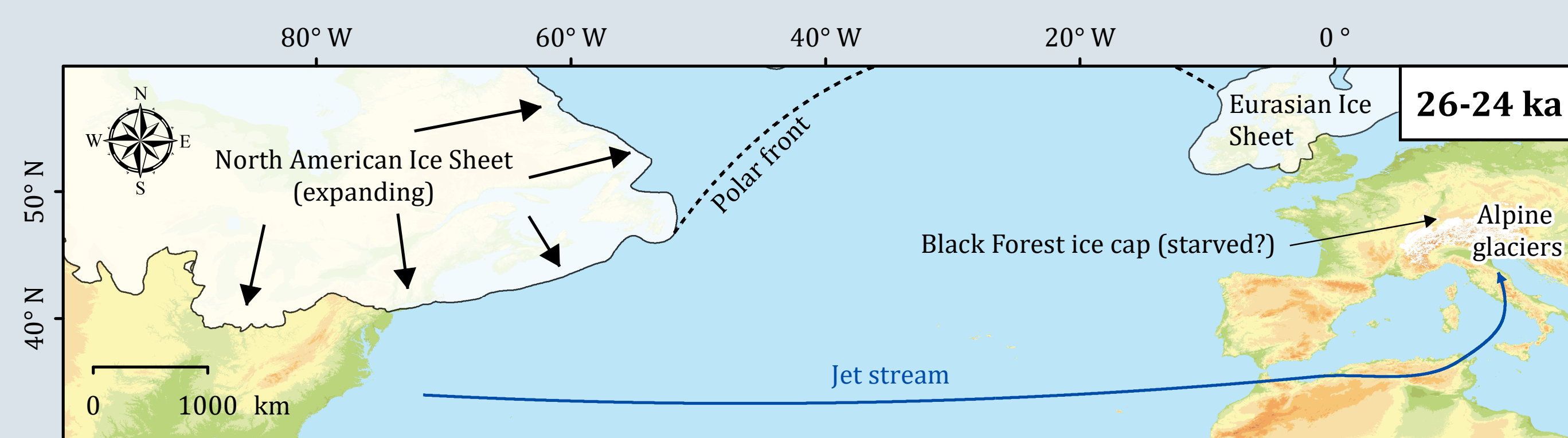


Fig. 2: Palaeoclimatic context at ca. 26-24 ka (Monegato *et al.* 2017)

- Black Forest in a leeward position to the glaciers in the Alps;
Hypothesis: Last glaciation maximum in the Black Forest out of phase?

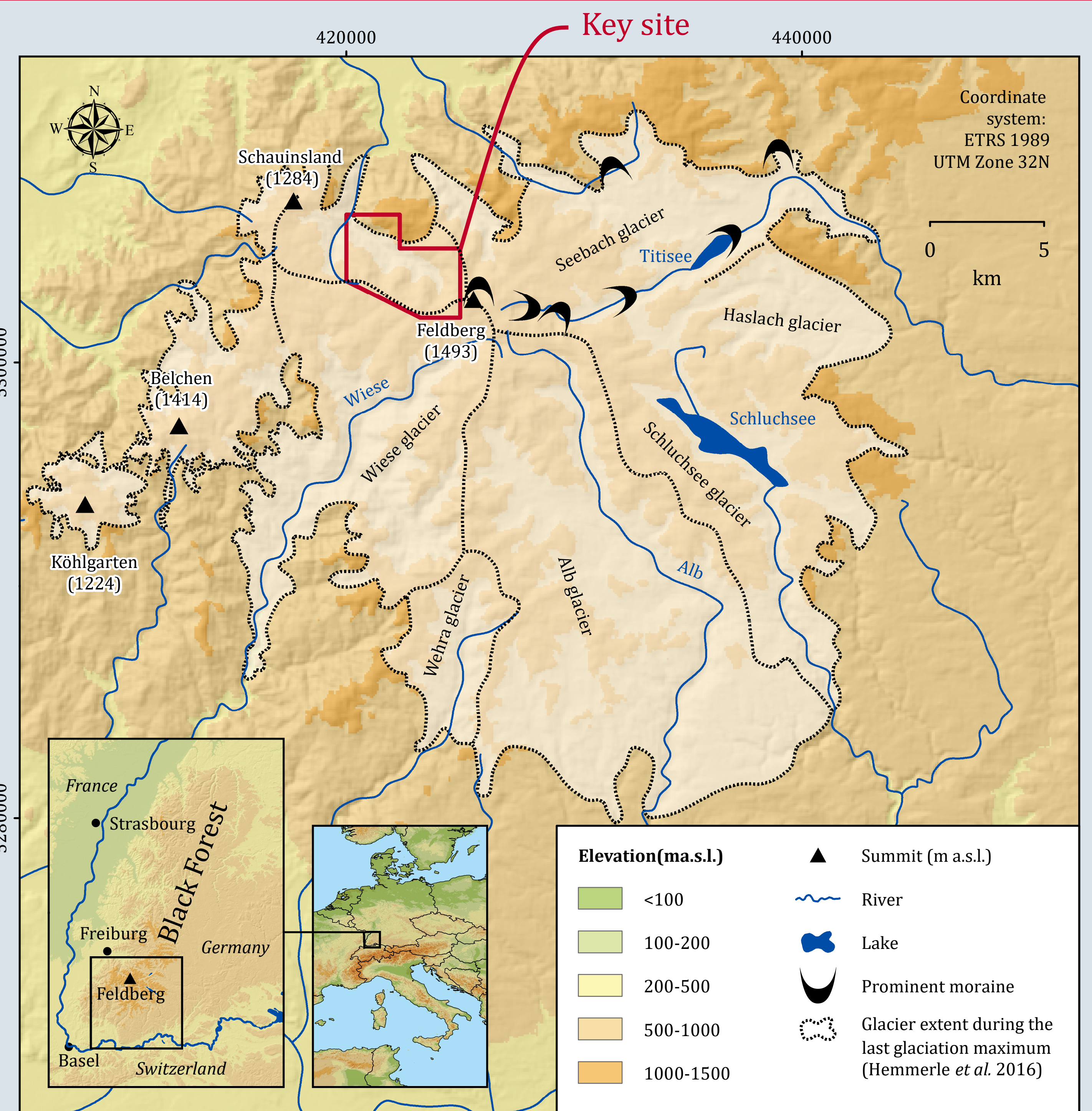


Fig. 1: Location of the study area, last local glacial maximum extent in the Black Forest and prominent terminal moraines

Key site: Sankt Wilhelmer Tal

- Geomorphological mapping with particular emphasis on moraines based on new field evidence and high-resolution remote sensing data

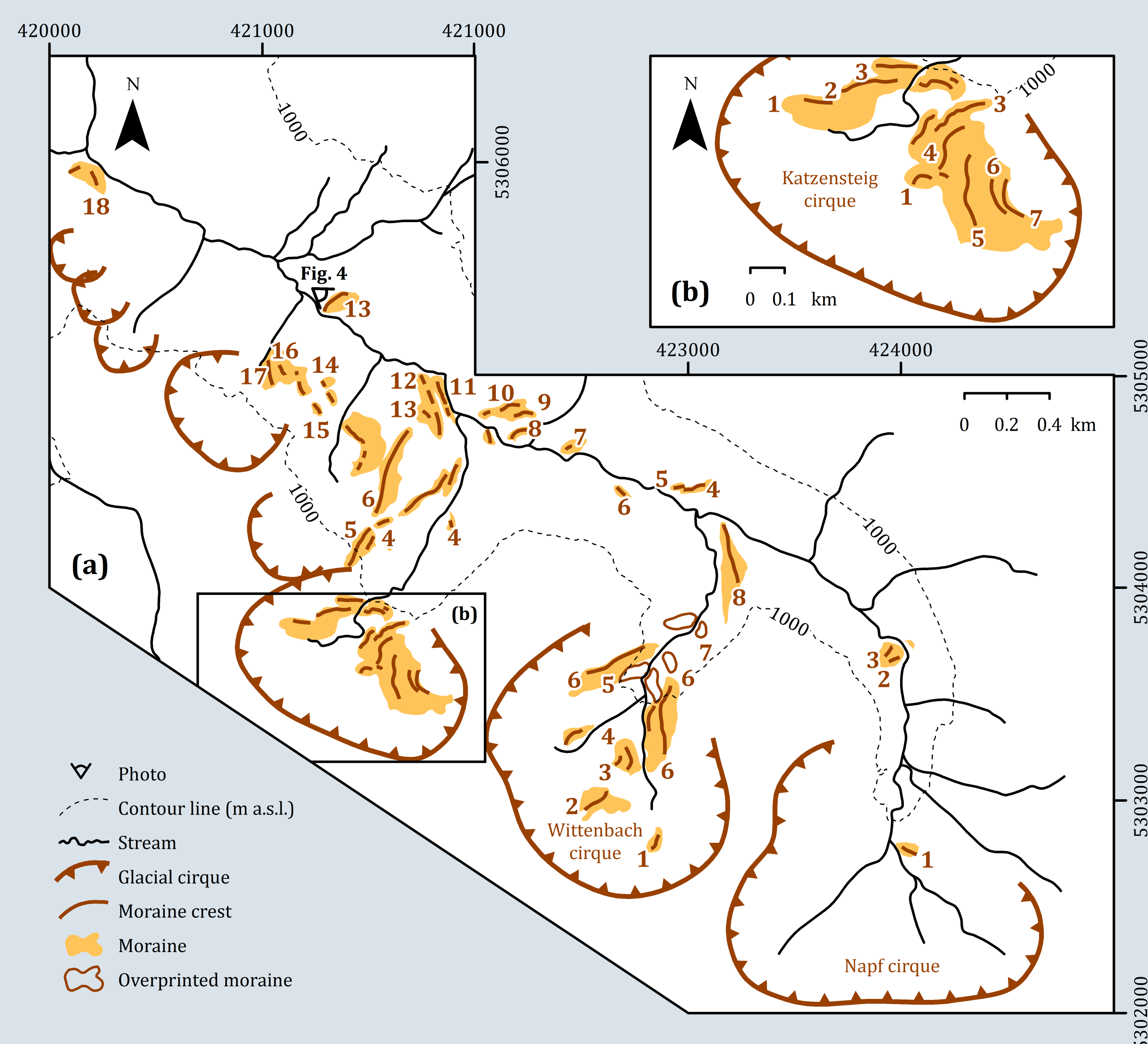


Fig. 3: Moraines in (a) Sankt Wilhelmer Tal and in (b) Katzensteig (numbering: morphostratigraphical position). Coordinate system: ETRS 1989 UTM Zone 32 N



Fig. 4: The prominent M13 moraine in Sankt Wilhelmer Tal viewed from NW (Photo: Felix Martin Hofmann)

Future directions

- Geomorphological mapping of further sites
- Application of modern geochronological methods to numerically date the last glaciation maximum and periods of glacier variability during the subsequent deglaciation: ¹⁰Be surface exposure dating of moraine boulders (Ivy-Ochs & Kober 2008) and dating with luminescence depth-profiles from boulders buried inside terminal moraines (Rades *et al.* 2018)
- Palaeoglacier modelling, equilibrium line altitude reconstructions as well as determination of palaeo-precipitation and temperature together with data from the lake Bergsee record (southernmost Black Forest; Duprat-Oualid *et al.* 2017)

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References

- Duprat-Oualid F, Rius D., Bégeot C., Magny M., Millet L., Wulf S., Appelt O. 2017. Vegetation response to abrupt climate changes in Western Europe from 45 to 14.7 k cal a BP: the Bergsee lacustrine record (Black Forest, Germany). *J. Quaternary Sci.*, 32, 1008-1021.
- Hemmerle H., May J.-H., Preusser F. 2016. Übersicht über die pleistozänen Vergletscherungen des Schwarzwaldes. *Ber. Naturf. Ges. Freiburg i. Br.*, 106, 31-67.
- Ivy-Ochs S., Kober F. 2008. Surface exposure dating with cosmogenic nuclides. *E&G Quat. Sci. J.*, 57, 179-209.
- Monegato G., Scardia G., Hajdas I., Rizzini F., Piccin A. 2017. The Alpine LGM in the boreal ice-sheets game. *Sci. Rep.-UK*, 7, 2078.
- Rades E.F., Sohbat R., Lüthgens C., Jain M., Murray A.S. 2018. First luminescence-depth profiles from boulders from moraine deposits: Insights into glaciation chronology and transport dynamics in Malta valley, Austria. *Rad. Meas.*, 120, 281-289.