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Constraining past bedrock surface temperatures at the Gorner glacier, Switzerland, using feldspar thermoluminescence for surface paleothermometry.

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Our ability to quantify past climate conditions is crucial for predicting future scenarios and landscape evolution. To date, reconstructions of the Earth's past climate have mostly relied on the use of climate proxies to infer previous surface conditions (e.g. Jones and Mann, 2004 for a review). However, few methods exist that are capable of directly measuring past temperature histories, particularly in terrestrial settings.

The aim of this study is to contribute towards a more detailed understanding of glacial and interglacial temperature fluctuations across the Central and Western Alps, from the Last Glacial Maximum to present day, by constraining past temperatures of exposed bedrock surfaces adjacent to the Gorner glacier in Zermatt, Switzerland. This is done through the recently developed application of feldspar thermoluminescence to surface paleothermometry (Biswas et al., 2018; 2020). The thermoluminescence signal of feldspar, from room temperature to 450°C, is sourced from a continuous distribution of electron traps within the crystal lattice (Biswas et al., 2018). The release of this trapped charge is temperature dependent and thus, at room temperature, results in traps with a range of thermal stabilities with electron residence times ranging from less than a year to several billion years (Aitken 1985). Traps sensitive to typical surface temperature variations (e.g. □10°C) have been shown to lie between 200°C and 250°C of the TL glow curve (Biswas et al., 2020). From this temperature range, five thermometers (200°C to 250°C in 10°C intervals) can be used together as a multi-thermometer, and subsequently combined with a Bayesian inversion approach to constrain thermal histories over the last □50 kyr (Biswas et al., 2020).

In this study, the preliminary temperature histories of five bedrock samples with independently constrained exposure ages, exposed progressively since the Last Glacial Maximum, will be presented.

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