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Can dryland geoproxy data generate Quaternary palaeoclimate and palaeoenvironmental records?

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Dryland regions present many challenges for robustly reconstructing late Quaternary palaeoenvironments and palaeoclimates, not least a common deficit, or considerable spatial variability, in the availability of high resolution biological proxy data sources. Substantial advances have been made in some regions in recent years, through the exploitation of new high resolution biomarker and isotope records, for example from hyrax middens (e.g. Chase et al., 2012) and from offshore sediments (e.g. Collins et al., 2014). In others however, suitable data sources for these approaches are absent, so these approaches are not available or if data are applied from distant sources, subject to risks of excessive spatial extrapolation of records in environmental contexts where environmental gradients are steep and variability is common (Thomas and Burrough, 2012, Thomas et al., 2013).

In these contexts, geoproxy records, derived from the analysis of landforms and their associated sediments, are often utilised in dryland Quaternary research (e.g. Burrough and Thomas 2009, Stone and Thomas, 2013, Thomas, 2013, Lancaster et al., 2015), but with a number of associated difficulties (e.g. Chase, 2009). This paper examines these difficulties and then explores different approaches to the analysis of Quaternary landform records. It is argued that geoproxies with chronometric control, usually provided by OSL dating, have considerable potential to improve data on Quaternary environmental and climate dynamics, if records are interpreted effectively and appropriately (e.g. Bailey and Thomas, 2014, Thomas and Burrough, 2016). Examples of challenges and new approaches will be drawn from aeolian and fluvial domains, and from research in Africa, Australia and Arabia.

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