
Loess Chronology in Iran

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Upper Pleistocene loess-palaeosol sequences provide excellent high-resolution terrestrial archives of climate forcing in Europe (Frechen et al. 1997, 2003), Central Asia (Frechen & Dodonov 1998; Stevens et al. 2006; Machalett et al. 2008) and in the Caspian Lowland and the Basin of Persepolis in Iran (Frechen et al. 2009; Kehl et al. 2005). The last glacial loess record of Iran has become of interest because chronological methods, such as luminescence dating, make the direct dating of deposition ages of aeolian sediments possible. The quasi-continuous loess record from Northern Iran span numerous glacial-interglacial cycles and make the investigation of long-term synchronicity of climate records in the Northern Hemisphere possible. Multi-disciplinary approaches combining stratigraphy, pedology, sedimentology, palynology, malacology, geochemistry and geochronology can provide a detailed reconstruction of wind dynamics, palaeoclimate and dust flux through the interglacial/glacial cycles of the Middle and Upper Pleistocene in Iran.

The Caspian Lowland of Northern Iran is part of the Eurasian loess belt extending from Northwest Europe to Central Asia and China. During the Pleistocene glaciations, Northern Iran was an extensive area of increased dust accumulation and loess formation. These sediments are widespread covering slopes and interfluves of the piedmont region of Alborz Mountains. Loess comprises a high sensitivity archive of regional climate and environmental changes in the terrestrial record and shows a close relationship with cooling and warming trends for the Quaternary period. The well-developed loess/palaeosol sequences reflect changes in mass accumulation rates of silt-rich sediments and is thus a measure to determine the palaeo-dust content of the atmosphere for the geological past - an important parameter for climate modeling. Furthermore, the loess record of Northern Iran provides a missing link for the correlation between Central Asian and European loess archives. The most complete loess/palaeosol sequences of the Caspian Lowland covering at least the time span of the Middle and Late Pleistocene are located in the area between the Rivers Gorgan and Atrek in Golestan province (Agh Band section) and on the northern foothills of the Alborz Mountains between the cities of Sari and Minodasht (Neka section and Now Deh section).

Little information has been published on records of past climate change in Northern Iran. During the 1960s and the 1970s, loess and the intercalated palaeosols were correlated with moist and dry

periods of the Holocene. Later in the 1980s it was suggested that brown palaeosols and loess correlate with the last interglacial period and the last glacial period, respectively. In the Caspian Lowland of Northern Iran, several well-developed palaeosol horizons intercalated in the loess record indicate an alternation of comparatively dry and cool climate phases with increased dust accumulation including loess formation, and moist and warm phases with soil formation, respectively. However, the origin, nature and absolute age of the loess and palaeosol members are still inadequately known and under discussion. Infrared optically stimulated luminescence (IRSL) was applied to set up a more reliable chronological frame for the last interglacial/glacial loess record of the Caspian Lowland in Northern Iran. The aim of this study is to reconstruct regional climate and landscape evolution in Northern Iran for the last interglacial/glacial period, the past 130,000 years. Furthermore, it is aimed to provide data for making a comparison of climate evolution between the Caspian Lowland and the Carpathian loess region in the west and the Central Asian loess region in the east. The increased precision and accuracy of luminescence dating will play an increasingly important role in understanding records of past spatial and temporal variations in dust flux and its relation to global climate change.

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