G. P. L. Walker og flæðibasalt

G. P. L. Walker and flood basalts

Birgir V. Óskarsson[1] and Morten S. Riishuus[2]

1-Institute of Earth Sciences, University of Iceland

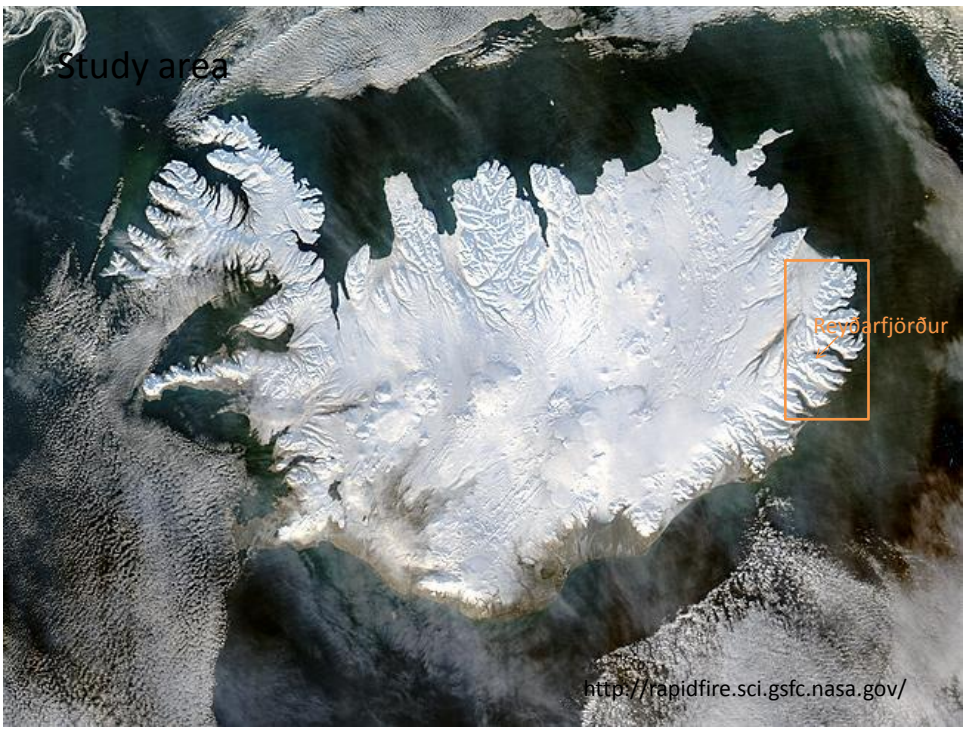
2-Nordic Volcanological Center, University of Iceland

rannís

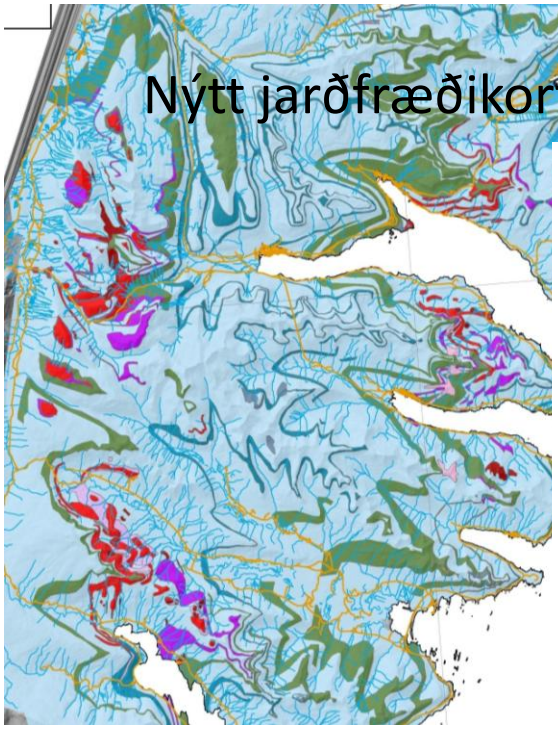
norden

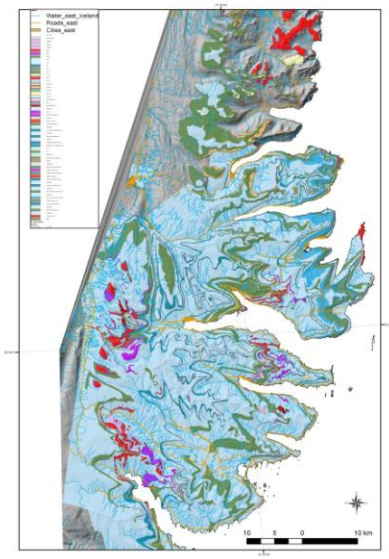
Nordic Council of Ministers

UNIVERSITY OF ICELAND



Nýtt jarðfræðikort 1:100 000





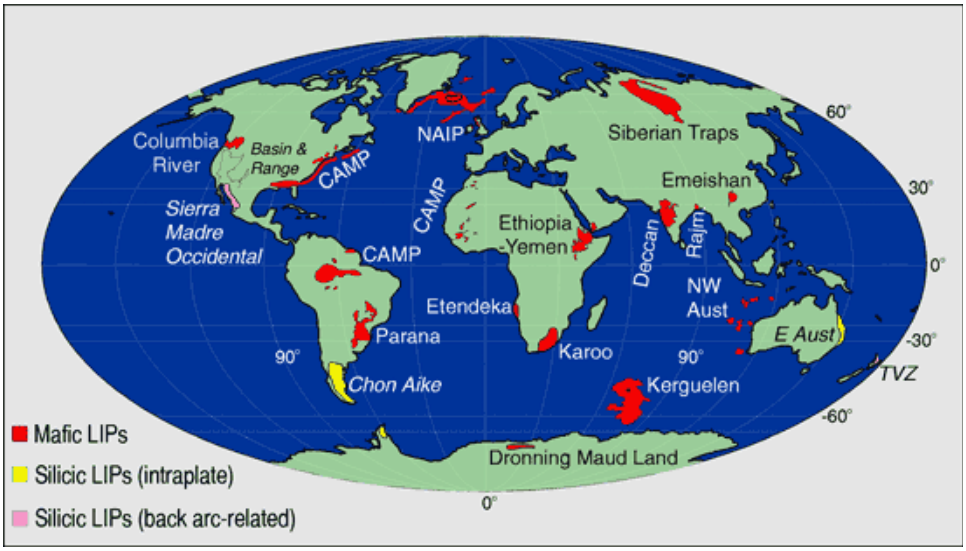
G. P. L. Walker and flood basalts

- Flæðibasalt = Plateau basalts - Flood basalt
- “early Tertiary volcanism being on a much bigger scale than recent volcanism in Iceland.”

Walker, 1995

Walker, G., 1995, Flood basalts versus central volcanoes and the British Tertiary volcanic Province, *Geological Society, London, Memoirs, 16*, 195-202

Flood basalt areas



Bryan et. al. 2002

G. P. L. Walker and flood basalts

Gibson, I., 1969, A comparative account of the flood basalt volcanism of the Columbia Plateau and Eastern Iceland, *Bull. Volc., Springer Berlin / Heidelberg,* **1969***, 33*, 419-437

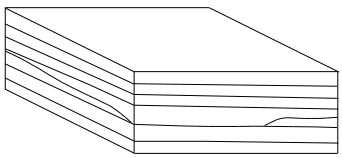
"A flood basalt field is an accumulation of overlapping or superposing tabular sheets..."

Walker, 1995

Walker, G., 1995, Flood basalts versus central volcanoes and the British Tertiary volcanic Province, *Geological Society, London, Memoirs, 16*, 195-202

End-members in flow architecture

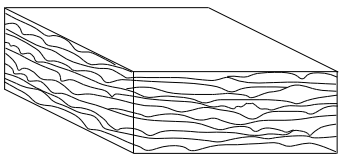
Simple flows (tabular)



not so divisible into flow-units

Common in flood basalt areas
No modern example

Compound flows

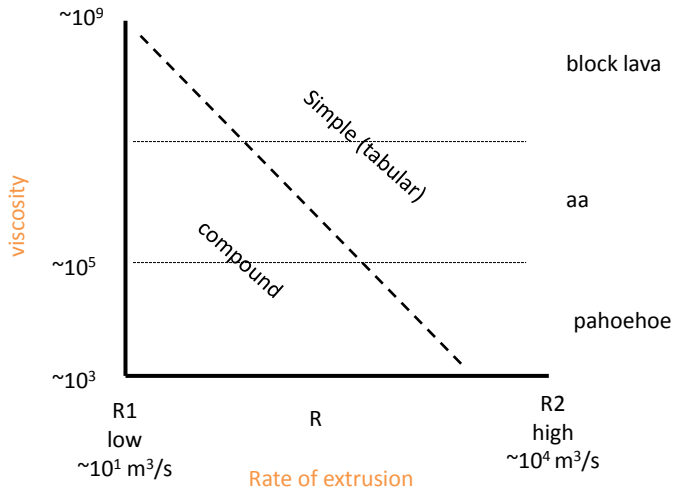


lava that is divisible into flow-units

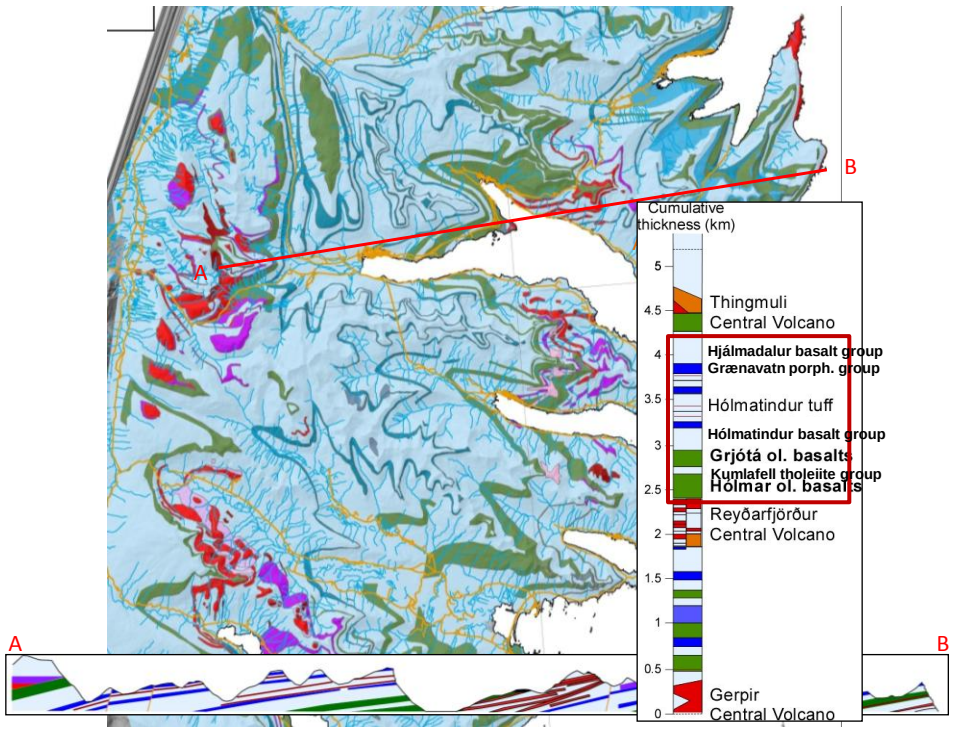
Common everywhere

Walker, G.P.L. (1971) Compound and simple lava flows and flood basalts. *Bull. Volcan., 35, 579-590.*

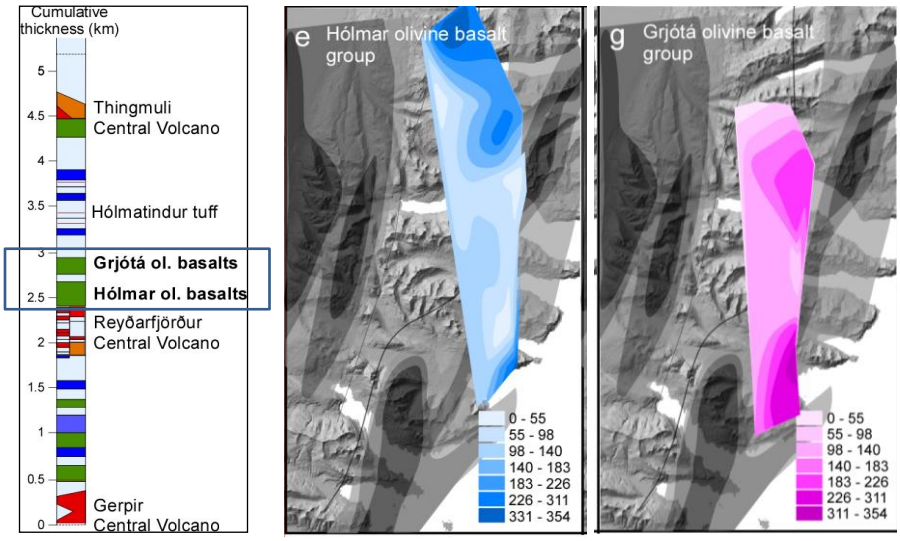
Walkers postulated relationships between simple and compound flows



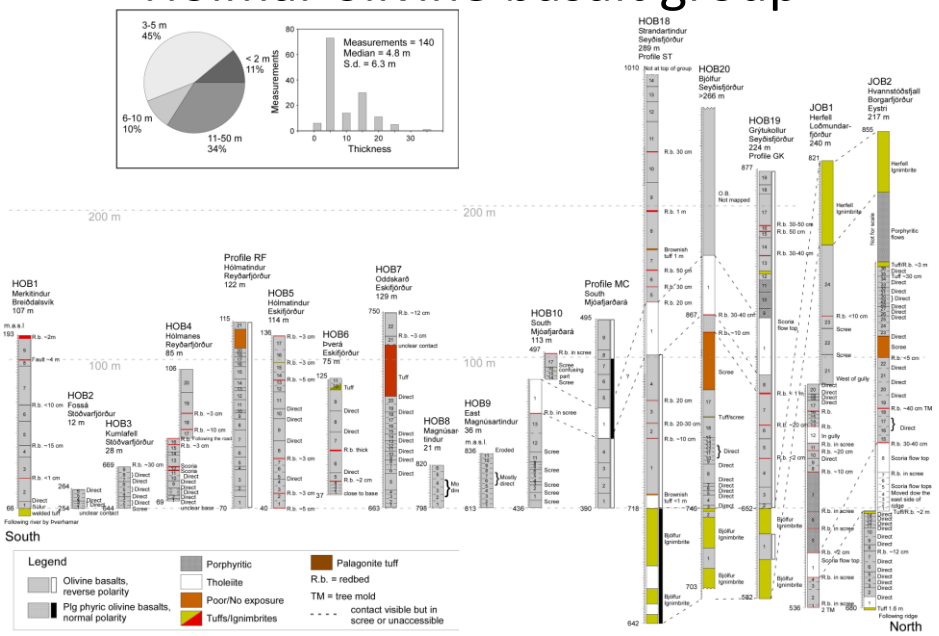
Walker, G.P.L. (1971) Compound and simple lava flows and flood basalts. *Bull. Volcan., 35, 579-590.*



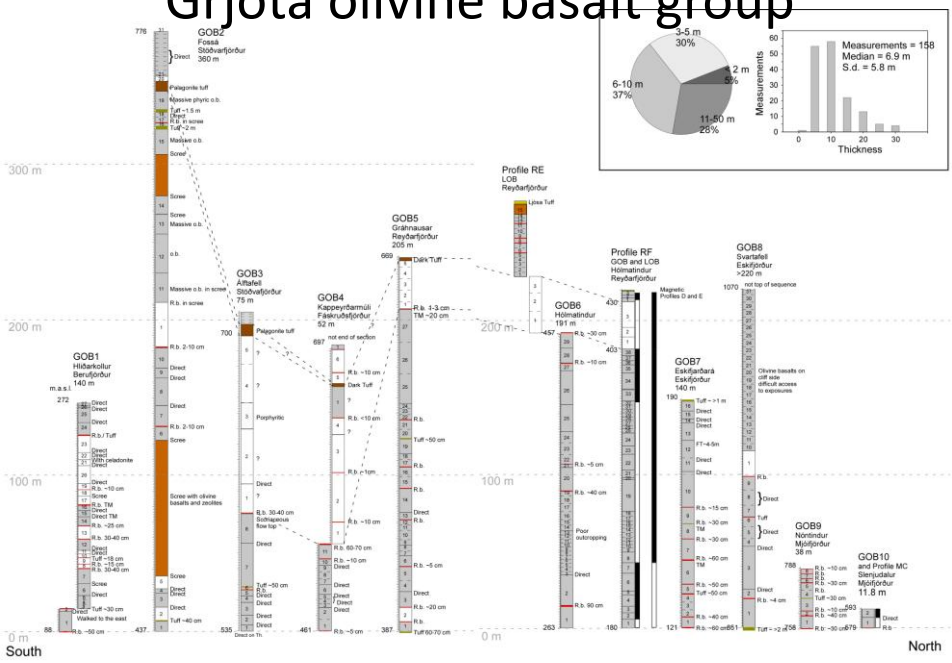
Hólmar and Grjótá olivine basalt groups



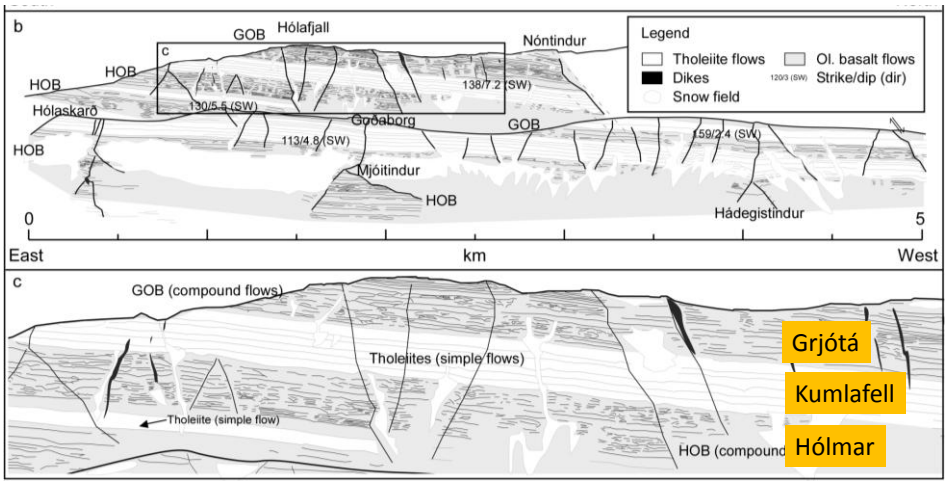
Hólmar olivine basalt group



Grjótá olivine basalt group



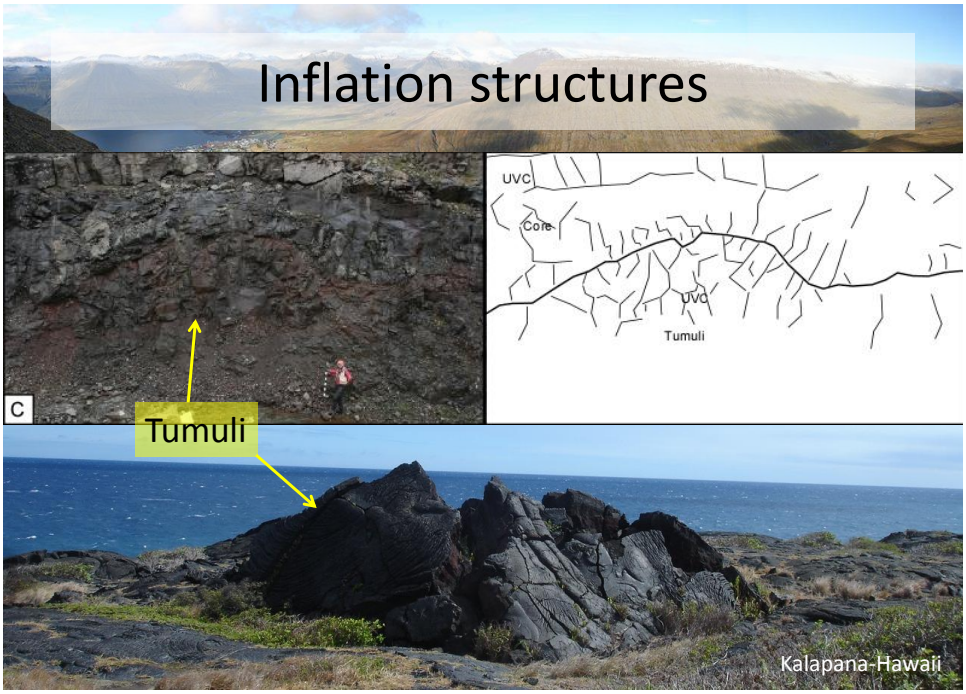
The architecture of the HOB and GOB groups

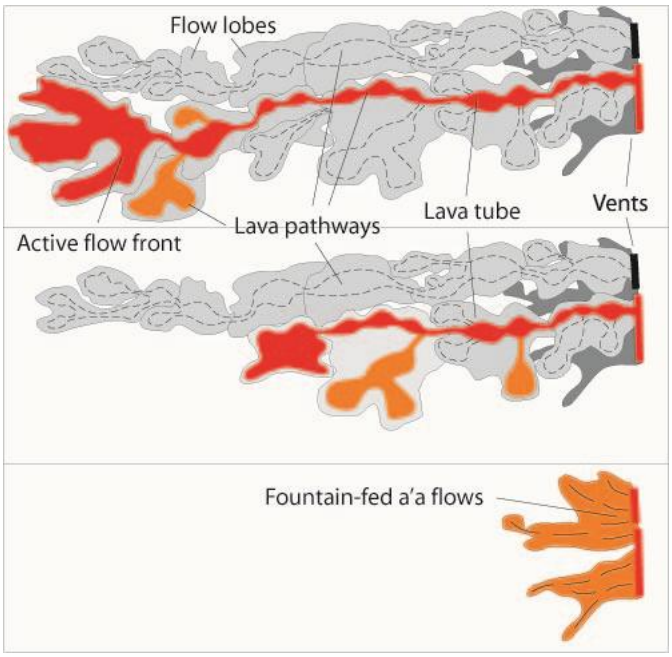


Dominantly compound with a few flows that are simple

Flow morphology

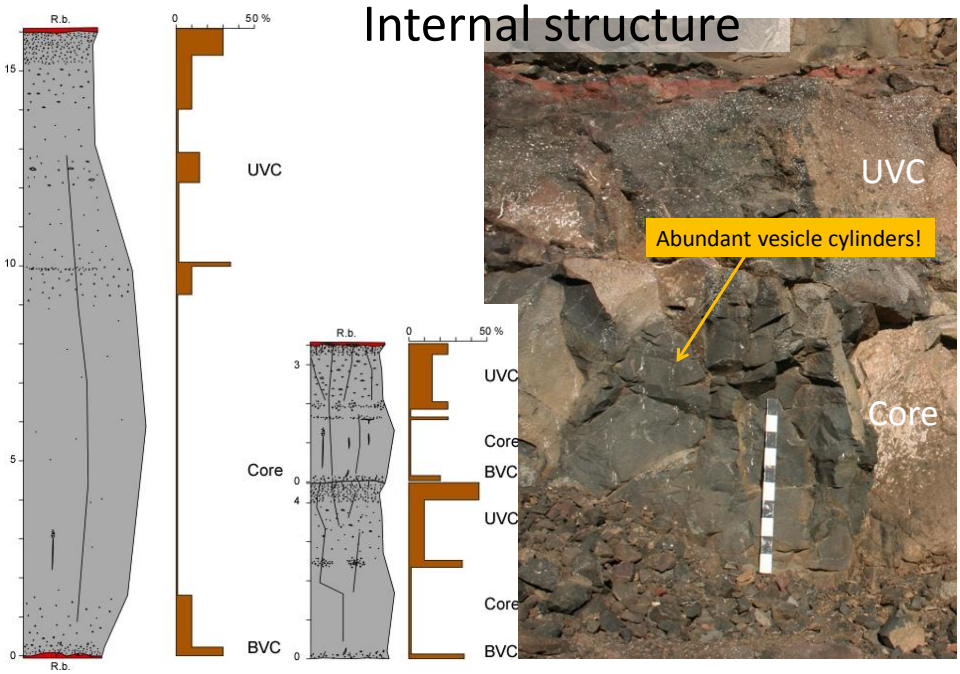
Inflation structures





Þ. Þórðarson

Internal structure



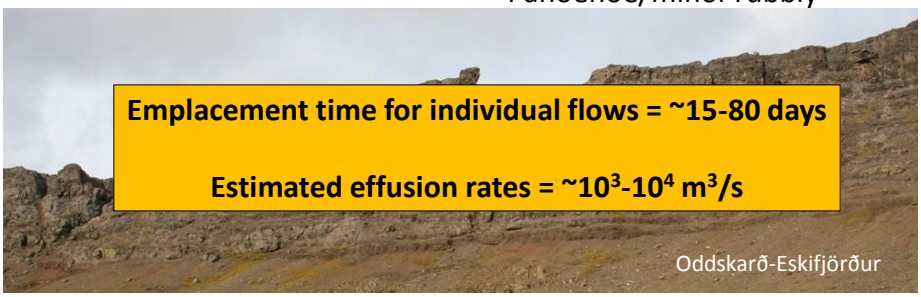
Overview

Hólmar olivine basalt group

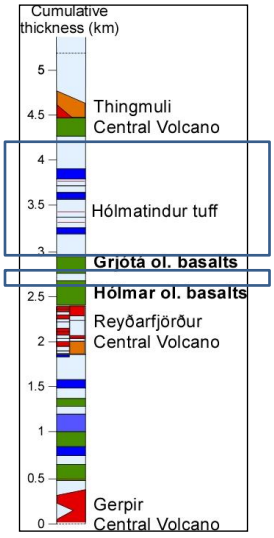
- Total volume = ~119 km^3
- Thickens around the RCV
- No. lava flows = ~ 20
- ~50% >6 m thick

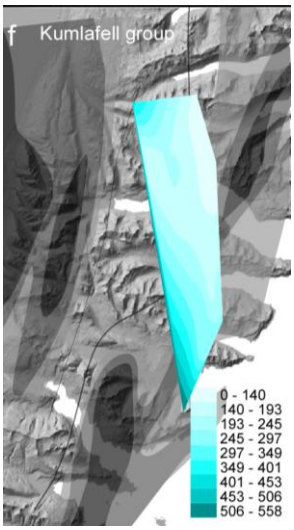
Grjótá olivine basalt group

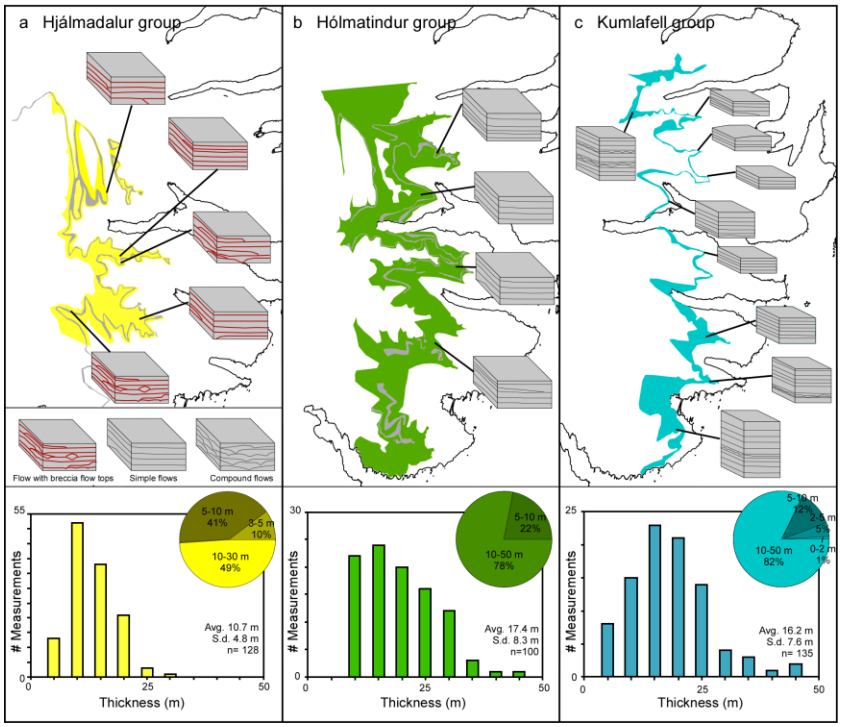
- Total volume = ~86 km^3
- Thickens above RCV
- No. lava flows = ~ 40
- >50% >6 m thick
- Pahoehoe/minor rubbly



Kumlafell, Hólmatindur and Hjálmadalur tholeiite groups

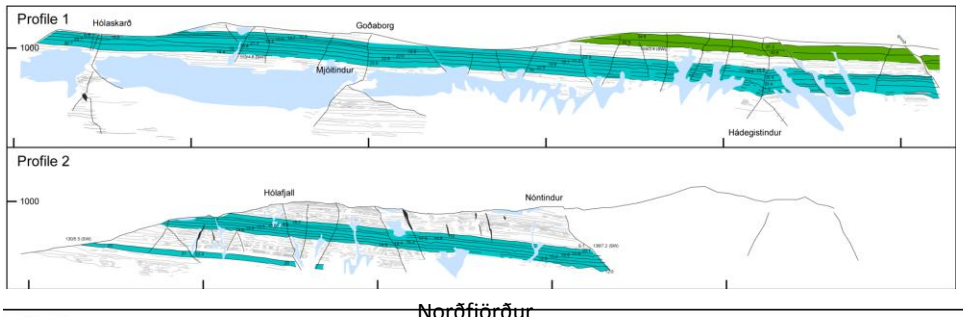




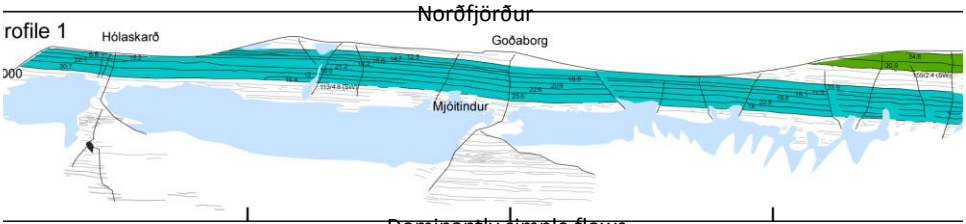


The architecture of the Kumlafell group

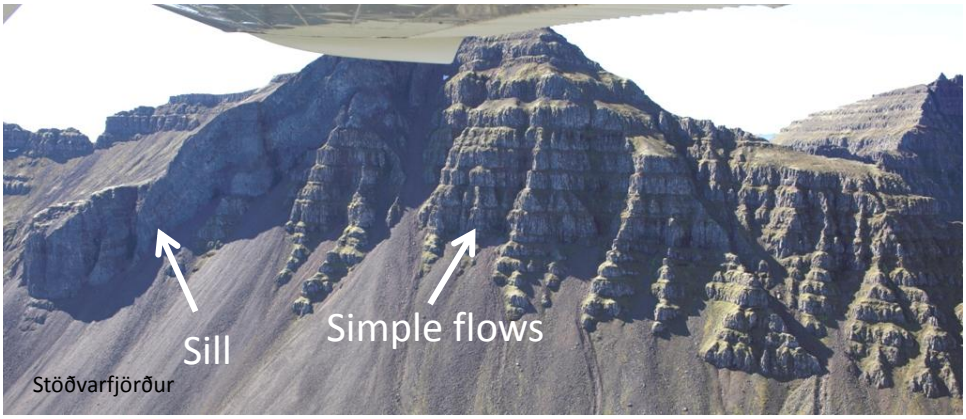
Mjóifjörður



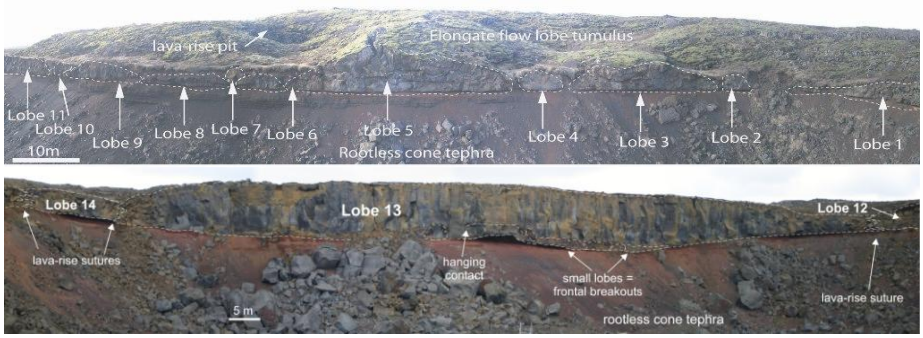
Norðfjörður



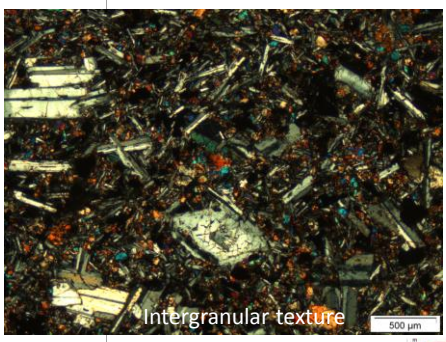
Dominantly simple flows



Pahoehoe in Rauðimelur quarry - Hrútagjá



Internal structure

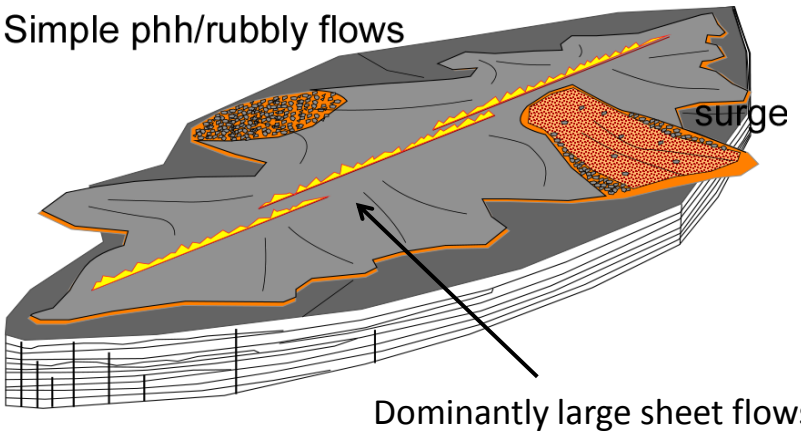


Simple upper vesicular crust

Phh base

Mode of emplacement of Kumlafell and Hólmatindur groups

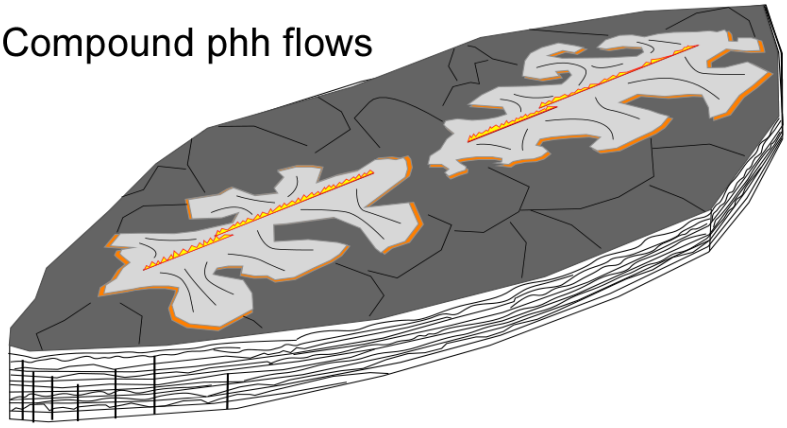
a Simple phh/rubbly flows



Dominantly large sheet flows/ Pahoehoe flows

High and sustained effusion rates

c Compound phh flows

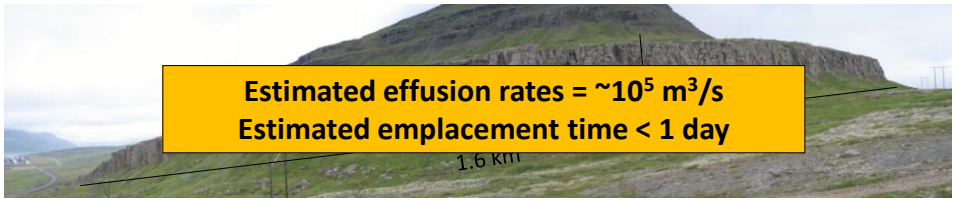


Low/er effusion rates

Overview

Kumlafell tholeiite group

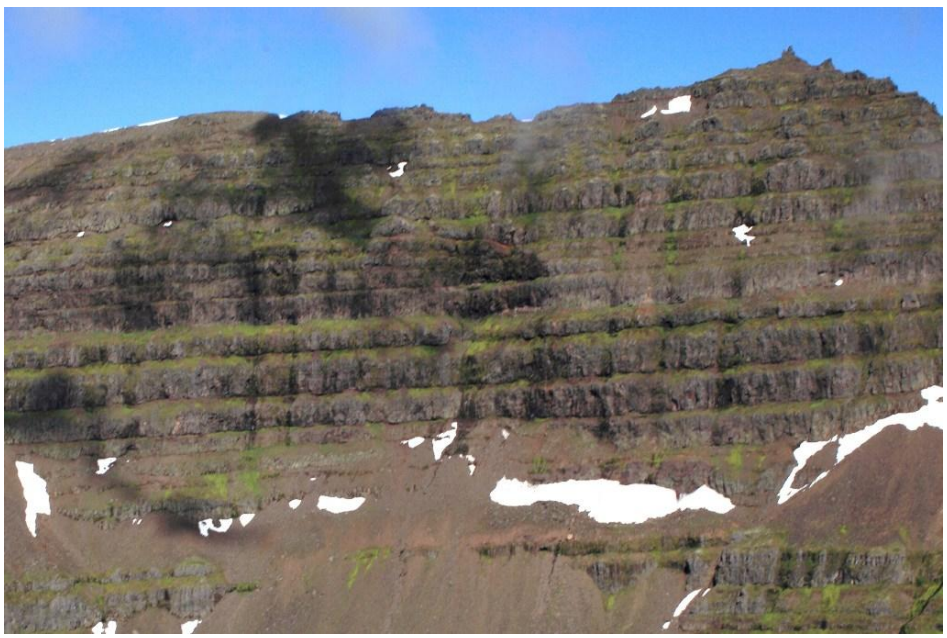
- Total volume = ~160km^3
- Area = ~1000 km^2
- Thicken to the west
- No. lava flows = ~25
- Largest flows ~10-30 km^3
- ~70% >10 m thick
- No inflation structures and tubes
- Pahoehoe and rubbly



Langhamar – Hólmatindur - Eskifjörður

The Hjálmadalur group

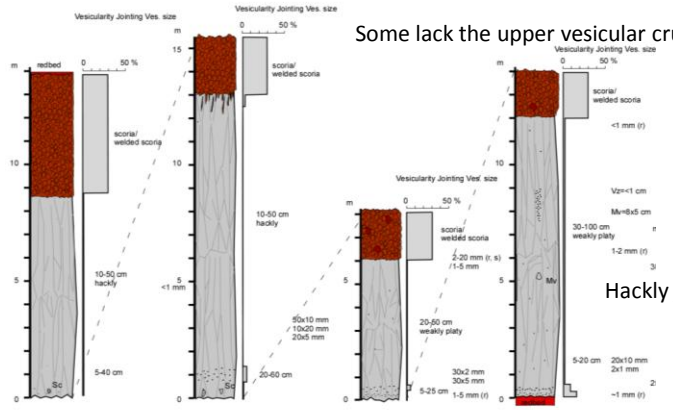
Dominantly simple flows



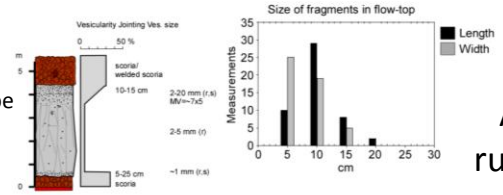
Some lack the upper vesicular crust

Rubbly pahoehoe

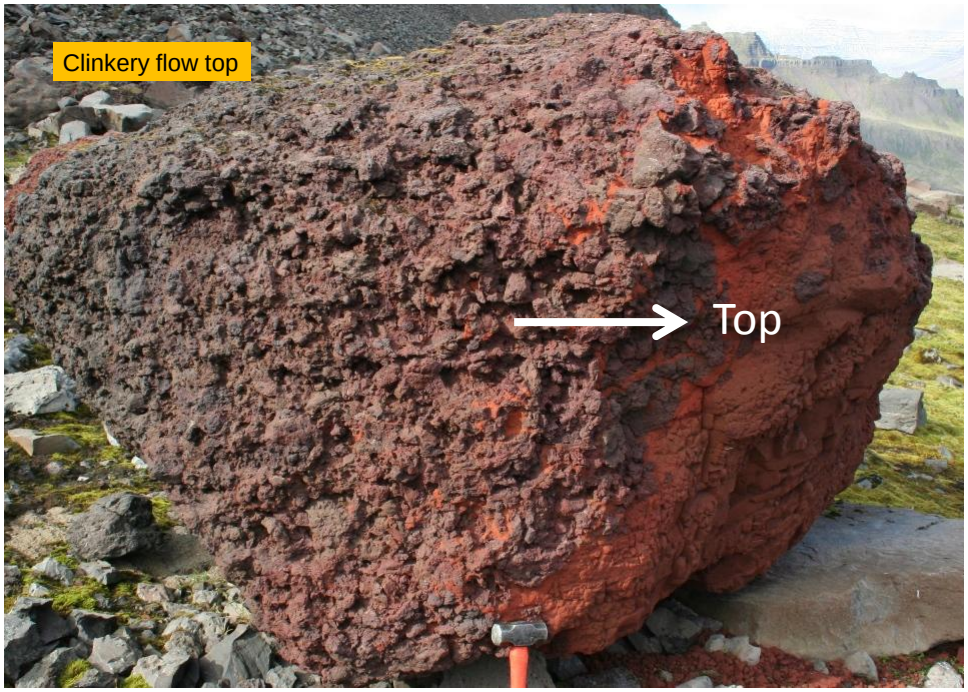
Hackly jointing



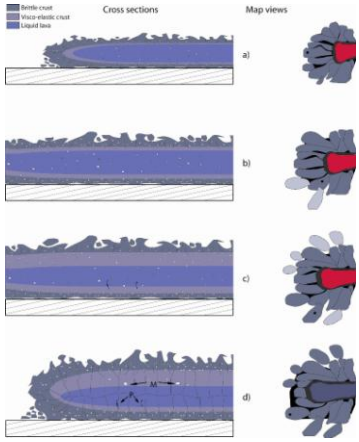
Aa flow lobe



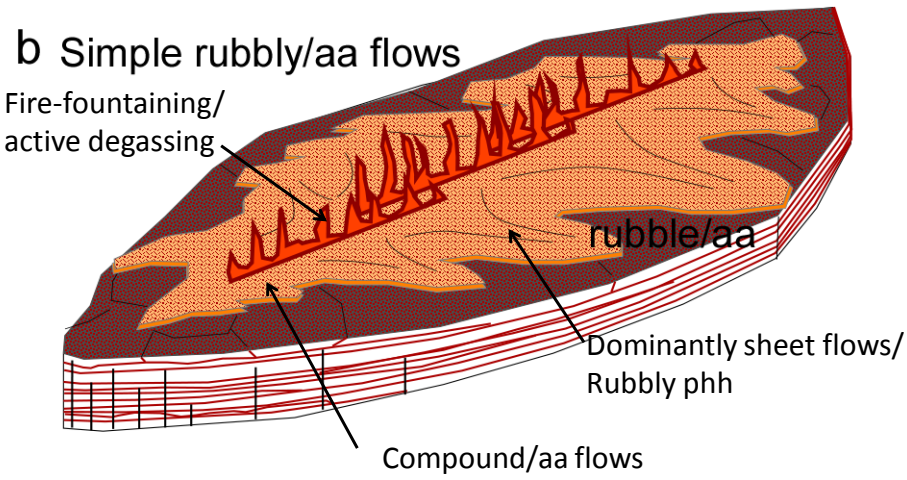
All flows have rubbly flow tops!



Aa in a quarry by Krýsuvíkurvegur - Kapelluhraun



Mode of emplacement of Hjálmadalur group



High and sustained effusion rates

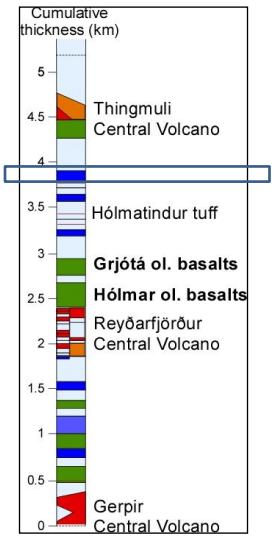
Overview

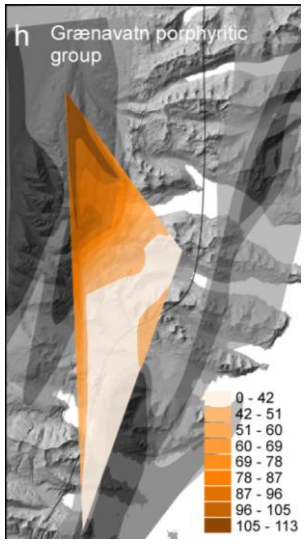
Hjálmadalur group

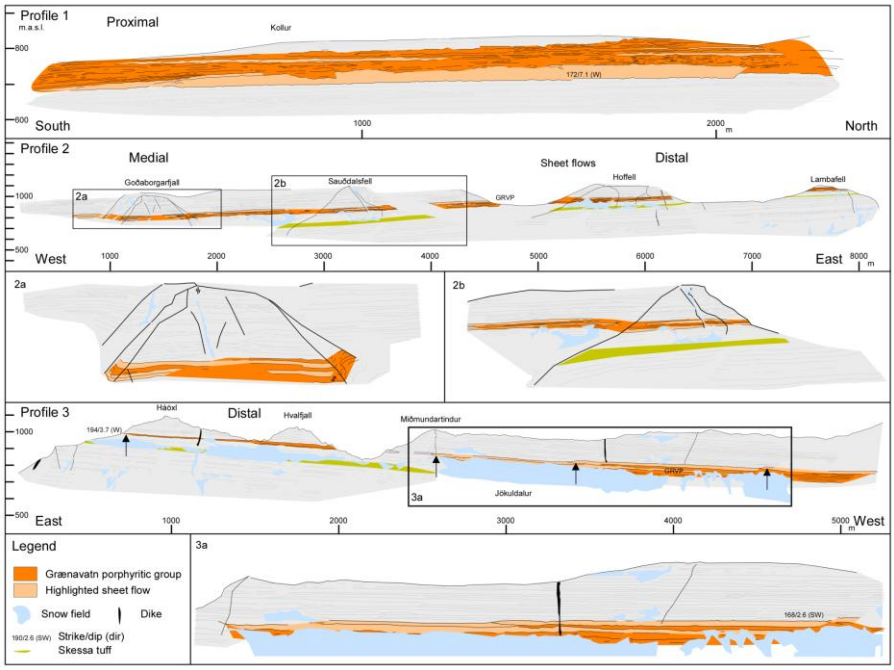
- Total volume = ?
- Area = ~600 km^2
- Thickens to the west
- No. lava flows = >20
- ~90% >6 m thick
- Not thermally efficient
- Rubbly and aa

Estimated effusion rates = ?
Estimated emplacement time = ?

Grænavatn porphyritic group





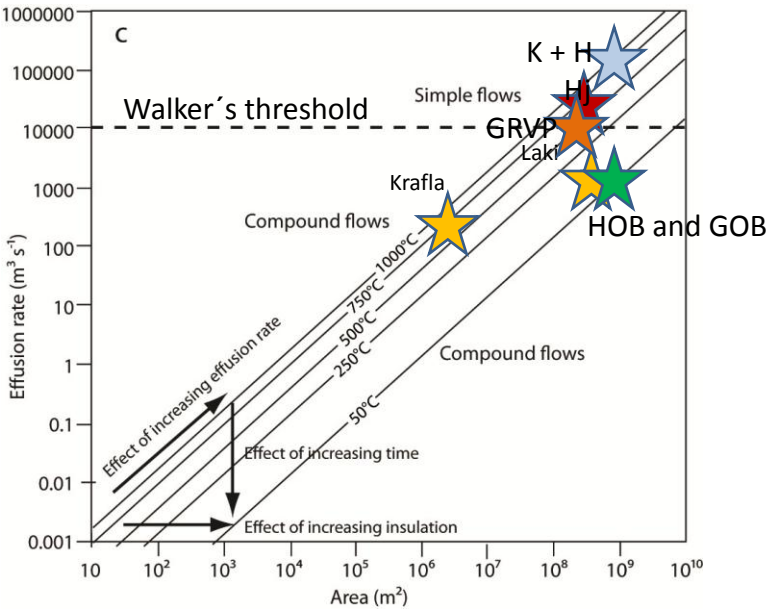


Overview

Grænavatn porphyritic group

- Total volume = 60 km^3
- Area = ~1000 km^2
- Thickens to the northwest
- No. lava flows = 14
- ~8 m thick
- Mixed compound and simple
- Pahoehoe, rubbly and slabby

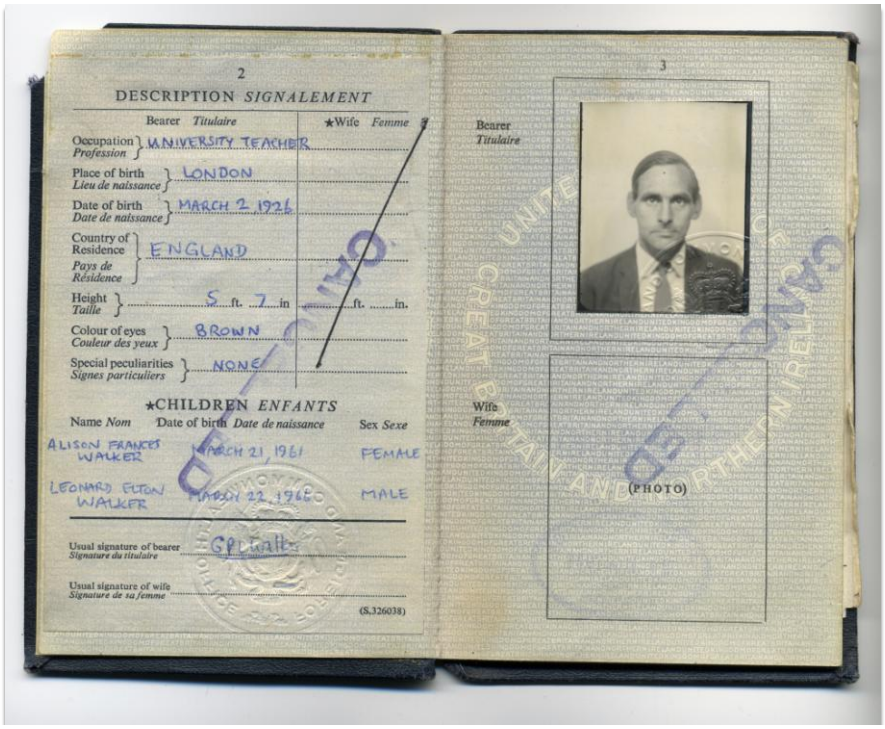
Estimated effusion rates = 10^3-10^4 m^3/s



Harris and Rowland, 2009

Conclusions

- Individual lava groups have their characteristic architecture.
- Individual flow fields display variation in flow morpholgy.
- Despite the diversity in flow morphology, the flows are still categorized as flood basalts.
- The flood basalts vary from laki-type to 1-2 orders of magnitude larger than Laki.



2

DESCRIPTION *SIGNALEMENT*

	Bearer *Titulaire*	★Wife *Femme*
Occupation *Profession*	UNIVERSITY TEACHER	
Place of birth *Lieu de naissance*	LONDON	
Date of birth *Date de naissance*	MARCH 2 1926	
Country of Residence *Pays de Résidence*	ENGLAND	
Height *Taille*	5 ft. 7 in	ft. in.
Colour of eyes *Couleur des yeux*	BROWN	
Special peculiarities *Signes particuliers*	NONE	

★CHILDREN *ENFANTS*

Name *Nom*	Date of birth *Date de naissance*	Sex *Sexe*
ALISON FRANCES WALKER	MARCH 21, 1961	FEMALE
LEONARD ELTON WALKER	MARCH 22, 1962	MALE

Usual signature of bearer
Signature du titulaire GP Walker

Usual signature of wife
Signature de sa femme

(S.326038)

3

Bearer
Titulaire

Wife
Femme

(PHOTO)