Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SEM032-P03 Room: Convention Hall Time: May 25 17:15-18:45

A revised system for detecting frequency and magnetic field dependence of AC magnetic susceptibility

Kazuto Kodama[1*]

[1]Center for Advanced Marine Core Research

The frequency dependence of low-field AC susceptibility has frequently been used as the difference of those at low (470 Hz) and high (4.7 kHz). The two different frequencies are based primarily on a commercial susceptibility meter, the Bartington device, which has been widely used in environmental magnetic research. However, the conventional frequency dependence index is insufficient to evaluate the spectrum of grain size distribution below the SP-SD threshold. Attempts have been made to measure AC susceptibility over a wide range of frequencies, though they appear to be not enough to detect a continuous change in susceptibility over a broader range of frequencies. This study deals with a unique equipment that enables susceptibility measurements over a broader frequency spectrum ranging from 1 Hz to 5 kHz, which could allow to provide new experimental data for better understanding rock magnetic characteristics, including grain size distributions near the SP-SD boundary, the effect of grain interactions and any other rock magnetic information applicable to environmental magnetism. The new measurement system consists of a primary coil for applying an excitation field to a one inch-size cylindrical or cubic sample, a set of pickup coils linked in series and wound oppositely. The number of turns for the primary coil is 6,000?and that for the respective pickup coil is 2,000. All of them are wound with copper wire of 0.1 mm in diameter. The excitation field is produced by a commercial function generator with two independent outputs, capable of generating sinusoidal current with frequencies of 0 to 10 MHz. The amplitude of the AC magnetic field is also changeable from 0 to 2 kA/m. To achieve null compensation of the pickup coil output, a mutual inductor coil is connected in series with the pickup coil system, to which the function generator supplies, through the second output, a small current that can be adjusted in phase and magnitude to compensate an unbalanced output prior to loading a sample. The resulting signal output voltage is fed, through a differential amplifier, to a digital rock-in amplifier that is connected to the primary coil as a reference signal input. The AC frequency spans from 1 Hz to 5 kHz due to the limitation of the lock-in amplifier, but can be changed continuously over the entire range. The outputs from the lock-in amplifier in both magnitude and phase are fed to a PC to draw a diagram showing the dependence of AC magnetic susceptibility on the frequency and magnitude of the applied field.

Keywords: AC magnetic susceptibility, frequency, magnetic field intensity