



The Laschamp and the Other Recent Events - Excursions or Reversals?

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The Laschamp event discovered by Norbert Bonhommet in lava flows of Massif Central (France) is the youngest and the most studied field excursion. Its geomagnetic origin has been controversial due to the existence of self-reversal processes. Taking advantage of new dated sites, we have studied 21 units including 12 new localities and found no new site with intermediate or reverse polarity was found. Ten sites have a normal polarity and all sites studied at Olby, Louchadière and Royat display intermediate but scattered directions. We confirm that reverse polarity flows are affected by self-reversals but we found that this is also the case for normal flows. A direct consequence is that self-reversals cannot be taken as responsible for the reverse directions but they likely contribute to generate dispersion. Thus despite complex magnetization, the geomagnetic origin of the Laschamp in the Chaîne des Puys is not questioned. The volcanic pole positions (VGPs) clearly indicate that the Laschamp event is associated with full reversed directions. The compilation of the most detailed records of excursions that occurred during the Brunhes and Matuyama chron shows that this situation is almost systematic. In all cases, at least one virtual geomagnetic pole (VGPs) is able to reach the opposite polarity. In the next step, we have computed different simulations of excursions during which the dipole progressively vanishes before growing back without reversing. This scenario produces very few reversed directions which are only visible at some latitudes. We infer that it is impossible to reach the ratio of reversed to intermediate VGPs present in the paleomagnetic records if the excursions were not associated with a short period of reversed dipole field. Therefore, excursions should be regarded as two successive reversals bracketing an aborted polarity interval. We propose that the same underlying mechanisms prevail in both situations (excursions or reversals) and that below a certain strength the field reaches an unstable position which precludes either the achievement of a reversal or the return to its former polarity .