



ÉCOLE DOCTORALE SCIENCES DE LA TERRE



Subject offered for a contract starting in September 2011

SUBJECT TITLE:

ARCHEOMAGNETISM IN CENTRAL CHINA: REGIONAL GEOMAGNETIC FIELD INTENSITY VARIATIONS OVER THE PAST FEW MILLENNIA, NEW CONSTRAINTS ON THE DIPOLE FIELD EVOLUTION AND ARCHEOLOGICAL (DATING) INFERENCES

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IPGP- Paleomagnetism – UMR7154

Financing: Doctoral contract with or without assignment

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Presentation of the subject: (1 or 2 pages)

The geomagnetic field observed at any point of the Earth's surface is fully described by a vector whose intensity and direction vary continuously in time and space. Direct measurements of the Earth's magnetic field made in observatories and also by mariners have provided a description of the geomagnetic secular variation but only for the past three to four centuries. For older periods, the characteristics of the geomagnetic field can be recovered from the study of the magnetic properties of archeological artifacts, such as kilns, tiles, or pottery. In these structures or objects, the firing process induces a stable thermoremanent magnetization parallel to the ambient geomagnetic field at the time and place of firing and whose intensity is proportional to this field. When they are well dated, i.e. from archeological, historical or radiocarbon constraints, it is then possible to determine the temporal evolution of the geomagnetic field for a given area.

Our group is involved in several archeomagnetic studies, which aim at recovering the geomagnetic field intensity variations over the past few millennia in Western Europe, in the Middle East, Africa and in South America. Comparisons between available data sets from France, Greece, Bulgaria, Georgia, Middle East and Central Asia suggest that the geomagnetic field intensity fluctuations were largely consistent during the past 3 to 4 millennia over a vast region probably extending from the Western Mediterranean to Central Asia (about 60° in longitude). In contrast, comparisons with archeointensity data from China are much less favorable. Although some

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archeointensity data were already obtained from China, the later are very scattered which prevents the determination of a precise and reliable “composite” Chinese intensity variation curve. This represents a major problem when constraining the geomagnetic field (dipole) evolution and more generally when constructing global geo(archeo)magnetic field models.

Thanks to its rich cultural past, China appears as a very promising country for archeomagnetism. We propose to obtain new intensity data from ancient pottery fragments dated to the past two to three millennia from Central China (Xi’an region). This project is twofold. The first objective is to establish a detailed geomagnetic field intensity variation curve in order to bring new constraints on the regional field behavior in Central China and on the dipole field evolution over the past millennia. A special care will be devoted to the detection of rapid field intensity fluctuations. A second aspect of our project concerns the possibility of using archeointensity data for archeological purposes. The regional intensity variation curve hence determined could indeed provide interesting and original dating constraints for undated or poorly dated archeological artifacts.