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黄土高原西北缘末次冰期晚期以来黄土沉积物的岩石磁学性质

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Rock magnetism of loess sediments in northwestern margin of Chinese Loess Plateau since the late last glaciation

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摘要

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摘要 以黄土高原西北缘的靖远和古浪剖面(包含黄土层L1上和古土壤层S0)作为研究对象,选取代表性样品进行磁化率、频率磁化率、热磁曲线、等温剩磁获得曲线和磁滞回线等测定.结果表明,靖远和古浪L1黄土和S0古土壤具有相似的岩石磁学特征.磁性矿物含量相对较低,载磁矿物均以磁铁矿为主,同时含有磁赤铁矿和赤铁矿,且S0古土壤中的磁赤铁矿含量要高于L1黄土.靖远和古浪剖面L1黄土和S0古土壤的亚铁磁性矿物平均粒度都分布在准单畴(PSD)范围,并且L1黄土平均粒径比S0古土壤更靠近多畴(MD)范围.通过与黄土高原东部黄土剖面L1黄土和S0古土壤的磁化率对比分析,认为导致靖远和古浪S0古土壤磁化率增强的主要因素是气候,但是,研究区受物源影响较大,来自粉尘源区的粗颗粒磁性矿物对磁化率贡献不可忽略.

关键词: 黄土高原西北缘 黄土沉积 岩石磁学 磁化率

Abstract: We have carried out a detailed rock magnetic investigation on the loess-paleosol sequences in the Jingyuan and Gulang sites, northwestern margin of Chinese Loess Plateau, including low-field magnetic susceptibility (χ), frequency-dependent susceptibility ($\chi_{fd}\%$), temperature-dependent susceptibility ($\chi-T$), isothermal remanent magnetization (IRM) and hysteresis loop. The results demonstrate that the total amount of magnetic minerals in Jingyuan and Gulang loess-paleosol sequences is relatively low, and the main magnetic mineral in paleosol and loess is magnetite, where there are maghemite and hematite as well. The maghemite content in paleosol is more than that in loess. Superparamagnetic (SP) and stable single domain (SSD) ferrimagnetic grains are generated in the process of pedogenesis. Cross plots of M_{rs}/M_s vs. B_{cr}/B_c indicate that the mean magnetic grain size in loess and paleosol are pseudo-single domain (PSD). But, the mean diameter of magnetite in loess is slightly larger than that in paleosol, and closer to the range of multi-domain (MD). It results from the fact that less fine-grained magnetite are generated in loess than in paleosol, for there are coarser magnetic particles transported from the source area of eolian to loess layer than to paleosol layer. Although the major factor leading to high susceptibility in S0 is the climate, the effect of coarse magnetic particles from dust source can not be ignored.

Keywords: Northwest Loess Plateau Loess Rock magnetism Susceptibility

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