Supplementary material to EGU25-18463 Poster in Session CR1.1 Glaciers and Ice Caps under Climate Change

Modelling the fluctuations of two small alpine glaciers (Glacier de Tsanfleuron and Glacier du Sex Rouge, western Swiss Alps) throughout the Holocene (11.5 ka – 2100 CE)

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Study Glaciers

Glacier de Tsanfleuron (2.44 km^2 according to Swiss Glacier Inventory SGI2016, mean altitude of 2759 m a.s.l.) and Glacier du Sex Rouge (0.26 km^2 according to Swiss Glacier Inventory SGI2016, mean altitude of 2798 m a.s.l.) in the western Swiss Alps (Fig. S1).

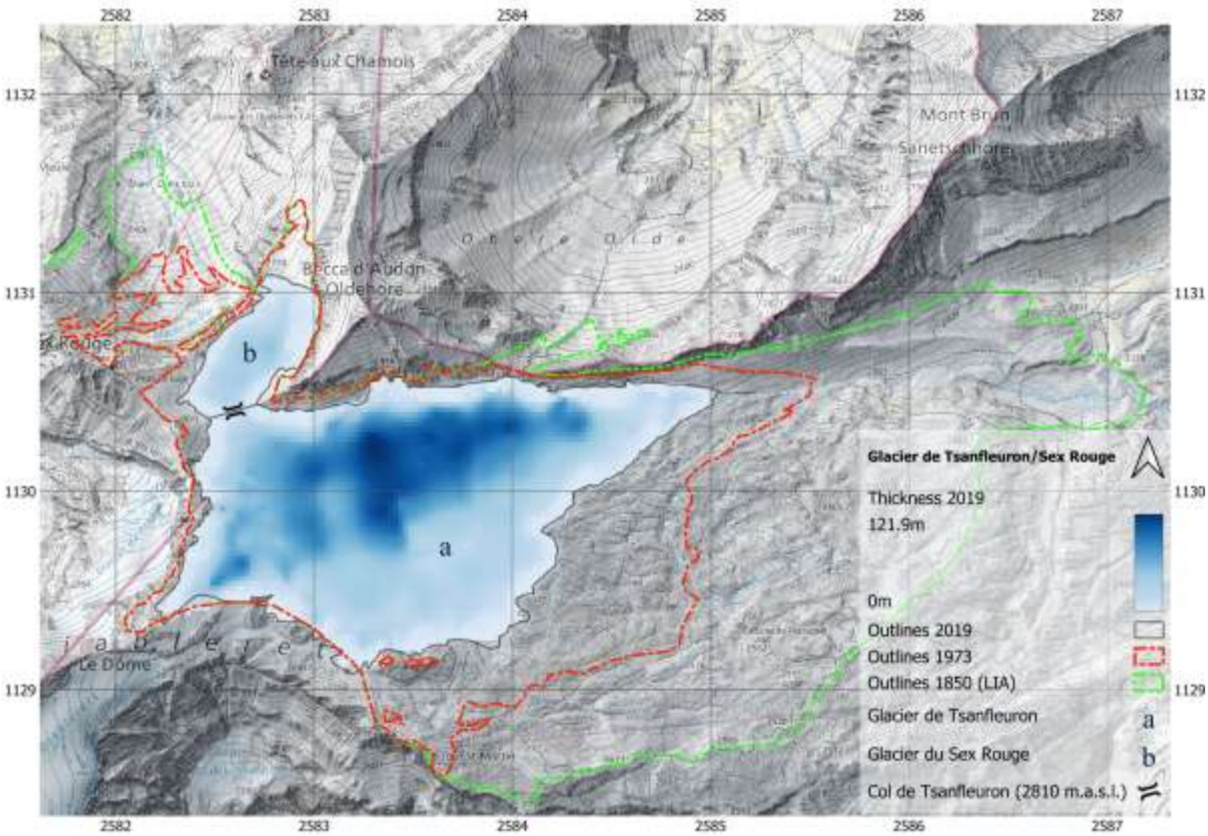

Figure S1. Ice thickness distribution in 2019 of Glacier de Tsanfleuron and Glacier du Sex Rouge as measured by UAV surveys (for surface elevation) and GPR surveys (for bed topography) by Neven et al. (2021).

Glacier data used for initiation and validation of the 3 IGM model runs

- **11.5 ka:**
  Reconstructed end-of-Younger-Dryas/early Holocene ***glacier outlines*** using data and evidence provided by Schoeneich (1998), Berthel et al. (2012), Steinemann et al. (2020) and Serra et al. (2021). In addition, the SGI1850 outlines (Maisch et al., 2000) were used.
  Glacier surface elevation was reconstructed inside the reconstructed early Holocene glacier extents via digitisation of reconstructed surface elevation contour lines.
  Bedrock topography was derived by merging 2019 measured glacier bed elevations from Neven et al. (2021) with current swissALTI^{3D} DEMs (swisstopo) outside the 2019 glaciers.

- **1850 (end-of-LIA):**
  Glacier outlines from the SGI1850 (Maisch et al., 2000).
  Glacier surface elevation reconstructed from Reinthaler and Paul (2025).
  Bedrock topography from Grab et al. (2021).

- **1974:**
  Glacier outlines from the SGI1973 (Müller et al., 1976).
  Glacier surface elevation DHM25 Level 1 (swisstopo).
  Bedrock topography from Neven et al. (2021) merged with swissALTI^{3D} (swisstopo)

- **2019:**
  Glacier outlines from Neven et al. (2021)
  Glacier surface elevation from Neven et al. (2021) merged with swissALTI^{3D} (swisstopo)
  Bedrock topography from Neven et al. (2021) merged with swissALTI^{3D} (swisstopo)

- **Mass balance data**
  In-situ measured glacier surface mass balance data (point and glacier-wide) for 2009/10 to 2023 from GLAMOS (2024)
  Geodetic mass balance data (glacier-wide) from Fischer et al. (2015) for 1980 to 2009/10

Climate data used as input for 3 IGM model runs

- **11.5 ka – 2000 CE:** CHELSA-TraCE21k (Karger et al., 2023)
- **1850 – 2020:** Imfeld et al. (2023)
- **1993 – 2023 CE:** Observations AWS DIA and DIB (MeteoSwiss and SLF)
- **2024 – 2100:** CH2018

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