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Geography of Loess in Iran

Introduction

Loess is known to be widespread across the mid-latitudes of most continents, but it has not been as obvious to look for loess in Iran. Even though articles regarding loess sediments in Iran exist, global and regional maps typically indicate little to no loess within Iran (e.g. figures 1, 2, and 3). The purpose of this poster is to help bridge the gap in knowledge and raise awareness of loess deposits identified and studied in Iran. Nonetheless, there has not been enough investigation into the precise nature and stratigraphy of these deposits. We attempt here to review what is currently known about the origin and geography of loess in Iran.



Figure 1. Map showing the distribution of loess in Eurasia and localities or regions referred to in the text. Modified from Muhs (2007).

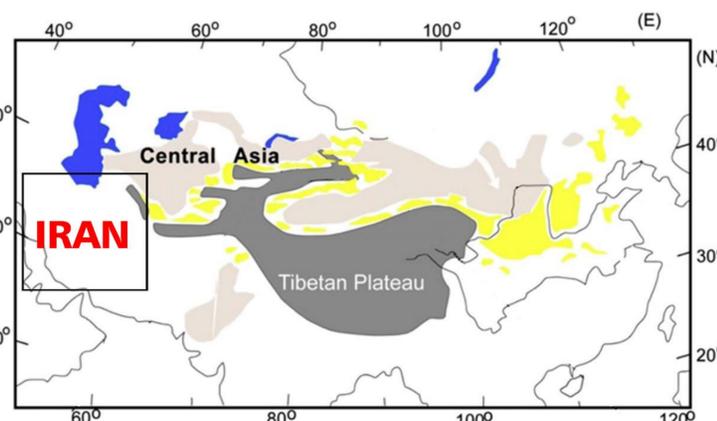


Figure 2. Loess distribution in Asia. Modified from Song (2012).



Figure 3. Global distribution of major deposits of loess sediments. Modified from Pidwirny (2010).

Distribution

The existence of loess in northern and eastern Iran has been confirmed based on grain size characteristics, microtextures, mineralogical composition and geochemical signatures of the deposits. The distribution of loess in Iran is most often associated with the northern provinces (i.e. Gilan, Mazandaran, Gilan, and East Azerbaijan). Okhravi and Amini (2001) and Karimi et al. (2009) confirmed the occurrence of loess in northeastern Iran based on the distribution of particle size and geochemical homogeneity of silty deposits. However, Fookes and Knill (1969) identified and characterized loess deposits in provinces of central and southern Iran (i.e. Isfahan, Yazd, and Fars provinces). The loess and loess-like deposits of southern Iran have not been fully investigated and are a curiosity due to their unusually low latitude.

Chronology

Kehl et al. (2005) and Karimi et al. (2009) postulated that the loess of northern Iran is part of the southernmost portion of the Eurasian loess belt. Frechen et al. (2009) determined that there were at least four periods of aeolian sediment accumulation in northern Iran from the last glacial period. Using infrared optically stimulated luminescence (IRSL), thermoluminescence (TL), and radiocarbon dating methods, Kehl et al. (2005) estimated loess in southern Iran was deposited ~30 ka. Furthermore, all investigators believed that the loess/paleosol sequences in Iran are similar to climate and environmental changes in southeastern and central Europe as well as central Asia, showing a close relationship to global cooling and warming trends for the Quaternary period (Frechen et al., 2009; Karimi et al., 2011; Ghafarpour et al., 2016).

Provenance

Loess deposits in Iran are dominated by coarse silt and very fine sand. Evidence from scanning electron micrographs quartz grains suggests that the silt particles were transported from central Asia (Rozychi, 1991; Asadi et al. 2013). For northern Iran, the Alborz Mountains likely acted as the main barrier to entrap the deposits on the plains of Golestan province. Karimi et al. (2009) stated that the presence of gypsum-enriched soil layers proved that gypsum transported from nearby hilly lands as a potential gypsum source. The identification of loess source areas to the east of depositional areas is not the norm in loess research. However, Iran is south enough that its dominant winds were likely influenced by the direction of the easterly trade winds as opposed to the westerlies in more northern latitudes. These unusual circumstances of the most likely loess sources being far to the east leave many opportunities for additional investigation.



Aghband, northern Iran.
Photo by Amin Ghafarpour.



Maravtapeh, northern Iran.
Photo by Amin Ghafarpour.



Perspolis, southern Iran.
Photo by Martin Kehl.



Perspolis, southern Iran.
Photo by Martin Kehl.

Conclusion

By connecting the latest studies recognizing loess deposits in Iran, this review suggests that there is indeed loess throughout Iran. However, the existing studies do not provide all of the information needed to properly update global and regional maps of loess distribution. There is still a need to further investigate loess in this area. This need includes field investigations and mapping in order to provide a comprehensive understanding of the origin and distribution of loess in Iran.

References

- Asadi, S., Moore, F., Keshevarzi, B. 2013. The nature and provenance of Golestan loess deposits in northeast Iran. *Geological Journal*. 48:646-660.
- Fookes, P.G., Knill, J.L. 1969. The application of engineering geology in the regional development of northern and central Iran. *Engineering Geology*. 3:81-120.
- Frechen, M., Kehl, M., Rolf, C., Sarvati, R., Skowronek, A. 2009. Loess chronology of the Caspian Lowland in northern Iran. *Quaternary International*. 198(1):220-233.
- Ghafarpour, A., Khormali, F., Balsam, W., Karimi, A., Ayoubi, Sh. 2016. Climatic interpretation of loess-paleosol sequences at Mobarakabad and Aghband, northern Iran. *Quaternary Research*. 86:95-109.
- Karimi, A., Frechen, M., Khademi, H., Kehl, M., Jalalian, A. 2011. Chronostratigraphy of loess deposits in northeast Iran. *Quaternary International*. 234:124-132.
- Karimi, A., Khademi, H., Kehl, M., Jalalian, A. 2009. Distribution, lithology and provenance of peridesert loess deposits in northeastern Iran. *Geoderma*. 148:241-250.
- Kehl, M., Frechen, M., Skowronek, A. 2005. Paleosols derived from loess and loess-like sediments in the basin of Perspolis, southern Iran. *Quaternary International*. 140/141:135-149.
- Muhs, D.R. 2007. Loess deposits, origins and properties. In: Elias, S.A. (Ed.), *Encyclopedia of Quaternary Science*. Elsevier, Oxford.
- Okhravi, R., Amini, A. 2001. Characteristics and provenance of the loess deposits of the Gharatikan watershed in northeast Iran. *Global and Planetary Change*. 28:11-22.
- Pidwirny, M. 2010. *Understanding Physical Geography*, 1st Edition. <http://www.physicalgeography.net/understanding/contents.html>.
- Rozychi, S.Z. 1991. Loess and loess-like deposits. Ossolineum, the Publishing House of the Polish Academy of Science: Wroclaw. 1-187.
- Song, Y., Li, C., Zhao, J., Cheng, P., Zeng, M. 2012. A combined luminescence and radiocarbon dating study of the Ili loess, central Asia. *Quaternary Geochronology*. 10:2-7.