Reconstruction of the late Quaternary environment of the lower Luni plains, Thar Desert, India

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ABSTRACT: Geomorphological processes in the Thar Desert of India are largely climate driven. In the lower reaches of the River Luni (the only major drainage system in the Thar Desert) a fluvio-aeolian sequence was located at a site called Khudala. Sediments of this sequence represented a variety of depositional environments, namely aeolian, fluvially reworked aeolian, overbank deposits, gravels, and occasional evidence of pedogenesis. This provided a good opportunity to study aeolian-fluvial interaction in the region and for deducing climatic records. From the luminescence dating standpoint these sequences offered a good opportunity for a comparative study of thermoluminescence (TL), blue-green light stimulated luminescence (BGSL) and infrared light stimulated luminescence (IRSL) on different mineral separates of identical provenance but deposited under different environments. Broadly, within experimental errors, the TL ages agreed with BGSL and IRSL ages on aeolian sands, but differed substantially in the case of fluvially reworked and proximally deposited sands and silts. The sequence provided a record spanning more than 100 ka, with an aeolian phase at > 100 ka, a channel activation phase between 70 and 30 ka and a phase of climate instability between 13 and 8 ka. This appears consistent with the records of monsoon performance during this period, which includes the Younger Dryas. It is also inferred that during the Last Glacial epoch, geomorphological processes in the Thar (both aeolian and fluvial) were dormant largely on account of their relationship with the southwest monsoon. Copyright © 2001 John Wiley & Sons, Ltd.

KEYWORDS: Thar Desert; Aeolian stratigraphy; fluvial stratigraphy; luminescence dating.

Introduction

Geomorphological processes in the Thar Desert are largely driven by climate. Minor perturbations in climate, especially the monsoon, influence landscape sensitivity here on an amplified scale. This is reflected in the fluvial, aeolian and lacustrine deposits of the region. Much of the record preserved in the Quaternary sedimentary sequences can now be studied and interpreted with chronological control. As part of a major multi-institutional programme funded by the Department of Science and Technology, India, several studies have been carried out recently to understand the nature, depositional environment, geoarchaeology and palaeoenvironmental implications of the sedimentary deposits. A major thrust of the programme is to determine the absolute chronology of well-documented stratigraphical sequences using the techniques of thermoluminescence (TL), optically stimulated luminescence (OSL) and electron spin resonance (ESR) (e.g. Singhvi and Kar, 1992; Dhir et al., 1994; Jain et al., 1999; Thomas et al., 1999). In the context of fluvial records, an enigmatic area is the lower Luni plains where the present landforms bear signatures of both climate-driven and tectonically driven processes (Ghose, 1965; Kar, 1988, 1991). However, until the present study little was known of the sequence of landform evolution and past climate of the region.