Comparison and evaluation of Feldspar-IRSL models for application in thermochronology

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Résumé

Over the past decades, significant advances in our understanding of trapped-charge techniques have been made. Particularly, the processes of electron trapping and de-trapping have been investigated through many laboratory experiments, as well as from physics theory. This has led to the conceptualization of numerical models that aim at reproducing trapped-charge signal growth and decay in response to ionising irradiation and exposure to elevated temperatures, respectively. Applications to thermochronology require accurate constraints of the kinetic parameters in these models to allow thermal histories, and ultimately exhumation histories, to be recovered. To date, several models exist to describe trapping and de-trapping of charge for Infra-red stimulated luminescence on feldspar, with different assumptions about the underlying physical processes. However, a recent application of these models to K-feldspar samples from the Mont-Blanc massif (European Alps), shows significant differences in the reconstructed cooling history of the massif in the last 200 kyrs, despite all models showing good fits to experimental data (dose response curves and isothermal decay curves). This is of primary concern since these differences in model predictions lead to opposite interpretations of the rock cooling history. Yet, benchmarking these models against known and natural isothermal history luminescence measurements from the KTB borehole does not discriminate model performance. In this presentation, I will summarize our findings and suggest potential way forward to better calibrate and validate trapped-charge models.

Mots-Clés: Trapped, charge models, Thermochronology, Feldspar IRSL

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