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福州盆地全新世沉积物的磁学性质及其对环境变化的响应

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Magnetic properties of sediments and their response to environmental changes during the Holocene in the Fuzhou Basin, Fujian, China

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摘要 福州盆地位于海陆过渡地带,在海陆变迁过程中,沉积物记录了高分辨率的环境信息,是揭示沉积特征对环境变化响应过程及模式的理想区域.本文选择位于福州盆地的FZ5钻孔进行岩石磁学、环境磁学和古地磁学方面的研究,以期阐明该区域沉积物磁学性质对陆源碎屑输入、海平面变化和成岩作用的响应.岩石磁学结果表明钻孔沉积物以低矫顽力的亚铁磁性矿物为主体,但是在不同的环境变化阶段,磁性矿物的类型有较大变化.在9~3 cal. ka BP的海侵过程中,沉积物中以磁铁矿为主体,存在菱铁矿和铁硫化物等还原性矿物.硫化作用使细粒磁铁矿溶解形成胶黄铁矿和黄铁矿,其峰面随碎屑磁性矿物的浓度变化而迁移.但硫化作用没有完全消除磁铁矿携带的特征剩磁和陆源碎屑输入量以及海平面升降对该阶段沉积物磁性的控制.在~3 cal. ka BP以来随着海平面下降、沉积环境向陆相氧化环境转化,虽然早期还原作用仍然存在,但后期氧化作用使磁性矿物向高矫顽力的赤铁矿等矿物转变,氧化作用基本扰乱了磁铁矿携带的剩磁.沉积及其后期成岩作用过程中,发生在约~8.2、~7.7、~7.5、~2.7、~1.5、~0.5 cal. ka BP六次强烈的古氧化界面反映了福州盆地当时异常干旱或湿热的气候事件.

关键词 环境磁学, 成岩作用, 海平面, 全新世

Abstract: The Fuzhou basin is an ideal place for high-resolution paleoclimate study due to its special location(in the coastal zone), where sediments recorded a wealth of information on the interaction between ocean and land during the Holocene. In this paper, rock magnetism, environmental magnetism and paleomagnetism features of core FZ5 sediments in the Fuzhou basin were studied to reveal response of magnetic properties to terrigenous input, sea-level change and diagenesis. The rock magnetism results show that ferrimagnetic minerals with low coercivity are the dominant minerals,while the types of magnetic minerals vary in different stages of environmental variation. Magnetite, siderite and some amounts of Fe-sulphides are the main contributors to magnetic properties in the transgression environment during the early and middle Holocene (9~3 cal. ka BP), although sulphidation dissolved fine-grained magnetite to form greigite and pyrite. However, sulphidation did not completely eliminate the natural remanence carried by magnetite and the dominant controls of the terrestrial detritus input and sea-level fluctuations to magnetic properties in this stage. During the late Holocene (3 cal. ka BP), magnetite was still partly dissolved to greigite due to the earlier reduction in the terrestrial oxidizing environment, but further transformation was restrained by the oxidation then. Strong oxidation process formed the high coercivity minerals and disturbed the natural remanence. During the deposition process, the six strong ancient oxide interfaces were produced at ~8.2, ~7.7, ~7.5, ~2.7, ~1.5, ~0.5 cal. ka BP, respectively, reflecting the unusually dry or humid climate events in the Fuzhou basin over these times.

Keywords Environmental magnetism, Diagenesis, Sea-level, Holocene

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