

Mapping of the Eldgjá lava flow on Mýrdalssandur with magnetic surveying

Sigrún Sif Sigurðardóttir¹, Magnús Tumi Gudmundsson¹ and Sigrún Hreinsdóttir²

¹Nordvulk, Institute of Earth Sciences, University of Iceland, Sturlugata 7, 101 Reykjavík

²GNS Science, New Zealand

Corresponding author: sigrunsis23@gmail.com

Abstract — The 934–938 AD Eldgjá lava flow was formed in the largest flood basalt eruption in Iceland during the last 1100 years. Since the eruption, sediments from Katla jökulhlaups have accumulated at Mýrdalssandur outwash plain and partly buried the Áltaver lava field, the westernmost branch of the Eldgjá lava flow. Using the results from a magnetic survey on Mýrdalssandur, the location of the buried edge of the Áltaver lava field has been estimated. The magnetic measurements indicate that the edge of the Áltaver lava field lies 1–4 km further to the west than previously suggested. The thickness of sediments on top of the lava edge is ~10 m with generally decreasing thickness towards the east and northeast. The depth to the lava flow suggests that sediment accumulation on central and western Mýrdalssandur has amounted to 3–5 km³ since the Eldgjá lava flow was emplaced. The buried part of the lava flow has an area of 64 km² and volume of 1.4±0.5 km³. When these values are added to older estimates, the total area of the Eldgjá lava flow increases to 844 km² and the volume to 20 km³.

INTRODUCTION

Eldgjá is a 75 km long discontinuous eruptive fissure in the Katla volcanic system in S-Iceland. The fissure extends from southwest to northeast from beneath the Mýrdalsjökull glacier towards the Vatnajökull glacier (Larsen, 2000). The exact date and duration of the eruption is not known but the year 934 AD is often used (Thorarinsson, 1955; Larsen, 1979; Hammer, 1984; Zielinski *et al.*, 1995). A large acidity peak in the Greenland ice core correlates well with an eruption onset around 934 AD and indicates that it may have lasted for up to 9 years (Hammer, 1984; Zielinski *et al.*, 1995). The activity during the eruption occurred in episodes separated by intervals of low or no volcanic activity (Larsen, 2000; 2010).

Huge amounts of tephra (6 km³), gas and lava were produced in the eruption, which had major impact on neighbouring areas (Thordarson *et al.*, 2001). Most of the tephra was produced in explosive,

predominantly phreatomagmatic activity on the subglacial part of the fissure below Öldufellsjökull outlet glacier (Thordarson *et al.*, 2001; Larsen, 2010). The bulk of the erupted magma, however, formed extensive lava fields in SE-Iceland. The lava followed rivers and valleys down to the lowlands, forming the lava fields of Áltaver, Meðalland and Landbrot (Figure 1) (Larsen, 2000). The tephra and lava fields have the chemical characteristics of the Katla volcanic system, being transitional alkali basalt with high concentration of iron and titanium (Jakobsson, 1979). Estimates of the volume of the lava flow have ranged from 14 km³ (Miller, 1989) up to ~18.3 km³ (Thordarson *et al.*, 2001). However, the westernmost part of the Áltaver lava field is covered by the Mýrdalssandur outwash plain making definition of its western margin difficult (Larsen, 2010). The most recent volume estimate of ~18.3 km³ (Thordarson *et al.*, 2001) makes the Eldgjá lava flow one of the largest lava flows on Earth in the last 11 centuries (Larsen, 2010).