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Direct dating of lithic surface artefacts using luminescence and application potential in geomorphology

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Lithic surface artefacts are anthropogenically formed stone materials (stone tools and spall generated during knapping) resting atop or being semi-embedded into the uppermost sediment layer of a stratigraphic sequence on a given landform. Such surface artefacts lack a secure stratigraphic context are encountered worldwide and often comprise a significant proportion of the archaeological record. Yet, direct absolute dating techniques for constraining the age of lithic surface scatters are currently not available.

Promising recent work has shown the potential of using the optically stimulated luminescence (OSL) signal from rocks to date the emplacement of gravel pavements and blocks in both, archaeological and geological contexts (e.g. Sohbati et al., 2015; Jenkins et al., 2018). We build on this work and introduce a novel way of directly dating lithic surface artefacts using OSL-rock surface burial dating. We use this approach to date a surface lithic artefact scatter site, in southern Tibet. By calculating spatially resolved OSL burial ages for slices at 1 mm increments into each artefact's buried surface we (i) infer the timing of artefact discard by humans at the site, (ii) demonstrate that most artefacts are not in-situ but were transported downslope and/or flipped and (iii) for some samples constrain the timing and number of cycles of artefact burial and re-exhumation.

This is the first time that the OSL signal is used to date sunlight exposure of artefacts. The method is not limited to archaeological contexts but can be applied to other surface clasts that yield a reasonable OSL signal too. OSL rock surface burial dating of surface clasts and artefacts thus holds great potential to (i) constrain manufacture and artefact discard by humans and (ii) detect and reconstruct post-depositional disturbances and transport pathways. We discuss the application potential of this approach in archaeology and geomorphology.

References:

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