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Magnetic anomalies in lava fields and consequences on the reliability of the palaeomagnetic signal recorded in lava flows: results from the Canary Islands

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In 1999, Jean-Pierre Valet and Vicente Soler published a study to explore the magnitude of deviations in direction and intensity of the ambient magnetic field induced by the crustal field and the possible consequences on paleomagnetic records. They measured, over more than two years, the total magnetic field above the surface of 12 lava flows in the islands of La Palma and Tenerife (Canary Islands, Spain) and observed that mean directions above the different flows showed values differing by 9° in declination and 6.5° in inclination. Also, virtual dipole moments differed by more than 10%. They concluded that paleomagnetic records could be significantly affected by this effect. Paleomagnetic measurements of a large number of samples or a spread-out sampling of lava flows would provide the best way to average out the contribution of anomalies.

In a recent paleomagnetic and multimethod paleointensity study performed on rocks from a lava flow erupted on December 4th, 2021, in the island of La Palma, paleomagnetic results were obtained from a large number of samples, yielding a mean palaeomagnetic direction in excellent agreement with the actual IGRF-13 value. In addition, paleointensity determinations were carried out on 25 specimens, yielding results in agreement with the expected value in 60 per cent of the studied cases. The use of a relatively high number of specimens and the sampling performed across the whole thickness of the flow might have been useful to reduce the effect of local magnetic anomalies.