



Icelandic lavas record quasi-continuous paleointensities of the Laschamp geomagnetic field excursion

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We sampled 28 lava flows and a tephra layer dated at about 40 kyr at the Reykjanes Peninsula, Iceland. 10 flows and the tephra recorded what is known as the Skalamelifell geomagnetic field excursion. The age of this excursion (42.9 ± 7.8 ka) is statistically indistinguishable from the Laschamp excursion (46.6 ± 2.4 ka). Rock magnetic investigations show that the main remanence carriers are (titano-)magnetites with different degrees of oxidation. One excursionsal flow exhibits partial self-reversal behaviour; however, its paleodirection is unaffected. We subjected 60 samples from 17 flows and the tephra to Thellier-type paleointensity determinations. Reliable paleointensity data were obtained for 10 of the 29 sites. The excursionsal sites have paleointensity values of about $5 \mu\text{T}$, about 1/10 of the intensity of the normal polarity flows ($27.40 \pm 0.28 \mu\text{T}$ to $59.30 \pm 3.86 \mu\text{T}$). Towards the end of the excursion, paleointensity regained about half of its original value ($17.66 \pm 0.58 \mu\text{T}$). A comparison of the paleointensity data with the results of previous studies gives a very consistent picture, as all records show almost identical intensity values during the Skalamelifell excursion. A tentative stratigraphic relationship between 25 sites prior to, during and after the Skalamelifell excursion was established by comparing them with virtual geomagnetic poles (VGPs) from different marine sedimentary records. Only VGPs from four flows could not be matched unambiguously to those of the marine records. Our results support the theory that the geomagnetic field during the Laschamp excursion likely had a simple transitional field geometry. The data are best explained by a decrease of the axial dipole and a substantial transitional equatorial dipole that was accompanied by a considerably reduced non dipole field.