ENVIRONMENTAL MAGNETISM: APPLICATIONS TO PALEOCLIMATIC RECONSTRUCTIONS AND AIR POLLUTION MONITORING

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This short course will be focused on environmental magnetism. In the first part I will present a general overview of the relevant rock magnetic techniques and parameters, briefly discussing laboratory measurements and basic data analysis. Following this general introduction, I will address the application of rock magnetic techniques to two main lines of research.

The first line of research refers to studies aimed at reconstructing paleoclimatic and paleoenvironmental changes from the analysis of sedimentary records. This topic will be illustrated and discussed with reference to selected key studies on various marine and continental sequences of different geologic ages and collected at various latitudes, that is in quite different climatic and environmental conditions. For a proper interpretation of the rock magnetic data as proxies of paleoenvironmental and paleoclimatic changes these studies particularly need the establishment of a sound cronostratigraphic framework, and therefore they are usually carried out as part of a multidisciplinary integrated stratigraphy approach. In many cases, the same rock magnetic and paleomagnetic measurements may significantly contribute to the definition of high-resolution age models for the analyzed sedimentary sequences, providing original constraints based on the reconstruction of paleosecular variation and relative paleointensity curves and/or on the identification of geomagnetic excursions and reversals.

The second line of research refers to studies aimed at monitoring present-day environmental pollution, with specific reference to the identification of airborne particulate matter (PM) sources and dispersal patterns. These studies address topics of high societal concerns, since high concentration of fine PM are associated with adverse impacts on human health. Fine-grained ferrimagnetic phases are released in the atmosphere as a by-product of human activities and are generally associated with heavy metals. Magnetic data may therefore represent reliable proxies for PM pollution monitoring. This topic will be illustrated and discussed with reference to studies carried out on soils and on airborne dust, in various industrial and urban environments.