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Granulometric composition and magnetic susceptibility of the Late Pleistocene loess-soil sequence of the stratotype section (Alexandrovsky quarry, Kursk, Russia)

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Granulometric composition and magnetic susceptibility are important indicators of the genesis of paleosols, loesses and other newest sediments. Along with other characteristics, they make it possible to reconstruct evolution, surrounding landscapes and climatic changes in the past. The stratotypic section "Alexandrovsky quarry" (natural monument in Kursk, 51°35'31"N, 36°3'21"E) reveals the most complete structure of the Late Pleistocene for the periglacial zone of the East European Plain. Soil-sediment stratum with a thickness of more than 10 m represents the filling of a small buried valley. The formation of the stratum took place practically without interruptions during the last 130 thousand years. It includes two interglacial paleosols: Holocene (Marine Isotope Stage 1) and Ryshkovo (MIS 5e); four interstadial paleosols: Kukuevka (MIS 5c), Streletsa (MIS 5a), Alexandrovka (MIS 3.1), Bryansk (MIS 3.2), and also loess, pedo-sediment and other deposits that have periodically experienced exposuring to cryogenesis [Sycheva, 2012]. The particle size distribution and the magnitude of the magnetic susceptibility reflect the complex history of the stratum formation and reveal detailed climate changes in the Late Pleistocene. The particle size distribution was determined with fractionation method by Kaczynski and by instrumental laser-diffractometry method on a "Malvern Mastersizer 3000" particle size analyzer. The magnetic susceptibility was determined by a SatisGeo KM-7m field capameter with triplicate measurements for every 6 cm.
A change in the granulometric composition from Ryshkovo (MIS 5e) medium loamy deposits to heavy loamy soils and loess belonging to MIS 3.1 was established. The largest value of the clay fraction (<0.001 mm) is characteristic of the MIS 3 paleosols. Significant values of this fraction are also characteristic of the humus horizons of paleosols and Bt horizon Ryshkovo paleosol (MIS 5e). The lowest clay content is observed in loess, especially in their upper parts and in the eluvial horizon of the Rushkovo paleosol (MIS 5e). The data gained by instrumental method of particle size determination is different from such as data gained by the Kaczynski method for the upper heavy loam stratum (MIS 3-1). The predominant fraction is fine dust, in contrast to the lower sediments MIS 5-4, where the coarse silt fraction prevails. Whereas according to data gained by Kaczynski method, the coarse silt fraction prevails in the entire studied thickness of the loess-soil sequence.

Magnetic susceptibility (MS) depends on the content of superparamagnetic mineral in each of the samples and represents levels of pedogenesis in loess deposits. The highest MS values are characteristic of the humus horizon of the interglacial Ryshkovo paleosol (MIS 5e). Followed by Ah horizon of the Streletsa paleosol (MIS 5a) and underlying loess. Smaller values are characteristic of the Kukuevka (MIS 5c) paleosol. But they are more eroded and represented by transitional AB horizons. Loess is characterized by the lowest values of magnetic susceptibility.

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