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Solid Earth
Discussions

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3, C428–C430, 2011

Interactive
Comment

Interactive comment on "Paleointensities on 8 ka obsidian from Mayor Island, New Zealand" *by* A. Ferk et al.

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Dear Dr. Muxworthy,

We are glad to see that you think that our manuscript should be published in Solid Earth after some minor alterations. Please find below your comments (in italics) and our answers to them.

On behalf of all authors, Annika Ferk

This paper describes a detailed palaeointensity study of 8ka obsidian from NZ. The use of obsidian is rare in palaeomagnetic studies, but due to its single domain character appears to be a reliable palaeointensity recorder. The southern hemisphere locality is also rare, making the data particularly important for global geomagnetic field mod-

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Interactive Discussion

Discussion Paper

els. The study includes detailed rock magnetic analysis, and attempts to determine the anisotropy of thermoremanence and the effect of cooling rate. Both of the latter experiments suffered from the thermal chemical instability of the samples. This is a well written paper which should be published after a few minor alterations: the discussion (and conclusions) should be extended to include further discussion of the potential future applications and importance of obsidian in palaeointensity and palaeomagnetic studies generally. -We have included some more sentences in the discussion to highlight the importance of obsidian for paleomagnetic studies.

Are there any potential experiments which could be used to determine the mineralogy? - There are indeed experiments that might help to identify the magnetic particles. Such experiments are for examples transmission electron microscopy (TEM), magnetic force microscopy (MFM) or microprobe analysis. However, the necessary equipment is either not available at the LMU Munich or measurements are very expensive. Thus, these experiments were not possible in the course of this small project. Further, it is not sure that they will work, as the very low content of magnetic particles makes it hard to locate them under the microscope. Also, microprobe analysis of glass samples is not trivial as the sample gets heated and might change.

2. While non-interacting single-domain systems show an increase in thermoremanence intensity with longer cooling times, using a Preisach model, Muxworthy et al. (2011), showed that the thermoremance of magnetostatically interacting SD systems decreases with increased cooling times. Given this difference in behaviour, the use of cooling rate corrections needs to be justified, i.e., how well the interactions within your system justified? Muxworthy, A. R., D. Heslop, G. A. Paterson, and D. Michalk (2011), A Preisach method for estimating absolute paleofield intensity under the constraint of using only isothermal measurements: 2. Experimental testing, J. Geophys. Res., 116, B04103, doi:10.1029/2010JB007844. - We have tried to identify possible magnetic interactions by measuring IRM acquisition and backfield curves and by plotting these data in Henkel plots, but due to the very low content of remanence carriers this was not

possible. However, if there were other cooling-rate dependencies than those expected, i.e. slower cooling leads to a higher TRM, we would recognize this during our cooling rate experiments: Generally, we measure the TRM after cooling with two different cooling rates. So if slower cooling would lead to a smaller TRM - as indicative for interacting systems -, we would see this right away. Unfortunately, only one of our cooling rate experiments was successful. Nonetheless, this one showed a higher TRM after the slow cooling. We do not have any indications that there are remarkable differences between the samples and therefore, do not think that interactions in other samples are dominating.

Interactive comment on Solid Earth Discuss., 3, 679, 2011.