



Holocene landscape dynamics of the Ghaggar-Hakra fluvial system, India: implications for the Indus Civilisation

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A range of palaeoclimatic and palaeoenvironmental evidence suggests the Asian sub-continent experienced phases of arid-humid alterations on centennial and millennial scales during the Holocene, which were set against a backdrop of insolation-driven weakening of the Asian Monsoon system. These oscillations would have affected fluvial regimes on the plains of northwest India, which were occupied by the Bronze Age Indus Civilisation during the mid-Holocene. It has been suggested that a decline in regional river systems contributed to the decline of the Indus at ~ 4 ka (e.g. Giosan et al., 2012 (PNAS 109, E1688), Singh A. et al., 2017 (Nature Communications 8, 1617)). In a recent study Orengo and Petrie (2017, Remote Sensing 9, 735) identify a complex channel network on the Sutlej/Yamuna interfluves, and Durcan et al. (in press, Quaternary International, doi.org/10.1016/j.quaint.2017.10.012) have highlighted complexity in the response of regional geomorphic systems to climatic/environmental change. Therefore, further work is required to understand the spatial and temporal dynamics of regional hydrological systems in order to assess the importance of changing climatic and environmental conditions in the establishment and decline of the Indus Civilisation

This paper presents luminescence dates from palaeochannel sediments and associated dune deposits on the Ghaggar-Hakra floodplain in northwest India, with particular focus on the area around the Indus site of Rakhigarhi. Rakhigarhi is the largest and potentially most important site in northwest India (Singh R.N. et al., 2010, Man and Environment, 35, 37-53), although its relationship to local and regional fluvial systems is unclear. Reconstructing fluvial activity and palaeoenvironmental variability allows a comparison between the documented archaeological record of the Indus Civilisation and an absolute chronology of regional landscape dynamism. Luminescence dating shows that the fluvial network around Rakhigarhi pre-dates the establishment of the site, and that regionally, there is no simple relationship between documented climatic deterioration and changing fluvial activity. This study presents a new reconstruction of palaeoenvironmental change on the Ghaggar-Hakra floodplain, and provides new insights into the fluvial landscapes occupied by the Indus Civilisation during the Holocene.