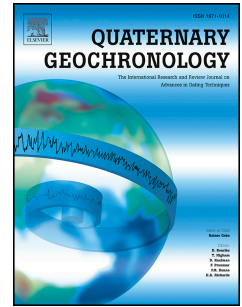


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Coupling cosmogenic nuclides and luminescence dating into a unified accumulation model of aeolian landforms age and dynamics: The case study of the Kalahari Erg

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1 Coupling cosmogenic nuclides and luminescence dating into a
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7 1. Introduction

8 The chronology and dynamics of dune fields have been extensively investigated, particularly as
9 proxies in paleoenvironmental studies (reviewed by Heine, 2005; Livingstone et al., 2007; Singhvi
10 and Porat, 2008; Thomas and Burrough, 2012). Dunes are found in a variety of climatic regimes
11 ranging from hyper arid to sub-humid (Telfer and Hesse, 2013). This range of climatic settings is
12 expressed in varied dune morphologies, from un-vegetated and meandering seif dunes (e.g. Tsoar,
13 1983, 1984), to densely vegetated and degraded dunes with little or no aeolian activity occurring at
14 present (e.g. McFarlane et al., 2005). Specifically, in many semi-arid to arid environments, dune
15 fields and sand sheets are the dominant geomorphological features, thus providing key archives for
16 paleoenvironmental research (e.g. Lancaster, 2013). Due to their varied depositional histories, dune
17 accumulation and erosional phases are usually used to infer paleo-wind patterns, precipitation and
18 vegetation coverage, as well as sediment supply and availability (e.g. Grove, 1969; Heine, 1992;
19 Livingstone et al., 1995; Bullard et al., 1997; Stokes et al., 1997; Thomas et al., 2000; Thomas et al.,
20 2003; Telfer and Thomas, 2007; Chase, 2009; Hürkamp et al., 2011). Furthermore, sand dunes and
21 their surroundings more than often provide archaeological and anthropological archives, many of
22 which extend into the early and middle Pleistocene (Gvirtzman et al., 1999; McDougall et al., 2005;
23 Parker, 2010; Chazan et al., 2012a, b; Lee-Thorp et al., 2012; Dennell, 2013). Therefore, a robust
24 chronological framework is required if a significant connection is to be made between archaeological
25 findings, appearance of sand-dominated landforms and environmental conditions. However, such a

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