Magnetic dating of postglacial lavas from Snæfells volcano, Iceland

Recent volcanic eruptions in Iceland demonstrate the importance assessing volcanogenic hazards. The determinations of historic eruptions, definition of eruption cycles as well as of all volcanic processes that may occur are the essentials for the assessment. Paleomagnetic investigations are ideal contributions for determining the age of historical lava flows as wells as defining eruption cycles. The advantage of this method is that dating is conducted in the lava flow itself. Other methods often use secondary sources, e.g. the dating of organic material from tephra layers of which the origin is often ambiguous.

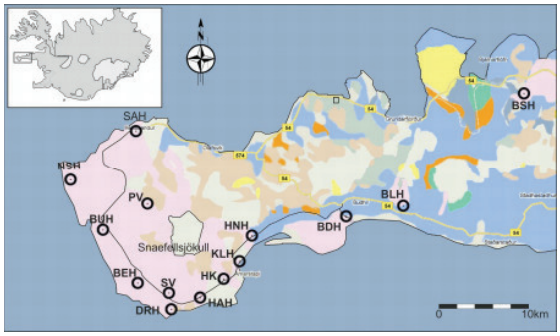

Figure 1: Map of the Snæfells peninsula and sampling sites.

Samples from fourteen different lava flows of the Snæfells volcano (Fig. 1) were subjected to paleomagnetic and rock magnetic analyses. Curie-temperatures, measurements of the anisotropy of magnetic susceptibility and thermally dependent anhysteretic remanent magnetization measurements are used to proof the reliability of paleomagnetic information. Thirty-eight samples were chosen for a modified Thellier-type paleointensity determination, which includes alteration and domain state checks. The results allow the estimation of the previously unknown ages of the Holocene flows in the vicinity of Snæfells. The paleomagnetic directions were compared to expected values of inclination, declination and field intensity from a Holocene geomagnetic field model (Leonhardt et al., 2010). Using a Bayesian archeomagnetic dating approach (Fig. 2) the probability ranges of such agreement could be analyzed and thus the age of the lavas determined. Two of the investigated lava flows correlate and confirm existing age determination of tephra layers. It was possible to relate one flow, which was previously correlated to an older event, to an eruption that occurred 1000 years later. Three of the determined lava flows are dated with more than 4500 years BP. Furthermore an additional event occurring 2770 years BP was identified (Tab. 1).

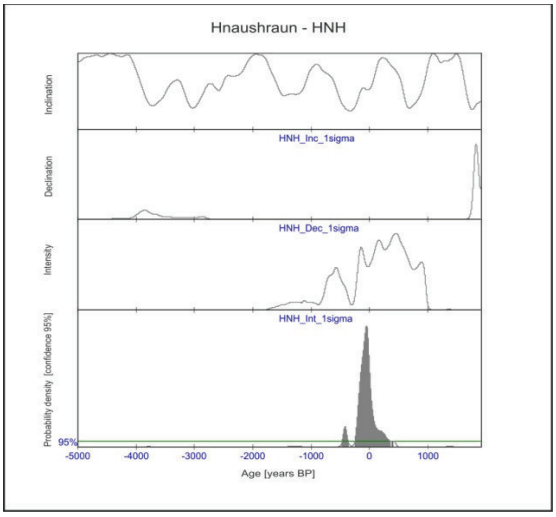

Figure 2: Age determination of HNH with RenDa (Lanos et al., 1999).

Table 1: Overview of the age determined for the lava flows

Site	Age [years BP]	± years [years BP]
Beruvikurhraun (BEH)	2770	230
Budahraun (BDH)	5600	1300
Haahraun (HAH)	1872	900
Drangahraun (DRH)	5570	1100
Svarta/Valhraun (SV)	1650	100
Hellna/Kalfatradahraun	6500	450
Hnaushraun (HNH)	1900	300

References:

Lanos, Ph., Kovacheva, M. & Chauvin, A., 1999. Archaeomagnetism, methodology and applications: implementation and practice of the archaeomagnetic method in France and Bulgaria, *European J. Archaeology, 2,* pp. 365–392.

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