ARCHAEOMAGNETIC AGES OF ARCHAEOLOGICAL FIRED STRUCTURES IN AZERBAIJAN

The aim of this program is to show the importance of the Azerbaijan archaeological sites to the definition of the archaeomagnetic curve for the easternmost countries of the peri-Mediterranean area and their contribution to the improvement of the European archeomagnetic curve definition.

In order to reach the objective of this project extensive sampling and analyses of fired structures such as domestic, pottery and metallurgic furnaces, in well selected archeological sites in Azerbaijan, should be performed.

Archaeometric dating techniques are nowadays commonly applied as routine tools in archaeological studies. Quite a number of techniques are available and the choice of the most suitable depends on several factors, such as the magnetic features of sample material, their degree of preservation, their absolute chronology and finally the accuracy of the method [1].

During the last decades, archaeomagnetism has established great progress in reconstructing chronologies of baked sediments, archaeological findings and volcanic rocks [2,3]. The ability to yield accurate dating mainly depends on our knowledge of the past secular variation paths of the Earth's magnetic field for a given territory and the existence of well-detailed and reliable reference curves [4]. As the direct instrumental measurements of the directional Earth's magnetic field started in Europe only in 16th century AD, any new archaeomagnetic study carried out on well-dated and undisturbed (since firing) archaeological structures and volcanic deposits can contribute to improve our knowledge of the behavior of the past geomagnetic field. Such a knowledge improvement requires the collaboration between scientists with different background such as geologists and archeologists and from different countries. It is in this context that the bilateral project between Italy and Azerbaijan is ranked.In particular, the archaeomagnetic sampling will be performed on structures selected by the Azerbaijan team of archeologists and by the Italian team of geologists, using the Modified Thellier Sampling Technique [5,6]. This technique allows collection of large samples which did not move after their formation or implacement of materials. Generally a total of 12-15 independently oriented samples are taken during sampling works. Measurements will be carried out at IGG-CNR Archaeomagnetic Laboratory in Villa Borbone, Viareggio (Italy). Archaeomagnetic analyses reveal the direction and/or the intensity [6] related to the final firing. Because Earth's magnetic field elements - directional (declination, D and inclination, I) and intensity data (F) - change temporally as well as spatially, different geomagnetic secular variation curves (SVCs) are needed for different sampling localities. Transferring archaeomagnetic data from the sampling site to a central reference point is commonly performed by the Virtual Geomagnetic Pole (VGP) method [7]. However this process can introduce systematic errors due to the non-dipole components of the main field, and generally their values increase with the relocation distance: that's the reason because SVCs should be constructed using data from a small territory and measuring furnaces or other fired structures or geological bodies of well-know age [8]. This factor implies that the data set has to be constituted by data obtained by means of archaeomagnetic measurements on samples homogeneously distributed in the space. The age of these samples should also be known by other methods, such as 14C, historical documents or in the context of the archaeological framework.

Training of Azerbaijan sceintists on the field and inside the Italian Archaeomagnetic laboratory will also constitute an important transfer of knowledge and will put the basis for long term collaboration between Italy and Azerbaijan.

Area of investigation and experience of the scientific teams

Azerbaijan has a great abundance of well characterized and dated archeological sites. To our knowledge, neither archeomagnetic investigation have been performed in the Azerbaijan territory, nor SVC is available for this country.

For this reason we should select a number of archaeological sites of different age in the Azebaijan territory which can be dated by means of Archaeomagnetic technique. The identification of Roman-age fired structures are of particular importance for the first year selection. Indeed the archeaomagnetic

information obtained by measuring these structure will be of upmost importance to compare with peri-Mediterranean SVC.

The above mentioned comparison will allow to establish, in the second year of the project, the applicability of the SVC for peri-Mediterranean region to Adzerbaijan, thus addressing the prosecution of the work in collaboration between the Italy and Azerbaijan on the field of geo-archaeology.

The obtainement of accurate dates depends on a number of factors that comprehend the morfology of the furnace and the archeological context. The main features that selected archeological sites must possess are as it follows:

- archaeological sites should be positioned on a regular geographical grid;
- their age, as inferred by archaeological studies, should be positionable in a certain time frame;
- the selected fired structures should be clearly positioned inside a stratigraphical record;
- the fired structures should not be moved after last firing;
- sample collection should be permitted by local authorities.

General objective: As no reliable SVC for the Azerbaijan, and more generally for the Caucasus region, is available, the regional geomagnetic models recently published for Europe can be used, and an adequate number of known-age fired structures will be sampled and analysed.

Tasks for the Azerbaijan Scientific community: (A-First year) Applicability of the European curve(s) to Azerbaijan, by means of the archaeomagnetic analysis of a number of indipendently well dated sites inside the last 3000 years. (B-Second year) Work focus on a time interval of major interest from the Archaeological point of view, for the building/perfectioning of the Azerbaijan SVC.

Tasks for the Italian Scientific community: To balance the geographical distribution of data inside the general data-base of the Archaeomagnetic data, with Azerbaijan well dated Archaeological structures, in the time span of the last 3000 years.

WORK PLAN

First year:

(1) - Selection and sampling of 8-10 archaeological sites of well known age in Azerbaijan. A field-survey of 10 days in Azerbaijan will be performed in the first half of 2012. The second (and last) 2012 field-survey will be performed in the second quarter of this year. In both cases, two members of Italian team and two members of Azerbaijan team will be involved.

(2) - The analitical work will be performed in the Archaeomagnetic laboratory of IGG-CNR by Italian and Azerbaijan personnel.

(3) - Dissemination of the first-year results in an international simposium/congress.

Second year:

(1) - Selection and sampling of 8-10 Archaeological sites of age preliminarly restricted to a given time interval. A field-survey of 10 days in Azerbaijan will be performed in the first half of 2013. The second (and last) 2013 field-survey will be performed in the second quarter of this year. In both cases, two members of Italian team and two members of Azerbaijan team will be involved.

(2) - The analitical work will be performed in the Archaeomagnetic laboratory of IGG-CNR by Italian and Azerbaijan personnel.

(3) - A meeting (3 days) will be held at the beginning of 2013 in Italy c/o IGG-CNR Archaeomagnetic Laboratory. The main results of the project will be summarized in Baku in a second 3-days meeting, in November/December 2013.

(4) - Dissemination of the main results of the project will be performed by the publication in an ISI peer reviewed Journal.

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