Violet stimulated luminescence dating of quartz from Luochuan (Chinese loess plateau): Agreement with independent chronology up to ~600 ka - DTU Orbit (09/11/2017)

Violet stimulated luminescence dating of quartz from Luochuan (Chinese loess plateau): Agreement with independent chronology up to ~600 ka

Luminescence dating at the Luochuan loess type (China) section is at present limited to ~0.1 Ma using quartz blue light stimulated luminescence (BLSL), but can be extended back in time to ~0.5 Ma by resorting to the more developmental post-infrared infrared stimulated luminescence (post-IR IRSL) and thermally transferred OSL (TT-OSL) signals. Since both the latter are associated with systematic uncertainties due to the potential (a)-thermal instability of these signals, a search continues for alternative, and demonstrably stable luminescence signals that can cover the entire Quaternary timescale. Here we explore the violet stimulated luminescence (VSL) signal at the Luochuan section, which provides a continuous archive of homogenous sediment with favourable luminescence characteristics and a solid independent age framework. By testing several VSL protocols and their associated performance, we demonstrate that the Multi-Aliquot Additive-Dose (MAAD) protocol produces a VSL chronology at Luochuan which is in agreement with independent ages up to ~0.6 Ma. For a more representative environmental dose rate of ~2 Gy/ka (~35% lower than at Luochuan), the documented range of MAAD-VSL sensitivity (200-1800 Gy) would correspond to the ability to date sediment up to ~1 Ma back in time, offering a remarkable advance over existing methods.

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