☐ **Talk** ☒ **Poster**

Linking luminescence signal dynamics to feldspar geochemistry: a synchrotron-based investigation to improve infrared-radiofluoresence dating

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Establishing reliable chronologies for terrestrial sediments remains a major challenge in Earth sciences, particularly for time intervals beyond the range of radiocarbon dating. Luminescence dating techniques provide a valuable solution by directly constraining the time of sediment deposition through the signal stored in mineral grains. Among these methods, infrared-radiofluorescence (IR-RF) dating of potassium (K)-rich feldspar offers significant potential for extending age limits into the mid-to-late Quaternary[1].

The IR-RF signal, generated by charge trapping during exposure to ionizing radiation, reflects the time since a grain's last exposure to sunlight. However, differences in the shape of IR-RF signal decay between individual grains complicate age determination[2]. The causes of these differences remain unclear, particularly with respect to grain-specific geochemistry. To address this, we investigate the relationship between IR-RF signal behavior and feldspar geochemistry at the single-grain level. Our approach integrates spatially resolved IR-RF measurements using a CCD imaging system within the Lexsyg Research luminescence reader[3] with synchrotron-based μ-X-ray fluorescence (μ-XRF) mapping at the SRX beamline of NSLS-II. We present results from a pilot study on K-feldspar grains from a sediment sample collected in the Turkana Basin, Kenya.

This work aims to refine the IR-RF dating method by identifying how grain chemistry influences signal response, thereby enhancing its reliability and extending its application across longer timescales. The study highlights the critical role of synchrotron-based microanalysis in improving luminescence geochronology for Earth science research.

References

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