TOWARDS A RELIABILITY CHECK FOR THE MULTI-SPECIMEN DIFFERENTIAL PTRM PALEO-INTENSITY METHOD

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The multi-specimen differential pTRM paleo-intensity method (Dekkers and Boehnel, 2006, EPSL 248, 507-516) presently lacks a constraint for the selection of the pTRM acquisition temperature. For reliable results (of any paleo-intensity (PI) method) no or very little changes in magnetic state should occur during the experiment. The occurrence of such changes is directly related to the pTRM acquisition temperature (also referred to as set-point temperature) at which the experiment is carried out. It is therefore important to constrain this temperature. This would yield an indication for the reliability of the outcome of the PI experiment independent of the actual result in technical terms.
Detecting changes in magnetic state as function of temperature along with thermo-chemical alteration has shown to be not trivial. Various ways have been proposed, including measurement of changes in low-field susceptibility or magnetization as function of temperature, and measurement of the susceptibility or hysteresis properties before and after the PI experiment. While insightful in some ways, these methods gave equivocal results when applying them on a sample set from historic (20^{th} century) lavas from mount Etna, Italy: no alterations were detected after heating at 160°C, while the multi-specimen method yielded an underestimate of the PI of about 25% compared to the IGRF. This indicates that very subtle changes in magnetic state, that go undetected by the aforementioned magnetic measurements, do have a large influence on the outcome of the PI method.
Here we explore the suitability of ARM acquisition curves to diagnose subtle changes in magnetic state. As is well known, specific ARM intensity varies strongly with magnetic grain size, particularly in the SD grain-size realm. By using the automated SQUID magnetometer with in-line rock magnetic facilities available in the Utrecht paleomagnetic laboratory, high-resolution ARM acquisition curves (47 steps) were taken from samples annealed at various temperatures. The results, although very preliminary at this stage, indicate that ARM acquisition might be an important addition to the aforementioned magnetic measurements to detect changes in magnetic state with temperature. Therefore it would provide an *a priori* constraint on the set-point temperature for the multi-specimen pTRM paleo-intensity protocol.

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