

引用本文(Citation):

徐新文, 强小科, 符超峰, 赵辉, 陈艇, 孙玉芳. Bartington MS2和Kappabridge MFK1-FA不同频率的磁化率在黄土、红粘土和湖相沉积物中的应用. 地球物理学报, 2012,55(1): 197-206,doi: 10.6038/j.issn.0001-5733.2012.01.019

XU Xin-Wen, QIANG Xiao-Ke, FU Chao-Feng, ZHAO Hui, CHEN Ting, SUN Yu-Fang.Characteristics of frequency-dependent magnetic susceptibility Bartington MS2 and Kappabridge MFK1-FA, and its application in loess-paleosol, red clay and lacustrine sediments.Chinese J.Geophys. (in Chinese),2012,55(1): 197-206,doi: 10.6038/j.issn.0001-5733.2012.01.019

Bartington MS2和Kappabridge MFK1-FA不同频率的磁化率在黄土、红粘土和湖相沉积物中的应用

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Characteristics of frequency-dependent magnetic susceptibility in Bartington MS2 and Kappabridge MFK1-FA, and its application in loess-paleosol, red clay and lacustrine sediments

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摘要

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摘要 通过Bartington MS2 和Kappabridge MFK1-FA两种仪器对黄土-古土壤、红粘土和湖相沉积物样品进行了5个频率的磁化率测试,并计算得到了4个频率磁化率.通过对比分析不同类型样品磁化率-频率变化曲线可知,当样品中细颗粒磁性矿物含量较高时,磁化率在较低频率即可达到峰值,而当样品中细颗粒磁性矿物含量较低时,磁化率在较高频率时才能达到峰值.因此,在黄土-古土壤等样品的应用中,成壤作用较强,细颗粒亚铁磁性矿物含量较高,Bartington MS2的低频(465 Hz)与Kappabridge MFK1-FA的 F_1 (976 Hz)和 F_2 (3905 Hz)频率均处于磁化率峰值区域,可以检测到SP/SD阈值区域颗粒的信息,但是对于红粘土和湖相沉积物等细颗粒亚铁磁性矿物含量较低的样品,磁化率峰值对应的频率较高,MS2型磁化率仪无法有效地检测其中细颗粒的含量,而MFK1-FA中 F_2 (3905 Hz)和 F_3 (15616 Hz)两个频率间的频率磁化率则可以较好地完成这一任务.

关键词 频率磁化率, Bartington MS2和Kappabridge MFK1-FA磁化率仪, 细颗粒亚铁磁性矿物

Abstract: Magnetic susceptibility (MS) of typical samples from Luochun loess-paleosol sequence, Zhuanglang core red clay, and Heqing core lacustrine sediments had been measured by Bartington MS2 and Kappabridge MFK1-FA meters. These two devices have five frequencies (two in MS2 and three in MFK1-FA) in all, and could get four frequency-dependent susceptibilities. MS achieve its peak value in low and high frequency when samples contain more and less fine grained particles respectively. Because of strong pedogenesis, loess-paleosol samples contain more fine grained particles, and could be detected by frequency-dependent susceptibility in both devices. However, for application in red clay and lacustrine sediments which lack fine grained ferrimagnetic particles, the low-frequency (465 Hz) in Bartington MS2 can not achieve peak value of magnetic susceptibility, and frequency-dependent susceptibility can not indicate the concentration of fine grained particles well. But Kappabridge MFK1-FA can do it well for its higher low-frequency (F_1 is 976 Hz, and F_2 is 3905 Hz).

Keywords Frequency-dependent magnetic susceptibility, Bartington MS2 and Kappabridge MFK1-FA magnetic susceptibility meter, Fine grained particles

Received 2010-12-10;

Fund:

国家自然科学基金(41072142,40872114),中国科学院知识创新工程重要方向项目群(KZCX2-YW-Q09-04),黄土与第四纪国家重点

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