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Improved procedure for interpreting multispecimen palaeointensity data

D Krasa
University of Edinburgh, School of GeoSciences, Edinburgh, United Kingdom (david.krasa@ed.ac.uk, +44 131 6683184)

The recently introduced multispecimen parallel differential pTRM palaeointensity method allows for much quicker palaeointensity determinations compared to other techniques such as the various modifications of the classical Thellier technique. Initial results by a number of authors suggest that it provides reliable estimates of palaeointensity even for magnetic multidomain remanence carriers. If true, this would substantially widen the range of samples suitable for palaeointensity determinations and would provide the chance to add much needed data to the palaeointensity database. However, more theoretical work is needed to underpin the validity of the method. Additionally, the method would benefit from some kind of check procedure to determine the reliability of results on a case-by-case basis.
Here, I introduce a first-order theory of the method and argue that the ordinary least squares (OLS) approach used for determining the best-fit line through the data needs to be replaced by a weighted least squares approach in order to obtain valid results. This is because the statistical data errors do not have constant variance, i.e. they are not homoskedastic, which is one of the conditions for being able to use OLS.
Additionally, I present a new quality check which compares the y-axis intercept in the fracpTRM-versus-field plot with data from stepwise thermal demagnetisation. This quality parameter can detect non-ideal behaviour and helps to determine the validity of results.