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Palaeointensity of historical lavas from Fogo, Cape Verde

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A major ongoing challenge in palaeomagnetism is the development of reliable absolute palaeointensity methods. In the last fifteen years a number of methods have been proposed and our understanding of existing methods has advanced greatly. However, palaeointensity results obtained from historical lavas produce significant variations about the expected result regardless of methodology. The source of these variations must be investigated if we are to make robust conclusions about the palaeomagnetic field during important times in geological history. We report a detailed palaeointensity study on approximately 200 specimens from eight sites within the 1951 and 1995 flow lobes on the island of Fogo, Cape Verde, showing results from LTD-DHT Shaw, Coe-Thellier, microwave, Wilson and multi-specimen parallel differential pTRM methods. In addition to commenting on the overall success of each palaeointensity method, we focus on two specific sets of specimens that show either no/limited deuteric oxidation or a high degree of oxy-exsolution with multiple generations of ilmenite lamellae growth. We describe their rock magnetic properties in detail and attempt to link them to specific characteristics seen in the palaeointensity experiments. We also look at the effect of using argon gas during the LTD-DHT Shaw experiments and highlight a significant improvement compared with experiments on sister specimens run in air. Coe-Thellier and LTD-DHT Shaw experiments run in argon were most successful, producing a mean within 10% of the expected historical field value; however, all methods resulted in pronouncedly scattered palaeointensity estimates.