INTERPRETING GEOLOGIC RECORDS OF PAST CLIMATE CHANGE USING ENVIRONMENTAL MAGNETISM

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The transport, deposition, and transformation of magnetic grains can often be influenced by the physical environmental. In environmental magnetic studies, the magnetic properties of soils and sediments are used as tracers of paleoclimatic and other environmental processes. A prime example of this approach involves interpretation of the paleoclimatic record of loess/paleosol sequences, particularly those in China. Initially, the magnetic susceptibility record of these sequences was used as a quantitative proxy for paleoclimate change. More recently, other magnetic parameters, especially those used in conjunction with methods adapted from soil science, have made it possible to obtain a more complex and more sophisticated interpretation of the paleoclimate record. This new interpretation makes it possible to separate the lithogenic and pedogenic components of the magnetic signal and to take into account the different mineral pathways that contribute to the overall paleoclimate record. Other recent applications of environmental magnetism include identification of drought conditions in Holocene sediments, detection of sub-millennial scale climate fluctuations during the last glaciation, and determination of the fine-scale structure of glacial/interglacial cycles during the Plio/Pleistocene. It has even been possible to detect an environmental magnetic signature for the transition from greenhouse to icehouse conditions in Antarctica at the Eocene/Oligocene boundary. Because the methods of environmental magnetism are rapid, non-destructive and inexpensive, they represent an effective means of augmenting traditional methods of studying the paleoclimate record.