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A new technique for probing thermal alteration by using comparison of AF demagnetization curves of AMS parameters

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We report our new findings that anisotropy magnetic susceptibility (AMS) parameters during stepwise alternating-field (AF) demagnetization can be used for probing thermal alteration that often occur in paleointensity experiments. It is generally recognized that changes in thermal remanent magnetization (TRM) due to thermal alteration of magnetic grains during laboratory heating are the main reasons to result in failure in paleointensity determination experiments. We wander whether there is a quick and simple mean that allow us to detect this kind of changes and thus better selecting proper samples for paleointensity experiments which is time-consuming and lab-intensive. Based on results from Zheng et al (2005, 2006, 2007) that it is magnetostatic interaction between grains, rather than domain interaction, could seriously affect on the properties of TRM and generate the non-ideal behavior in the Thellier-Coe method even in the case of mixture of MD and PSD grains, we recently identified that anisotropy magnetic susceptibility (AMS) parameters such as shape parameter (T) and mean susceptibility (K) are also significantly affected by the grains interacting field. Thus, AF demagnetization curve of AMS parameters is also a function of grains interacting field and magnetic mineralogy of grains, which can potentially probe the thermal changes in TRM as well. To enforce the effect of grains interacting field we charge sample with greatest magnetization of saturation isothermal remanent magnetism (SIRM) before running of AF demagnetization. After every AF demagnetization step, AMS parameters are measured to obtain the stepwise AF demagnetization curves of shape parameter (T) and mean susceptibility (K). By comparison of the curves obtained from raw sample and heated sample, it is possible to check whether thermal alteration has occurred in view of both magnetic mineralogy and magnetostatic interacting field. We will illustrate the effectiveness of this method with true rock examples from the Northeastern China Tertiary - Cretaceous basalt sequences.

Keywords: probing thermal alteration, AMS parameters, paleointensity experiment, magnetostatic interacting field, SIRM, AF demagnetization