E135-005 **Room: 301B** **Time: May 16 16:30-16:45**

How to separate magnetostatic interactions between particles or domains? Clues from high temperature FORC measurement

ZHONG ZHENG[1]; Yozo Hamano[2]

[1] Sogokaihatsu Co. Ltd.; [2] Dept. Earth & Planetary Physics, Univ. of Tokyo

We report high temperature FORC measurement results on representative samples of historical lava from Hawaii and Izu-Oshima that allow us to distinguish magnetostatic interactions caused by magnetic particles or domains. The Thellier-Coe method is generally accepted as the most reliable approach for absolute paleointensity determination because it relies on the thermal remanent magnetization (TRM), the best understood magnetization process. This method essentially requires that the unblocking temperature spectra of TRM must match the sample's blocking temperature spectra. Our recent study suggests that magnetostatic interactions between magnetic assemblages can seriously affect the properties of TRM (Zheng et al. poster of this meeting) and generate non-ideal behavior for the Thellier-Coe experiment. With presence of magnetostatic interactions, not only the unblocking temperature will not equal to the blocking temperature, but also additional TRM due to grain's interaction field will be created and blocked in the sample. The additional TRM blocked by the internal field is caused by the existing average remanent magnetization of clustered particles. Thus, the magnetostatic interactions will have particular disastrous effects on the Thellier-Coe paleointensity experiment. The first-order reversal curves (FORC) technique provides a potential method to detect the magnetostatic interactions between magnetic particles (Pike et al. 1999, Roberts et al. 2000). A FORC diagram is a contour plot of a FORC distribution, with microcoercivity (Hc) and interaction-field (Hb) plotted on the horizontal and vertical axes, respectively. Our results on historical lavas from Hawaii and Izu-Oshima show that although the spreading in Hb axis could refer both magnetostatic interactions between magnetic particles and domains (perhaps also including the domain walls) of magnetic grains, the characteristics of the two interactions have rather distinctive differences, especially at higher temperatures. Magnetostatic interaction between magnetic particles is a function of magnetic states and the distance between particles, and is sensitive to the change of the saturation magnetization (Ms). The resultant FORC diagram is asymmetric about the Hb axis. Because Ms often decreases at higher temperatures, it is reasonably to expect that the effect due to magnetic particle's interactions will be weakened. The FORC diagram at higher temperature thus would become slight symmetric. In contrast, magnetostatic interaction between magnetic domains is insensible to the change of Ms, and its FORC diagrams are almost symmetric in the Hb direction. Magnetostatic interaction between magnetic domains is found to be dominant in large multi-domain (MD) grains, and often characterized by low coercivities that lie symmetrically close to the Hb axis. Thus, FORC diagrams for high temperature measurements can be used to detect the magnetostatic interactions caused by magnetic particles or domains and separate the two effects.