RESEARCH FIELD:
Physics of the Earth

RESEARCH SECTOR:
Magnetism and Archaeology

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RESEARCH DESCRIPTION:
This research sector embraces various applications of the rock-magnetic techniques to archaeology:
1) Archaeomagnetism. This research is mainly focussed on the study of direction and intensity of the Earth’s magnetic field in the past, in order to derive the secular variation (SV) of the field. Well dated, baked clay archaeological structures have been and are currently sampled in various archaeological sites in Italy (Fig. 1) and Greece. These samples provide tie-point for the paleodirection (declination and inclination angles) and the
paleointensity, which – together with literature data – have been used to draw the reference SV curves for Italy, Greece and the Balkan peninsula (Fig. 2). The curves, supplemented by the regional field models available for the past 3000 years for southern Europe, are used to date structures of unknown age, both for our research programs and at request of the Sovrintendenze Archeologiche. Besides traditional baked clay material, we also study mural paintings, which behave as magnetic recorders because of the pigment such hematite used in the preparation of red colours. The laboratory techniques for the measurements of mural paintings have been devised at the ALP laboratory and applied to paintings in Italy, Mexico and the Vatican city.

2) Provenance study. Obsidian is an ideal material for reconstructing past trade routes between the production places and even far distant archaeological sites. Rock-magnetism helps in identification of the provenance of ancient obsidian tools. We have proposed a new laboratory approach based on the evaluation of the size of the magnetite grains within the obsidian and used measurements at the liquid nitrogen temperature to detect the nanometric grains characterized by superparamagnetic behaviour. The method has been successfully checked using geological and archaeological samples from the obsidian sources in the Mediterranean Sea (Lipari, Palmarola, Pantelleria, Sardegna - Monte Arci, Milos).

EARTH SCIENCE DEPARTMENT LABORATORIES USED:

Rock preparation laboratory
Alpine Laboratory of Paleomagnetism (Peveragno)

RESEARCH PRODUCTS:


Tema, E., Goguitchaichvili, A., Camps, P., 2010. Archaeointensity determinations from Italy: new data and the Earth’s magnetic field strength variation over the past three
Fig. 1. Examples of ancient kilns excavated in various archaeological sites in Italy that have been studied for the determination of the Earth's magnetic field direction in the past (da Tema et al., 2006, Geophys. J. Int.)
Fig. 2. a) Declination, b) Inclination and c) Intensity secular variation curves of the Earth's magnetic field in the Balkan Peninsula obtained for the last 8000 years (da Tema & Kondopoulou, 2011, Geophys. J. Int.)

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