

## **Measurement and analysis of dynamic magnetizations in time domain and frequency domain: a rock magnetic approach**

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Dynamic magnetizations, or transient magnetization variations in short period time, were measured for selected natural samples (volcanic rocks and sediments) in time domain and frequency domain. The time domain measurements were performed by measuring magnetic relaxations after application of short pulse fields with variable lengths (10  $\mu$ s to 10 ms) and amplitudes (0.5 mT to 0.7 T). In the frequency domain, low-field magnetic susceptibility was measured over broad-band frequencies; 1 kHz to 500 kHz at room temperature and 1 Hz to 1kHz at low temperatures. Results in the time domain with strong pulse fields ( $> 0.5$  T) were characterized by rapid magnetization variations with time that are considered as magnetic relaxations with the decay-time constants ranging in  $10^{-4}$  to  $10^{-5}$  sec. In weak pulse fields, no such relaxation was observed except for the sediments rich in superparamagnetic (SP) particles. These field dependencies suggest that the relaxations in the strong fields could be due to the dynamics of the domain walls in the MD particles, while those of the sediments in weak fields may be ascribed to the relaxation of the SP particles. Meanwhile, results in the frequency domain were obtained in terms of the frequency spectrum of the real and imaginary components of complex susceptibility. Comparisons and interpretations of the data in these different domains were made in terms of the distribution of relaxation times. Discussions on the numerical conversion and transformation of these data as well as their rock magnetic applications will be provided.