

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

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→ In this study, we use feldspar thermoluminescence surface paleothermometry on exposed bedrock surfaces adjacent to the Gorner glacier, Switzerland. The hope is that the results will contribute towards a more detailed understanding of temperature fluctuations across the Central and Western Alps, from the Last Glacial Maximum to present day.

Theory

- Thermoluminescence (TL) is a trapped charge dating technique where a mineral (e.g. feldspar) emits light upon being heated.
- The trapped charge population is continuously subjected to two competing processes- growth and decay (via thermal and athermal pathways).

Study site

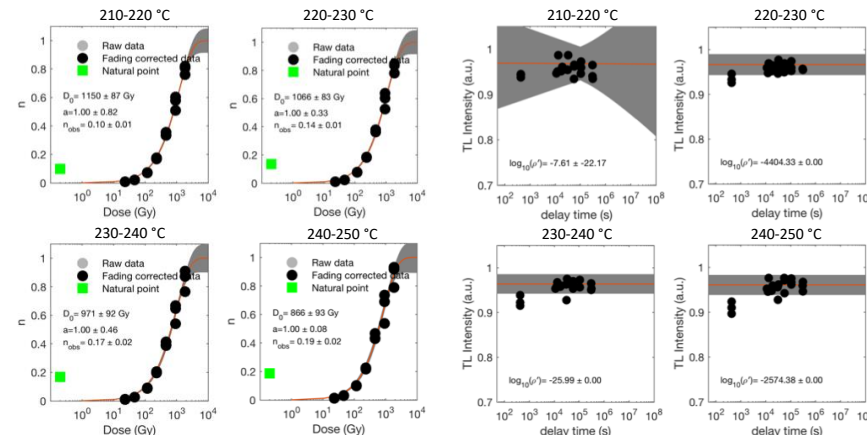
- This technique was applied to three south-facing bedrock samples adjacent to the Gorner glacier, Switzerland.



Methods

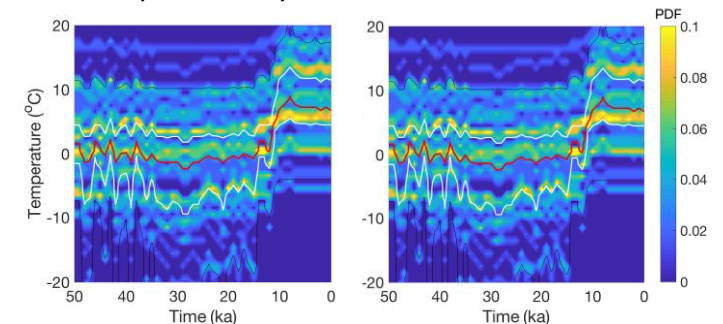
- The kinetic parameters dictating growth and decay of the TL signal are constrained in the laboratory for four TL thermometers (210- 250 °C in 10 °C intervals).
- A Bayesian approach is subsequently used to invert for the paleo-temperatures.

Examples results from constraining the kinetic parameters of growth and athermal decay.



Results and Discussion

- So far, preliminary results from three of the samples suggest:
 - LGM median temperatures of ~ -9.3 °C.
 - An increase in temperature from LGM to present day of ~ -6.8 °C.



Examples inversion results- The red line shows the median predicted thermal history, while the white and black lines are 1σ and 2σ respectively.

- These results are promising when compared to other studies in the region and overlap within 1σ.