

Reproducibility of the Thellier paleointensity determination: A case study on the Tateno lava flow, Aso Volcano

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In order to assess the reproducibility of the paleointensity determination, Thellier experiments were carried out on the Tateno lava flow of Aso volcano. Samples were taken from 15 sites on the Tateno lava flow, which was found to be well behaved in the Thellier experiments by the preliminary research.

We submitted 55 specimens to the Thellier experiments of 13 steps between 20 to 570 deg. The data selection criteria used was essentially same as Selkin and Tauxe (2000) with some stricter parameters. For the point selection for the regression on Arai-diagram, a criteria that "the residual error does not change taking the end point or not" was added in addition to the correlation coefficient. Under those criteria, we got the 32.5 ± 0.57 micro-T, which was one of the most well determined paleointensity ever recovered. The successful results were from 46 specimens, with the success rate of 84%, and 13 out of 15 sites gave at least one paleointensity result.

The error of the results was analyzed comparing the error of each specimen, and within site and between sites dispersions. The error expected from the linear fitting on Arai diagram was typically 2.5%, while the standard deviation calculated from all the valid results were 5.5%, which means that there was the unknown source of error in between. The within site dispersion was typically 2-3%, which corresponded well with the individual error. It indicates that the fitting error of individual specimen fairly represent the total experiment error.

The source of the between site dispersion was assessed with several rock magnetic experiments, including hystereses measurements, thermo magnetic analyses, and reflection right microscopic observations, and the magnetic field intensity measurements on the sites. However, none of the parameters obtained in the above experiments corresponded to the paleointensity, and we failed to explain the paleointensity variation between sites.