Publications of the Institute of Geophysics, Polish Academy of Sciences
Geophysical Data Bases, Processing and Instrumentation
vol. 423 (C-112), 2018, pp. 103-104
DOI: 10.25171/InstGeoph_PAS_Publs-2018-053
16th Castle Meeting New Trends on Paleo, Rock and Environmental Magnetism, Chęciny, Poland, 2018

Toward a Full-vector Geomagnetic Field Record (~130–550 ka) from the El Golfo Section, El Hierro, Canary Islands, Spain

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A b s t r a c t

The Earth's magnetic field is generated in the liquid outer core. So-called absolute paleointensities, i.e., a field intensity in μT for a given location that can be converted to a virtual (axial) dipole moment, are tedious to obtain and therefore remain rather scarce, in particular for periods older than the Holocene. The Holocene field intensity is considered (unusually?) high; it is reasonably well constrained by data from lavas and archaeological artefacts, at least for considerable portions of the northern hemisphere. The average intensity of the Brunhes Chron is ~20% higher than most of the underlying Matuyama Chron (Ziegler *et al*. 2011). Longer term trends within the Brunhes Chron, however, are surprisingly poorly characterised. It seems that the period between ~200 and ~400 ka featured a lower field intensity as determined for Hawaii (Pacific Ocean, USA; Tauxe and Love (2003)) and the Eifel (Germany; Monster *et al.* 2018) but data paucity precludes firm inferences. Regional full-vector PSV curves are essential to further our understanding of geodynamo operation. Such curves typically lack palaeointensity information. Here, we present new paleointensty data from El Hierro, Canary Islands. The Canary Islands are part of the Canary Island Seamount Province which developed on ancient ocean crust, the oldest Atlantic Ocean crust Jurassic in age, relatively close to a continent, Africa. El Hierro and La Palma represent the youngest islands with ages of < 2 Ma (e.g., Guillou *et al*. 1996). We sampled 28 lava flows (age range c. 150 to 450 ka) from a section along the Camino de Jinama, about 4.5 km to the south of a section sampled by Széréméta *et al*. (1999) for an analysis of directional PSV. Individual flows range in thickness between 1 and several meters, and are usually easily distinguished by the presence of scorias, pyroclastic layers, or paleosols. Three groups of flows are recognized, referred to as the upper group (UG), the middle group (MG) and the lower group (LG). In line with earlier results (Széréméta *et al.* 1999), we observe an easterly declination deviation of c. 14° for the middle and lower part of our section. We relate this to

under-sampling of the complete PSV spectrum; rotation of El Hierro since c. 500 ka is deemed unlikely. Attempts to date the flows with the $^{40}Ar/^{39}Ar$ method on a state-of-the-art multi-collector instrument were unsuccessful due to the presence of copious amounts of methane in the extracted gases.

Three different paleointensity protocols were utilized, IZZI-Thellier, multi-specimen, and pseudo-Thellier, to provide an additional consistency check and to increase the success rate. Reasonably robust paleointensities could be obtained for 22 flows, a success rate of over 70%. If more than one protocol yielded results for the same flow, the obtained intensities were nearly always within error of each other, testifying to their robustness. Flows with a common true mean direction tend to produce similar intensity values, also adding to the robustness. Obtained paleo-intensity values typically range generally between c. 20 μT and c. 35 μT, somewhat low compared to the present-day (2015) value of c. 38.5 μT but in line with other rather low values obtained elsewhere for this particular time span. However, converting these intensities to Virtual Axial Dipole Moments shows that they are in line with the average value for the past 300 ka and past 300 Ma (Selkin and Tauxe 2000), to the average Brunhes value of $6.2 \cdot 10^{22}$ Am^2 (Ziegler *et al.* 2011). Due to the lack of precise age constraints, we cannot compare our data to geomagnetic field models such as PADM2M (Ziegler *et al.* 2011) or calibrated relative palaeointensity stacks.

Keywords: absolute paleointensity, Brunhes Chron, El Hierro (Canary Islands, Spain).

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