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Anisotropy of magnetic susceptibility of Pleistocene loess-paleosol sequences from Ukraine and its paleoenvironment implications

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Anisotropy of magnetic susceptibility (AMS) of the loess-paleosol sequences from Ukraine was analyzed in order to define Pleistocene paleowind directions and to prove the viability of AMS-based paleoclimatic reconstructions, spanning the past 1.0 Ma. For the AMS studies more than 1200 oriented samples were taken from 7 loess-paleosol sections located in the area between Bug and Dnieper rivers, and the Black Sea.

Our results indicate normal sedimentary magnetic fabric for almost of all samples, characterized by minimum susceptibility axes grouped in vertical direction. The distribution of magnetic susceptibility axes allows to define main wind directions for different time intervals, which are comparable to regional paleogeographic reconstructions of each unit. An oblate magnetic fabric is prevalent in all horizons. Magnetic lineation, foliation and anisotropy degree depend on lithology, having higher values in Late Pleistocene loess horizons of Volhynian Upland sequences in Western Ukraine. The AMS of the loess-paleosol sediments from the Black Sea region is much weaker, than noted in loess and paleosol of Western and Northern Ukraine, comparable to distinguished Chinese loess. The destruction of primary fabric due to pedogenesis has been observed in Middle Pleistocene paleosol layers from Podolian Upland and Dnieper Lowland sections in Central Ukraine. However, most of paleosol horizons display AMS orientation distributions and AMS ellipsoid parameters statistically identical to those of primary loess fabric. In general, the loess-paleosol deposits in Ukraine are good candidates for AMS studies: the changes in prevailing wind directions are found to be coincident with major climatic changes. These results are encouraging and provide an additional method for studying and understanding Ukraine's paleoenvironment.