



# Climatic implications of late Holocene loess and intervening paleosols, Southern Zanskar range, northwestern Himalaya

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## ABSTRACT

The loess-paleosol proxy records from mid-latitude Asia have been instrumental in the reconstruction of regional paleoclimate evolution and its relationship with global climatic changes. The present study explores the discrete occurrence of a loess and paleosol sequence (LPS) in the Southern Zanskar Range (SZR), NW Himalaya. Stratigraphic variations in sediment texture, supplemented with geochemical, organic and magnetic proxies, indicate two broad phases of loess accretion (L-1) and paleosol formation (PS-1). The older phase of loess accretion (L-1) is dated between  $2.5 \pm 0.3$  ka and  $>2.0$  ka, whereas the L-2, which fully transformed into the modern soil (MS) probably deposited during the Little Ice Age (LIA) phase. The textural attributes (high sand content) of loess indicate source proximal deposition, whereas the geochemical and magnetic proxies point towards the pre-depositional weathering (in the source area). The PS-1 dated to  $2189 \pm 296$  cal yr BP indicates improved moisture conditions, whereas the MS is assigned to post LIA warm phase. These findings provide an important step towards better understanding the sensitivity of loess accretion and paleosol formation in the SZR linked to late Holocene climate variability.

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## Introduction

Loess and paleosol sequences (henceforth LPS) are posited as useful archives to reconstruct Quaternary climate shifts (Ahmad & Chandra, 2013; Gocke et al., 2014; Kukla & An, 1989; Muhs & Bettis, 2003; Muhs et al., 2004; Pant et al., 2005; Pye, 1995; Muhs, 2013b). Typically composed of quartz, feldspars, micas, carbonates, and clay minerals, these deposits generally blanket pre-existing landscapes and can be few centimeters to hundreds of meters thick. These deposits occur in many countries such as parts of the central and northwestern United States, Alaska, Argentina, Europe, Russia, Central Asia, China, and New Zealand, as well as scattered areas of Africa and the Middle East (Muhs, 2013b). Moreover, these deposits have distinct advantages over other Quaternary sediments because loess is usually associated with cold glacial climate, whereas the