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Low-temperature multi-OSL-thermochronometry of feldspar

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Constraining exhumation rates and landscape histories over Quaternary timescales represents a major challenge for understanding the interaction between changing climate and erosion processes. Facilitated by closure temperatures of as low as ∼30 C, OSL-thermochronometry is able to constrain cooling rates from the top few km of the earth's crust, and offers the potential for recent changes in erosion to be determined. Based on the well-established Quaternary dating technique of optically stimulated luminescence dating, OSL-thermochronometry benefits from a strong methodological and theoretical foundation.

A further advantage of OSL-thermochronometry is that it is possible to measure multiple luminescence signals from a single mineral, such as feldspar. Therefore OSL-thermochronometry can be used as a multi-thermochronometer whereby different signals from the same mineral have closure temperatures in the range of 30-70 C, enabling the derivation of very precise cooling histories. However, in contrast to other low-temperature methods, OSL-thermochronometry is limited by signal saturation, restricting its application to either elevated temperature settings (e.g. bore holes, tunnels) or rapidly exhuming terranes. Here we outline the principles of multi-OSL-thermochronometry of feldspar and its potential as a low-temperature thermochronometry system.