EXPERIMENTAL TESTING OF THE EFFECT OF SAMPLE INHOMOGENEITY ON MEASURED REMANENCE VECTOR

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ABSTRACT

We present the results of a simple experiment aimed to show the effect of sample inhomogeneity on the vector of RM when measured using JR6 series Spinner Magnetometer.

Keywords: Sample inhomogeneity, Spinner magnetometer, Helmholtz coils

RESUMEN

Presentamos los resultados de un sencillo experimento con el objeto de mostrar los efectos de heterogeneidades en la muestra sobre el vector de la RM cuando son medidas usando los magnetómetros de rotación de la serie JR6.

Palabras claves: Muestras heterogéneas, Magnetómetros de rotación, Bobinas de Helmholtz

Explanation

The observed remanent magnetization (RM) of a paleomagnetic sample is the vector sum of the remanent magnetic moments (normalized per sample volume) of all the magnetized particles contained within it. Considering the inhomogeneous nature of many paleomagnetic samples, a question arises how this inhomogeneity may affect the measured RM vector, especially when dealing with very coarse-grained rocks or banded rocks with inhomogeneously magnetized bands. The inhomogeneity effect can be even more pronounced in archeomagnetic samples, which usually consist of irregularly shaped archeological material (*e.g.*, piece of pottery or brick) embedded in a regularly-shaped specimen composed of plaster or other non-magnetic material. We present the results of a simple experiment aimed to show the effect of sample inhomogeneity on the vector of RM when measured using JR6 series Spinner Magnetometer.

The AGICO JR-6/JR-6A dual speed Spinner Magnetometer is based on classical spinner magnetometer principle with pick-up unit consisting of a pair of Helmholtz coils. The coils were designed as such to ensure the maximum spatial homogeneity in sensing the magnetic field generated by a spinning specimen. To test this homogeneity, we elaborated an artificial sample in which various degrees of inhomogeneous magnetization can be simulated. Our test sample consists of a cube of non-magnetic plexiglass with a series of precisely oriented threaded holes. A small non-magnetic screw with embedded magnetized ferrite wire is used to simulate a magnetic dipole. By gradual screwing this screw into various holes of the plexiglass cube we were able to simulate the situations where exactly the same magnetic moment is inhomogeneously positioned within the sample volume including the extreme eccentric positions at the cube corners. A full vector of RM was repeatedly measured in each screw position. Our experimental results show that the orientations of RM vectors are virtually the same regardless of the position of the ferrite within our test sample. The module of RM can be repeatedly measured within a precision of 1%.