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Constraining Last Glacial Maximum bedrock surface temperatures in the Western Alps using thermoluminescence paleothermometry.

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Our ability to quantify past climate conditions is crucial for understanding and predicting future climate scenarios as well as landscape evolution. One of the most drastic climatic changes in Earth's history was the Last Glacial Maximum (LGM) where a significant area of the planet's surface was covered in ice (Clark et al., 2009). However, most reconstructions of the Earth's past climate rely on the use of climate proxies (e.g. Jones and Mann, 2004 for a review), which are particularly poorly preserved in terrestrial settings previously covered by ice- thus limiting the applicability of existing methods.

Here, we apply feldspar thermoluminescence (TL) surface paleothermometry (Biswas et al., 2018; 2020) to better constrain the temperature history of exposed bedrock surfaces since the Last Glacial Maximum to present day. 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. Feldspar TL paleothermometry is a recently developed technique that exploits the dependence of trapped charge on temperature (Biswas et al., 2018). The trapped charge is sourced from feldspar's crystalline lattice. While a TL signal can be extracted between room temperature and 450°C, traps sensitive to typical surface temperature variations (e.g.10°C) are found between 200°C and 250°C (Biswas et al., 2020). As a result, 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 last50 kyr (Biswas et al., 2020).

The temperature histories of bedrock samples collected down two vertical transects adjacent to the Gorner (Switzerland) and the Mer de Glace (France) glaciers, which have been exposed progressively since the LGM, will be presented. Preliminary results suggest a temperature difference of □10 °C in both locations, which is promising and in agreement with past surface temperatures obtained from other studies.

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