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Evaluation of the domain-state corrected multiple-specimen absolute palaeointensity protocol: a test of historical lavas from Iceland.

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Palaeointensity estimates were made for a suite of five historical lava flows from Mt. Askja, with the purpose of testing newly proposed domain state corrections to the multispecimen parallel differential pTRM palaeointensity method (MSP), where pTRM stands for partial thermoremanent magnetisation. Before beginning the experimental procedure the chemical stability on heating to the determined pTRM induction temperature was assessed; some flows were found to be reliable, some displayed inconsistent repeatability, while one flow was severely affected by heated. To implement the domain state corrections and interpret the data successfully, we had to implement two new approaches to the MSP method: (1) we use vector addition/subtraction in our calculations, and (2) we have introduced a new selection/rejection criterion that improves the robustness of the estimates by preferentially removing outliers based on the error analyses of the linear regression. This rejection criterion typically rejected one or two points, and was found to significantly improve the estimates. With the exception of one flow, which displayed significant chemical alteration during the experiment, the palaeointensity estimates determined using the original MSP protocol yielded estimates within $\pm$ 3 μT of the known filed of 49.5 μT. On comparison, the domain state corrected MSP estimates were all within $\pm$ 4 μT, with no clear relationship between the uncorrected and domain state corrected palaeointensity estimates.