

Eldvirkni á Íslandi og hugsanleg áhrif á innviði

Þorvaldur Þórðarson



HÁSKÓLI ÍSLANDS

VERKFRÆÐI- OG NÁTTÚRUVÍSINDASVIÐ

JARÐVÍSINDAEILD

Rannsóknarstofa í Eldfjallafræði og Náttúruvá
(REN)



HÁSKÓLI ÍSLANDS

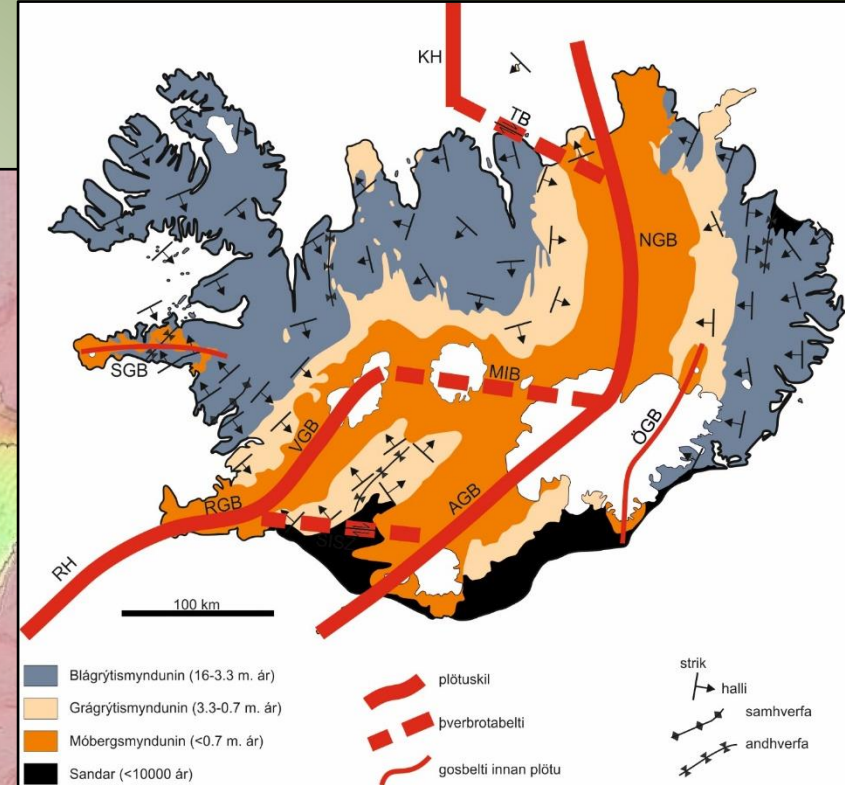
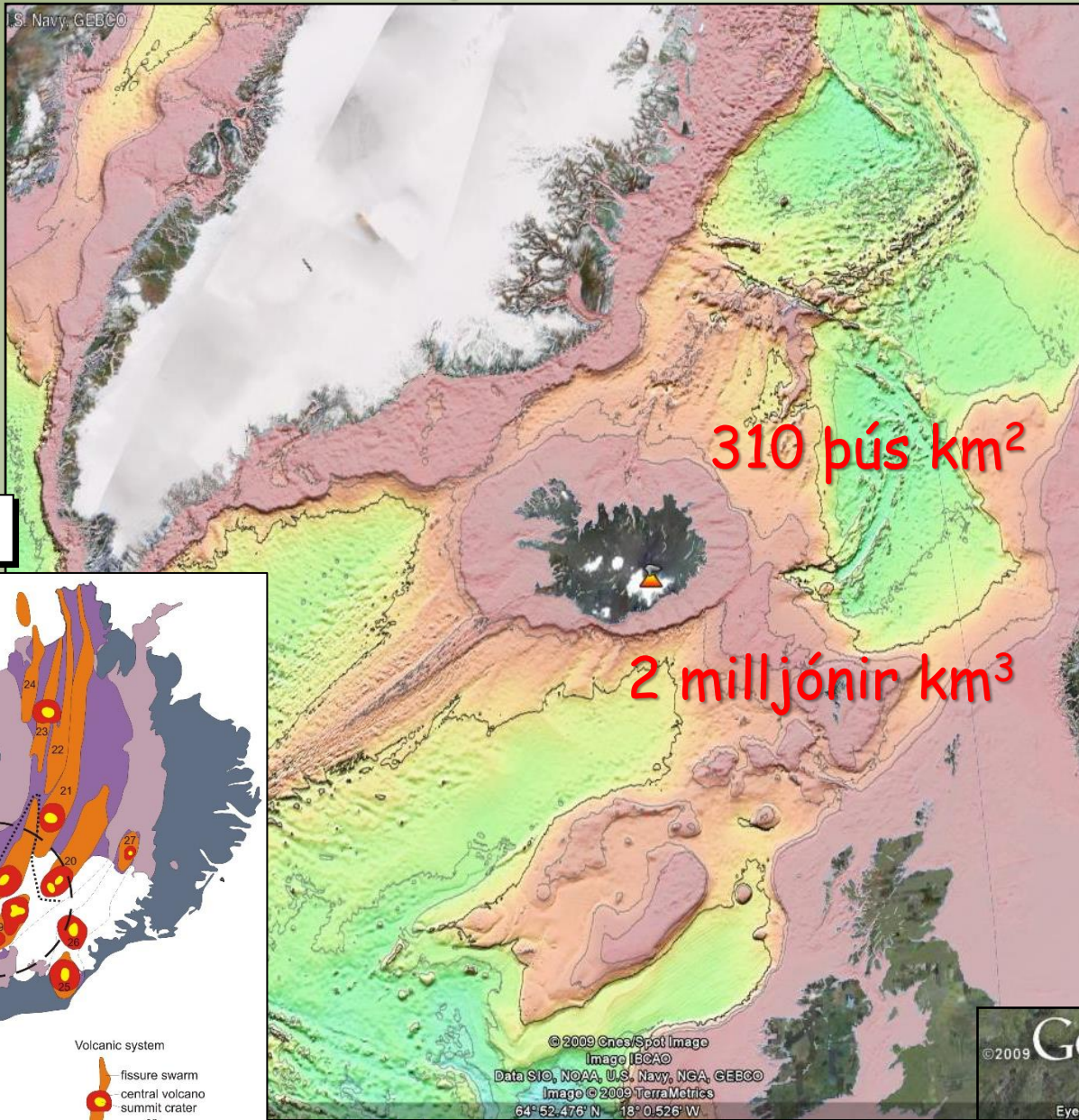


Samstarf og Stuðningur

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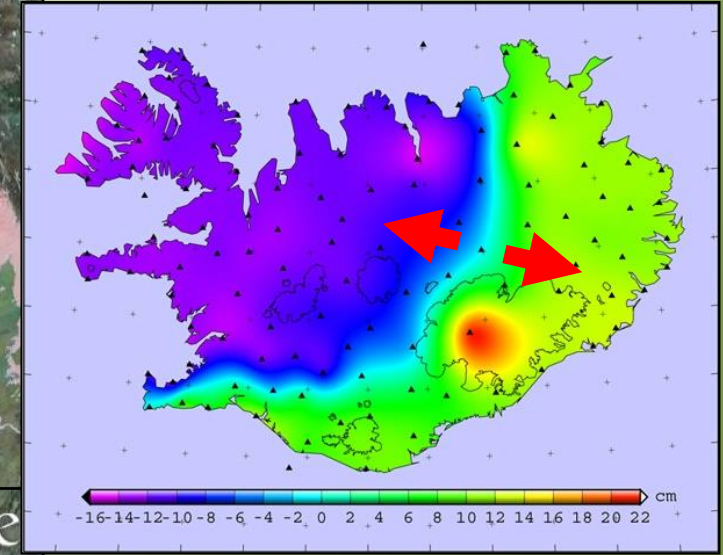
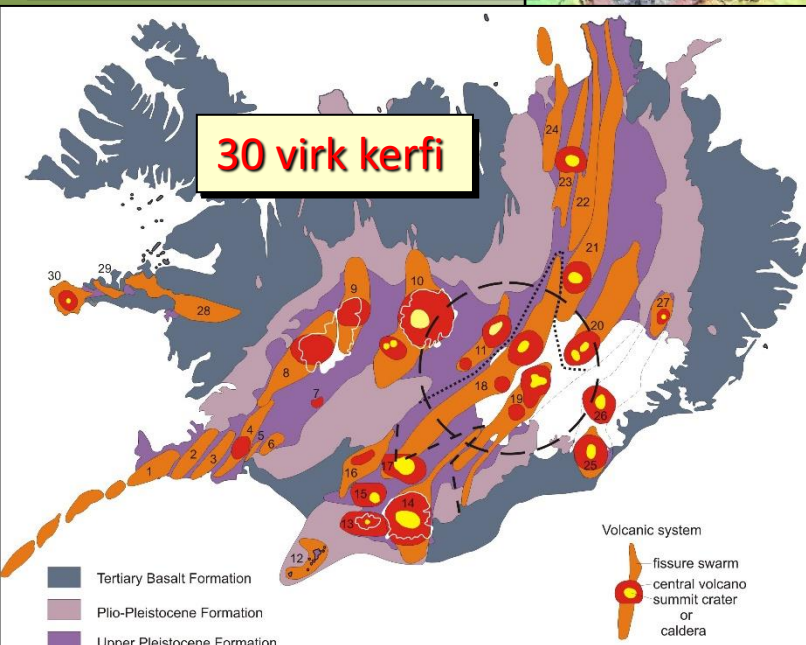


Ísland - stóra myndin



Eldstöðvarkerfin

30 virk kerfi



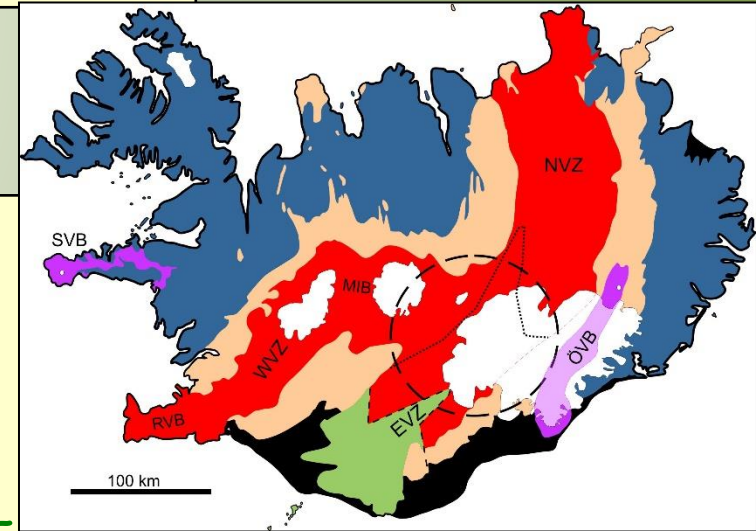
Eldvirkni og kvikuframleiðsla á Nútíma

Fjöldi gosa á síðustu 10 þús árum

	Hraungos		Sprengigos		samtala	%
	á Nútíma	söguleg	á Nútíma	söguleg		
Total	501	56	1933	161	2434	
EVZ	163	25	1860	142	2023	83

Kvikuframleiðsla í km³ á síðustu 10 þús árum

	Hraun	Gjóska	Gjóska (P.B.)	Samt. (P.B)	%
Total	393	446	173	566	
EVZ	174	412	163.4	337	59.5



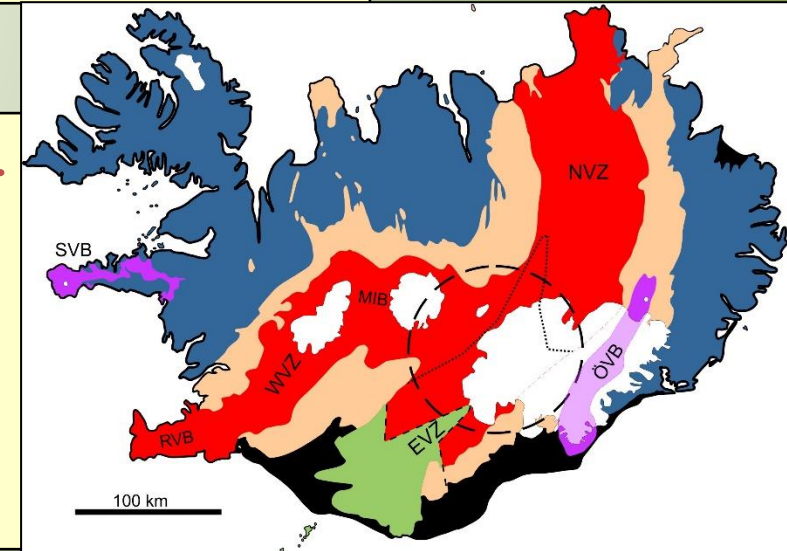
Eldvirkni og kvikuframleiðsla á Nútíma

Fjöldi gosa á síðustu 10 þús árum

	Hraungos		Sprengigos		Sam.	%
	á Nútíma	söguleg	á Nútíma	söguleg		
basalt	457	41	1772	146	2229	91
íslandít	29	11	112	7	141	6
rhýólít	15	4	48	8	63	3

Kvikufрамleiðsla í km³ á síðustu 10 þús árum

	Hraun	Gjóska	Gjóska (P.B.)		Samt. (P.B)
	n				
basalt	369	367	149	518	91
íslandít	23	25	11	34	6
rhýólít	1.2	54	13	14	3



Eldgosagerðir

Geldingadalir



2021

Krafla

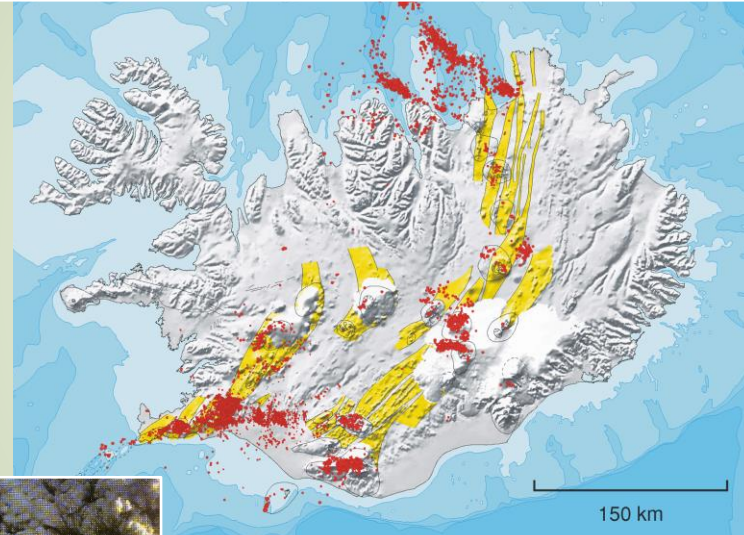


1980

Holuhraun



2014-15



150 km

Grímsvötn



2011



Hekla

1980



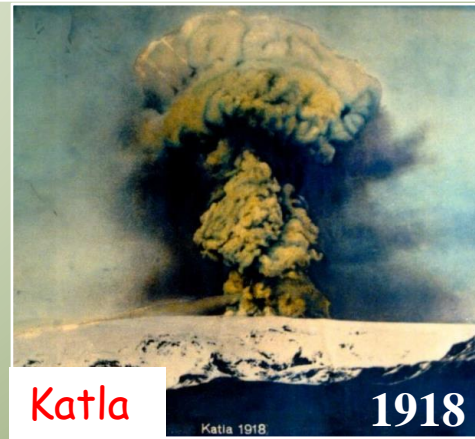
Surtsey

1963-7



Eyjafjallajökull

2010

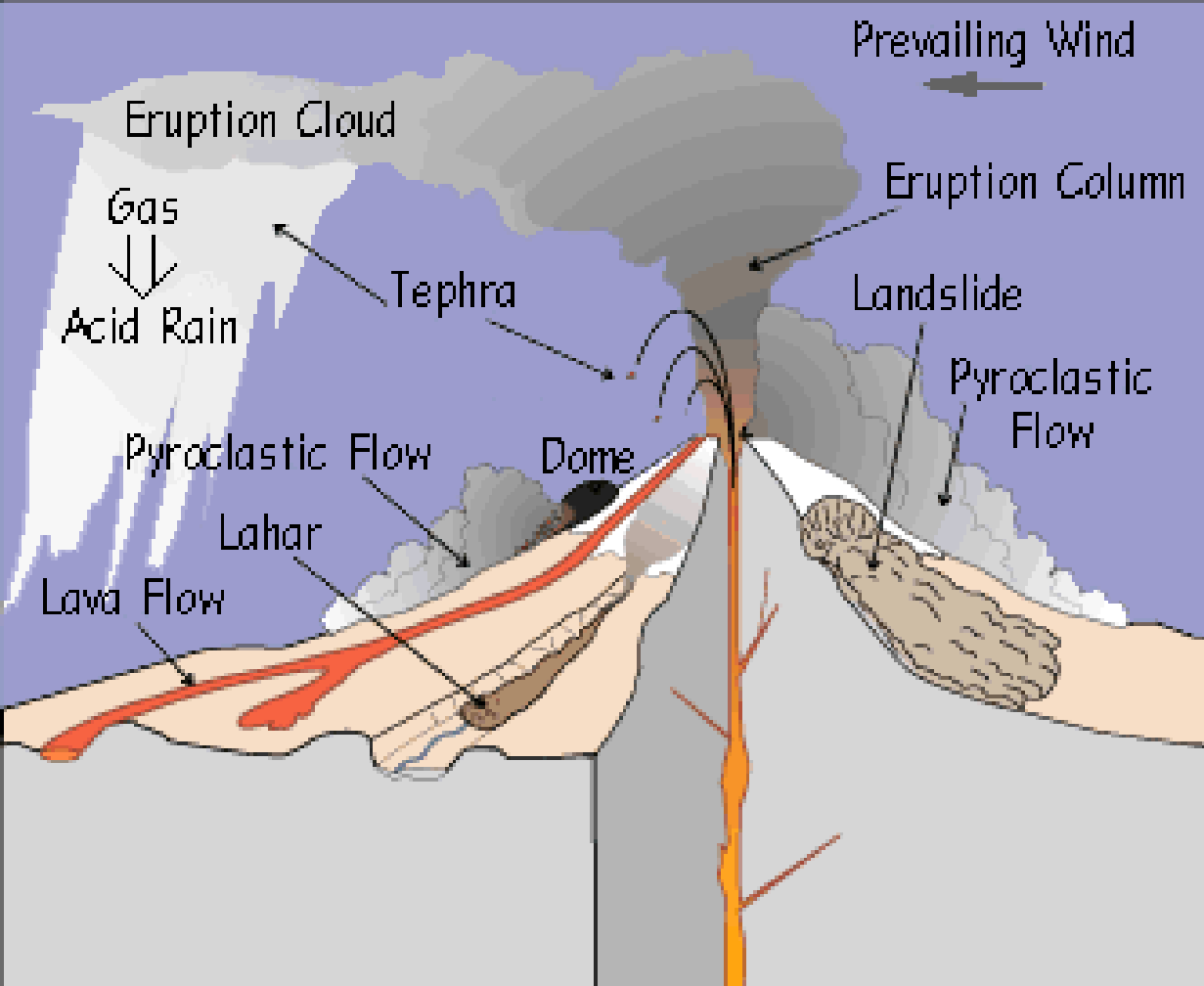


Katla

1918



Photo A. Einarsson



Eldgosavá

Eldvirkni getur framleitt

Svo gott sem allar tegundir
af jarðfræðilegri vá

+

Veðurfarslega vá

bein og óbein vá

Eldgosavá



Gjóskugos í sjó

Umfang eldgosavárinnar ræðst af:

- i. staðsetningu eldstöðvarinnar
- ii. afli, stærð og/eða lengd gossins
- iii. forvörnum og skipulagi
- iv. samfélagslegum skilningi og viðbrögðum

Hver er váin?

Gjóskufall
Gusthlaup
Gjóskuhlaup
Hraunflæði
Gasmengun
Flóð og Skriður



Hraungos

Hvað er hættu?

Íbúar
Innviðir
Atvinnustarfsemi
Eldgosa-ferðamenn



Blandgos á landi

Pekking
+
upplýsingar

Viðbragð

Undirbúningur
+
Framkvæmdir



Gervigígagos

Gjóskufall



Grímsvötn 2011



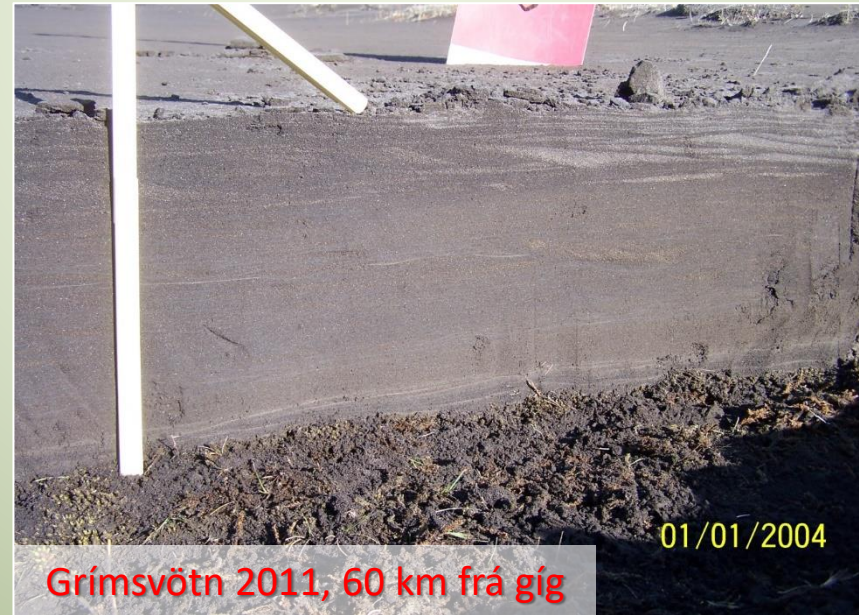
Grímsvötn 2011 sporrækt, ~100 km frá gíg



Grímsvötn 2011
7 km frá gíg; 70 sm



Grímsvötn 2011, 80 km frá gíg



Grímsvötn 2011, 60 km frá gíg

01/01/2004

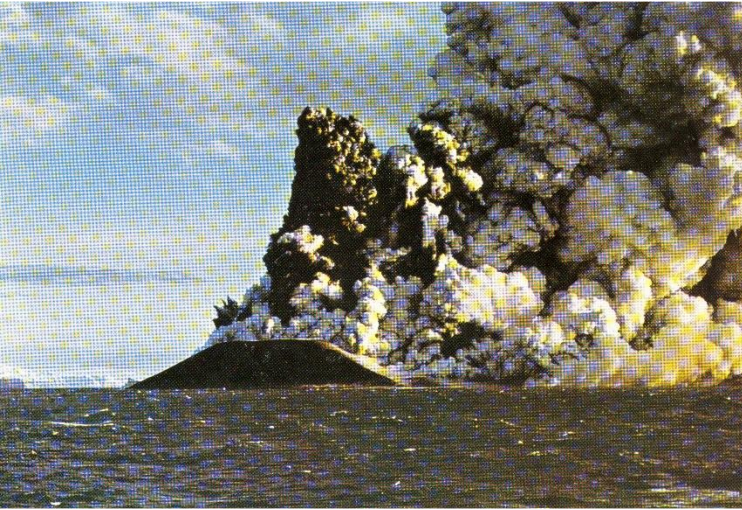


Eyjafjallajökull 2010
7 km frá gíg; 7 sm

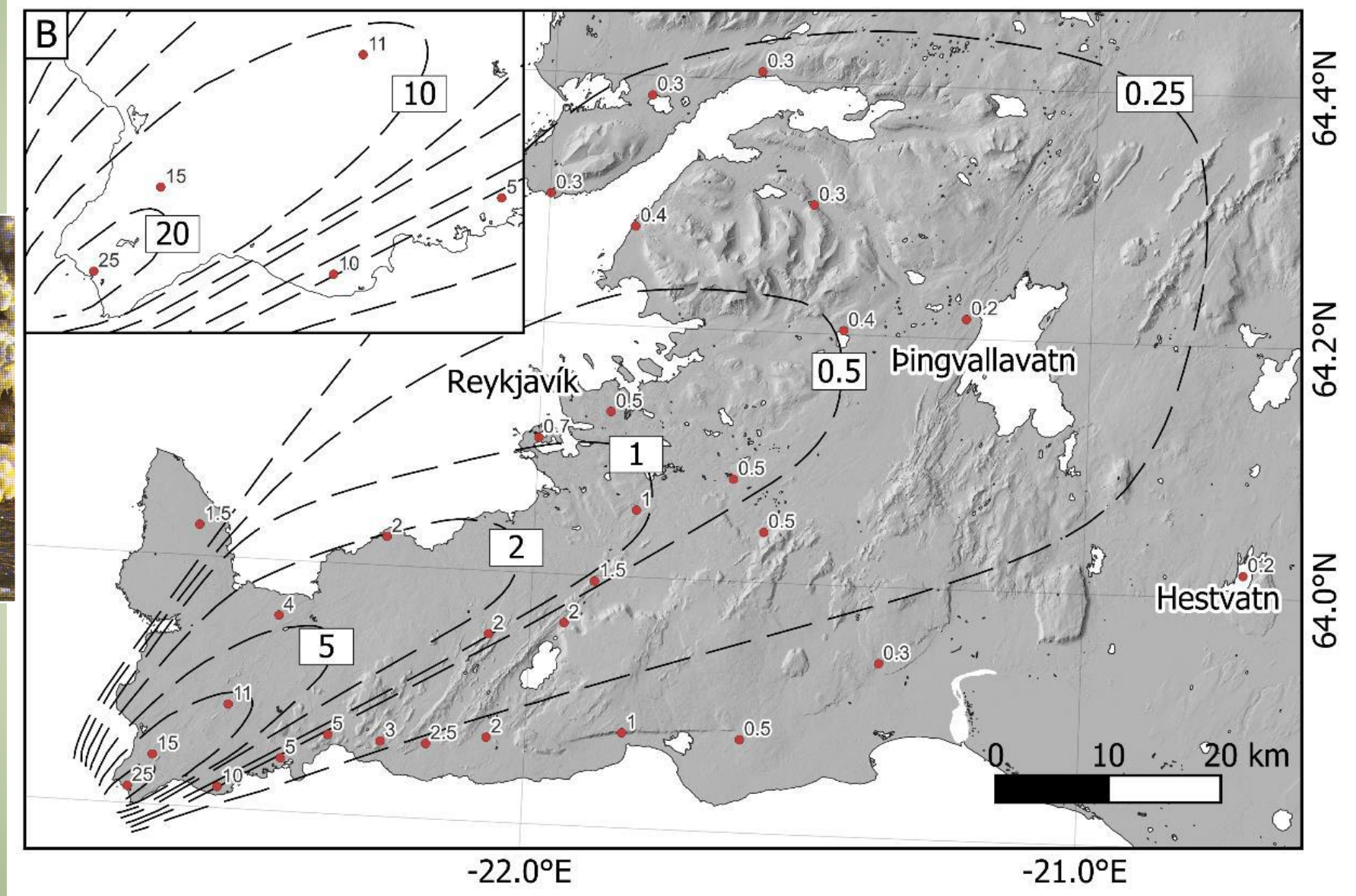
Gjóskufall

tætigos í sjó

Almennt ekki mannskæð



Geta valdið verulegum
truflunum og óþægindum



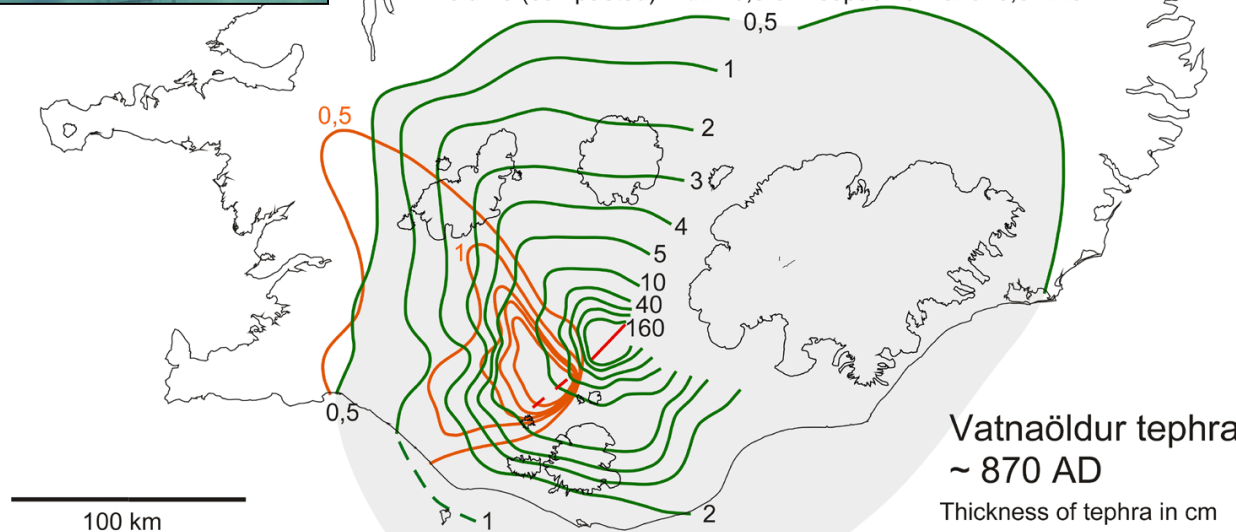
Gjóskufall

Stór Basísk Sprengigos

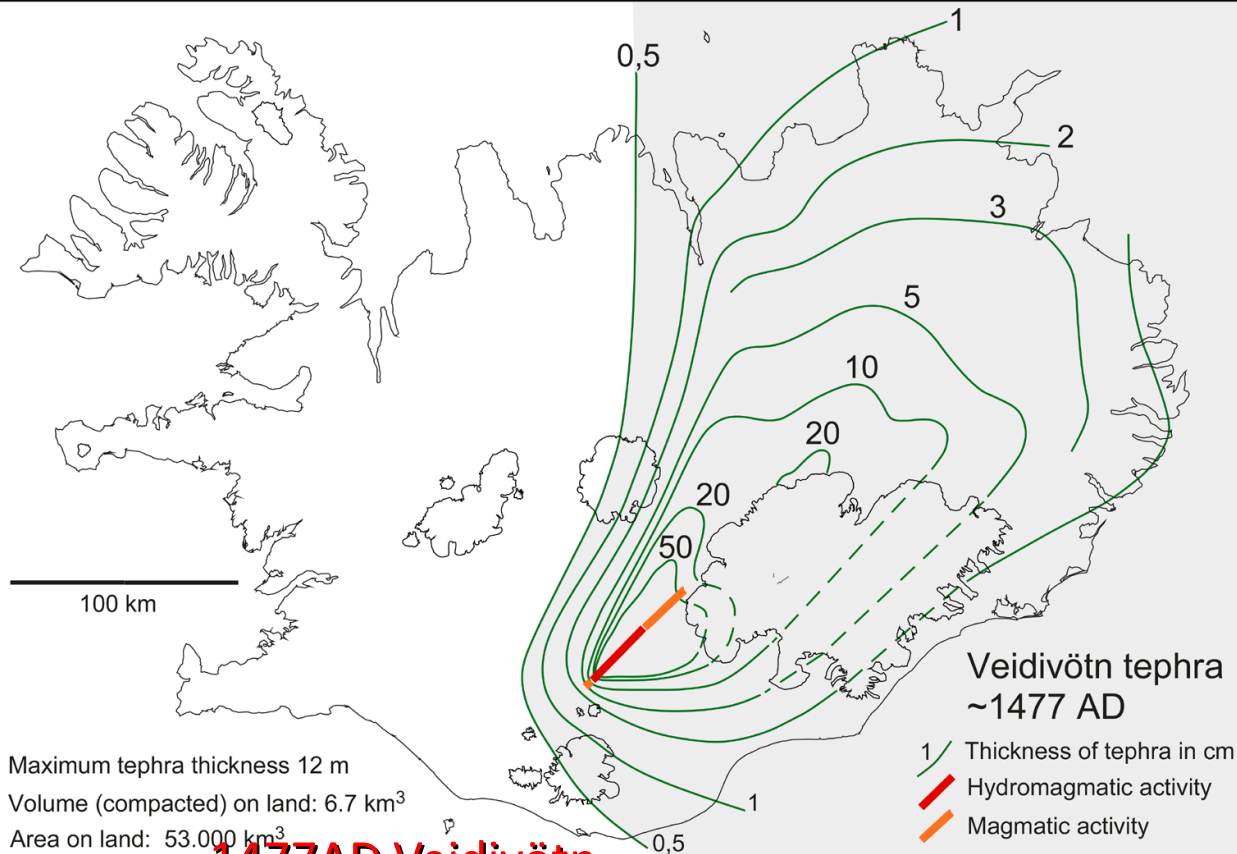


~870AD Vatnaöldur

Maximum tephra thickness: 12 m
Area within 0,5 cm isopach on land: 50.000 km²
Volume (compacted) within 0,5 cm isopach on land: 3,3 km³



Vatnaöldur tephra
~ 870 AD
Thickness of tephra in cm



Maximum tephra thickness 12 m
Volume (compacted) on land: 6.7 km³
Area on land: 53.000 km³

Veidivötn tephra ~1477 AD

- 1 Thickness of tephra in cm
- Hydromagmatic activity
- Magmatic activity

1477AD Veidivötn

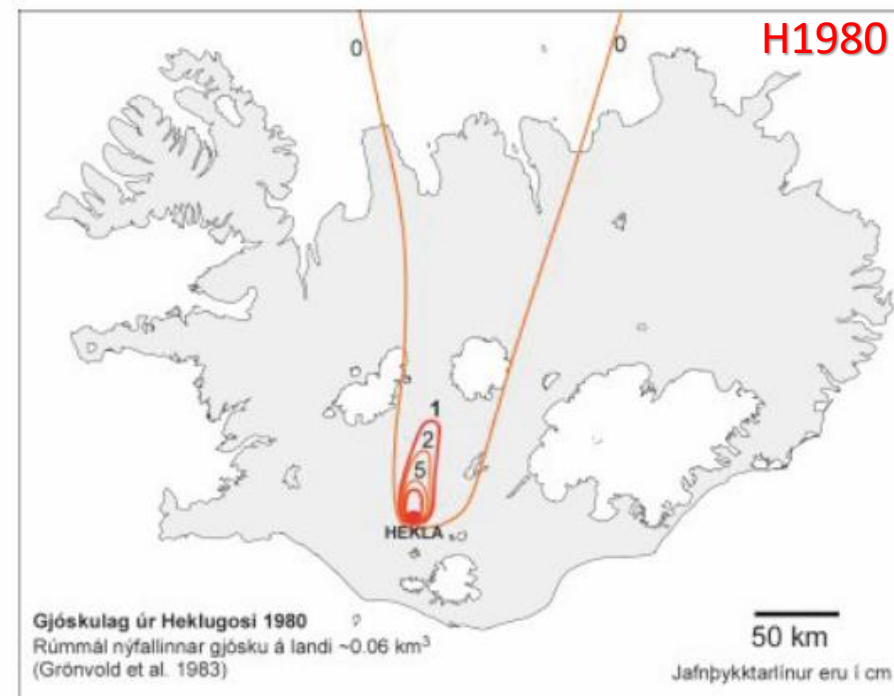
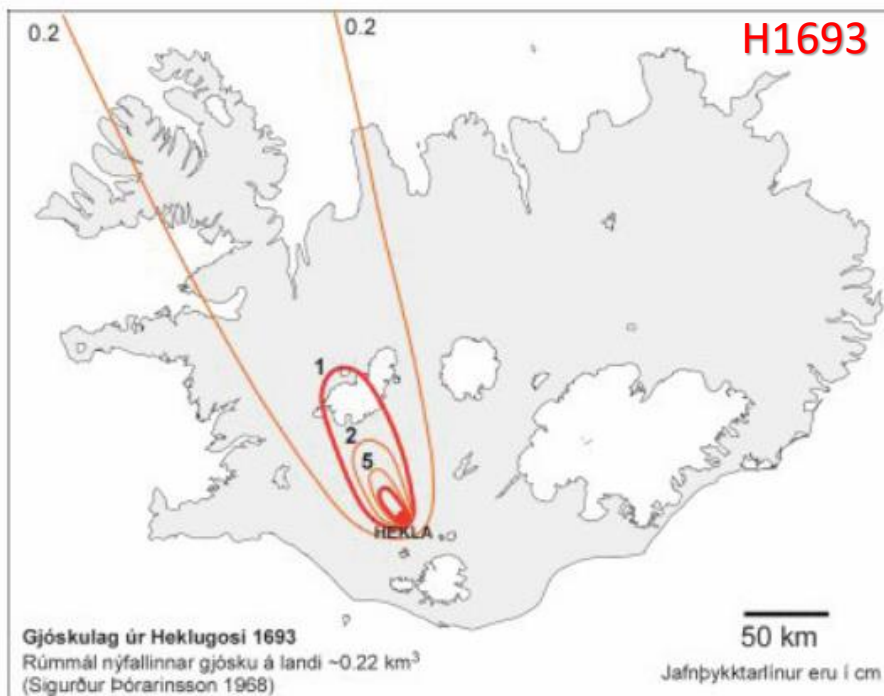
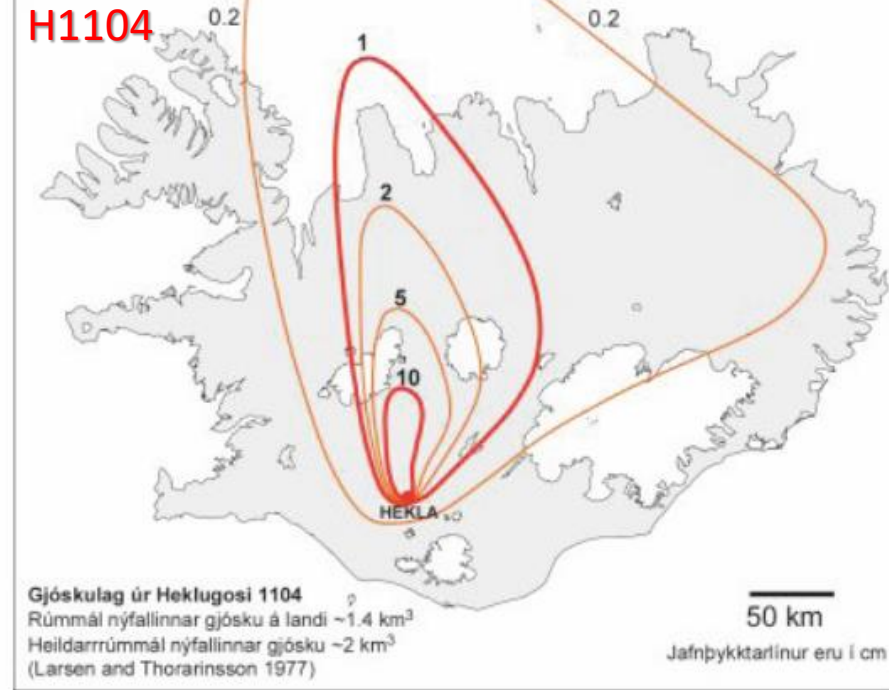
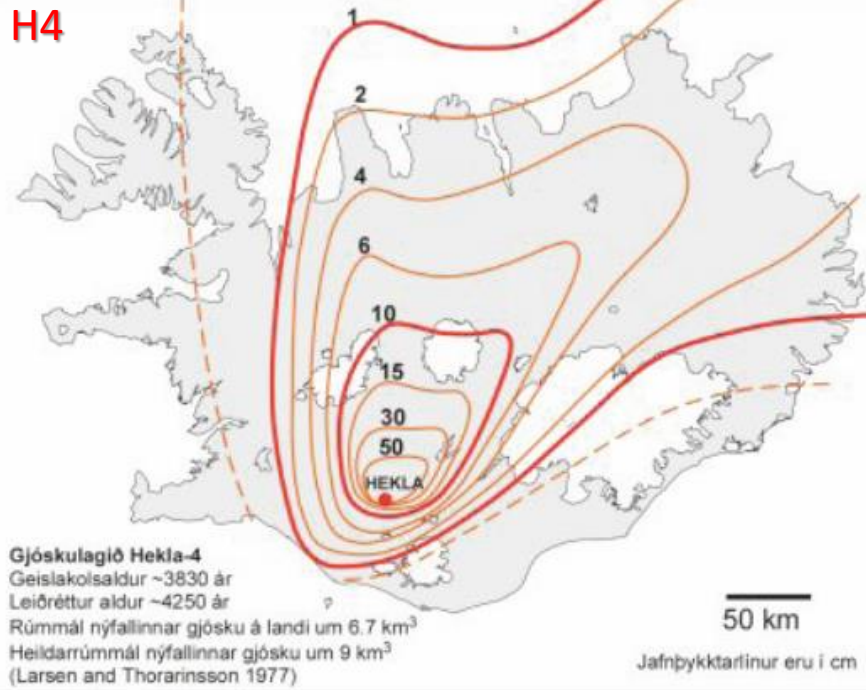


Larsen, G. 1984

Photos: O. Sigurdsson

Gjóskufall

Sprengigos í Heklu

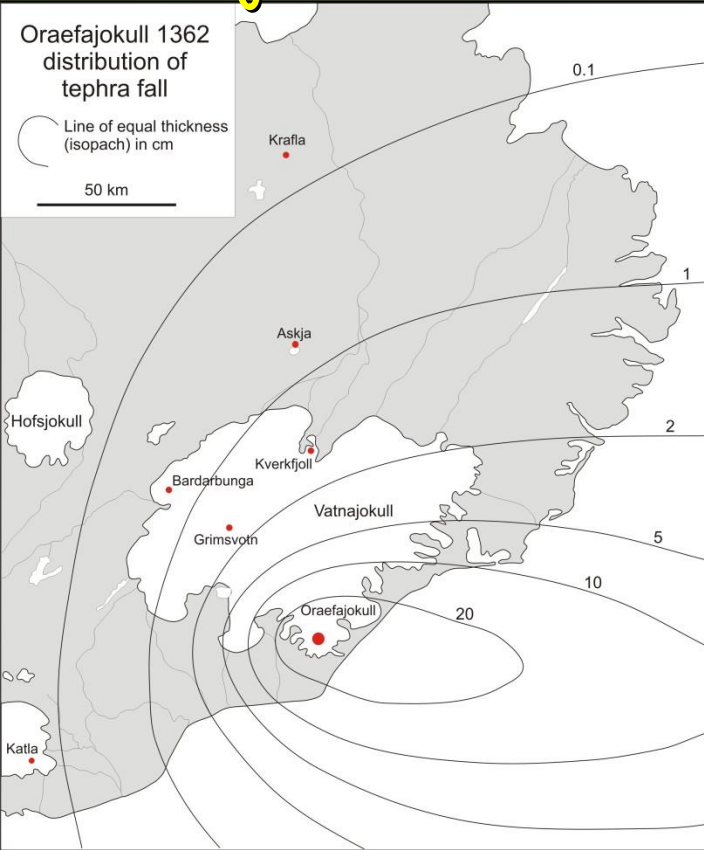


Gust- og Gjóskuhlaup

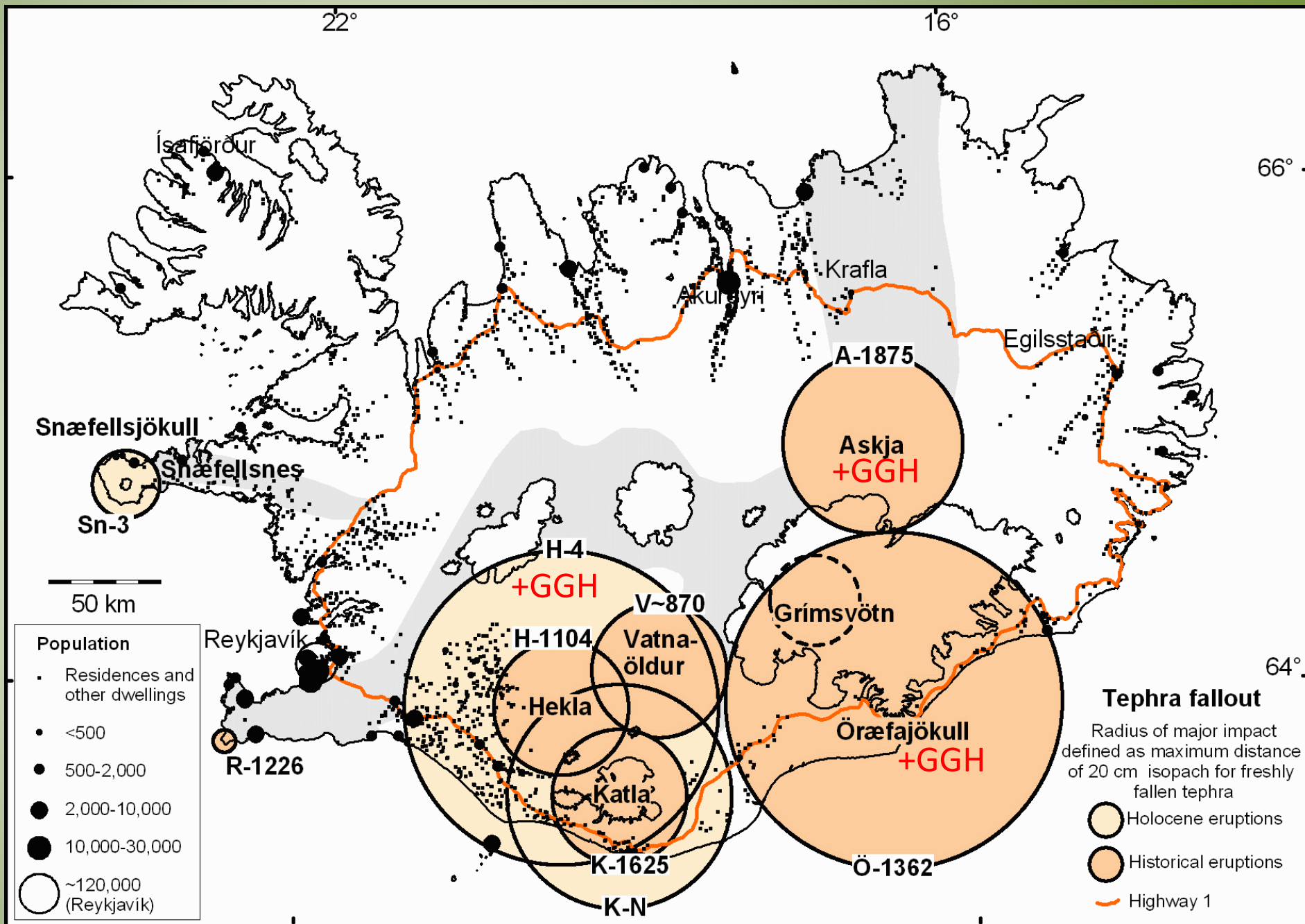


Bær

Öraefajökull AD 1362



Gjóska
áhrifasvæði
innan 20 sm
jafnþykktarlínunar



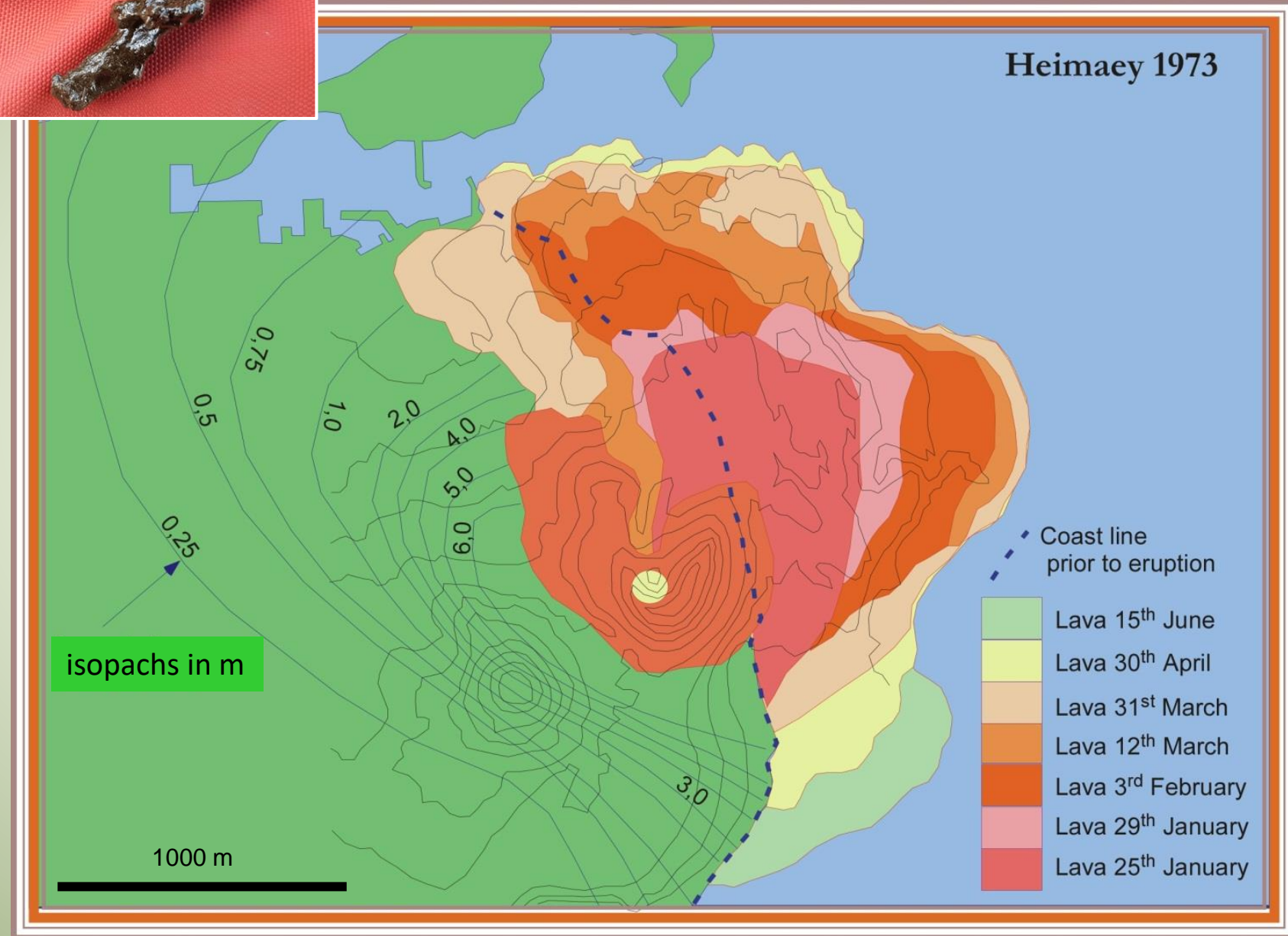
Blandgos á landi Ditto



Heimaey 1973



Heimaey 1973



Eldgosamengun

Photo: G. De Pascale,
Institute of Earth Science
University of Iceland
10 July 2023

Litla-Hrútsgosið 2023

Brennisteinn -> brennisteinssýruagnir

SO_2 -> H_2SO_4

Klórsýra (HCl) , Flúorsýra (HF)

H_2SO_4 mengun (24-PM2,5) > $15\mu g/m^3$ -> hættu

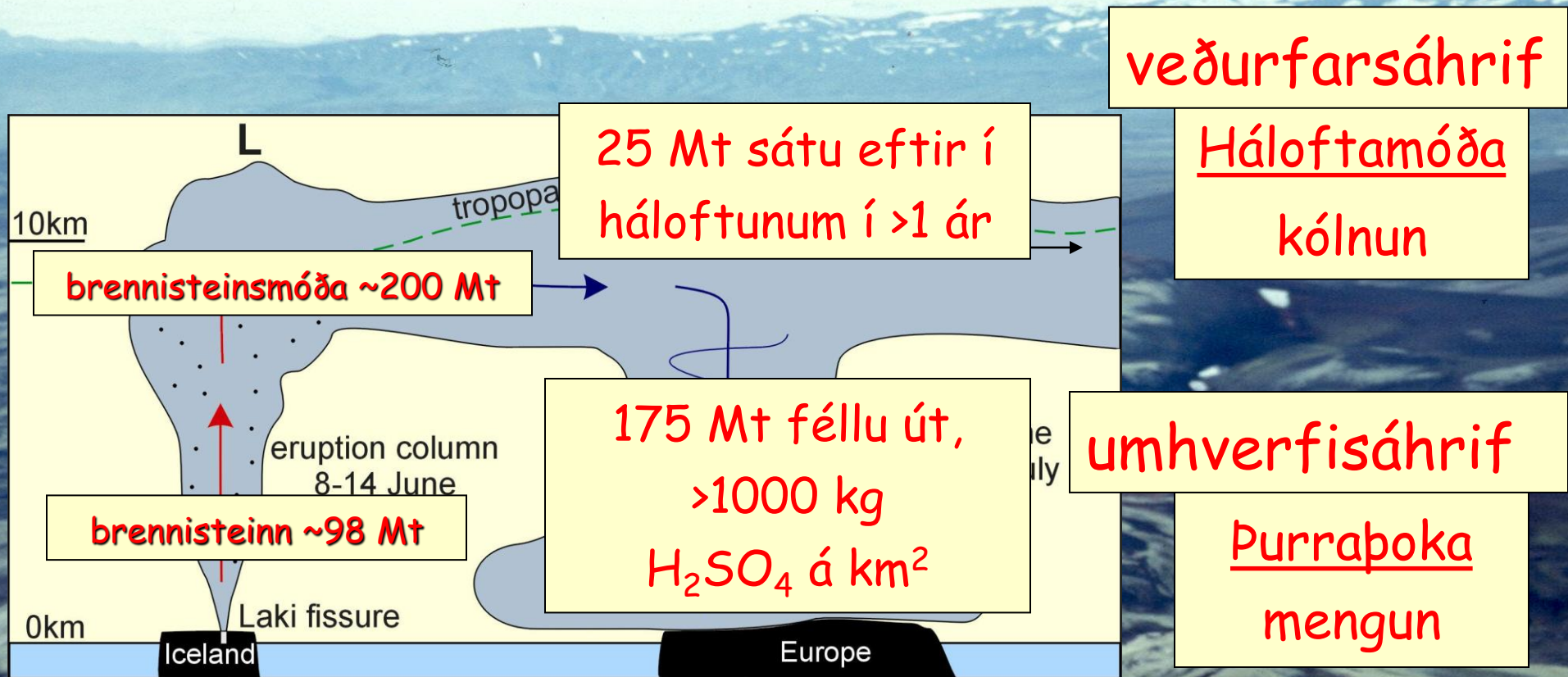


brennisteinssmökkur

Photo: G. De Pascale,
Institute of Earth Science,
University of Iceland

Litla-Hrútsgosið 2023

Brennisteinsmóðan

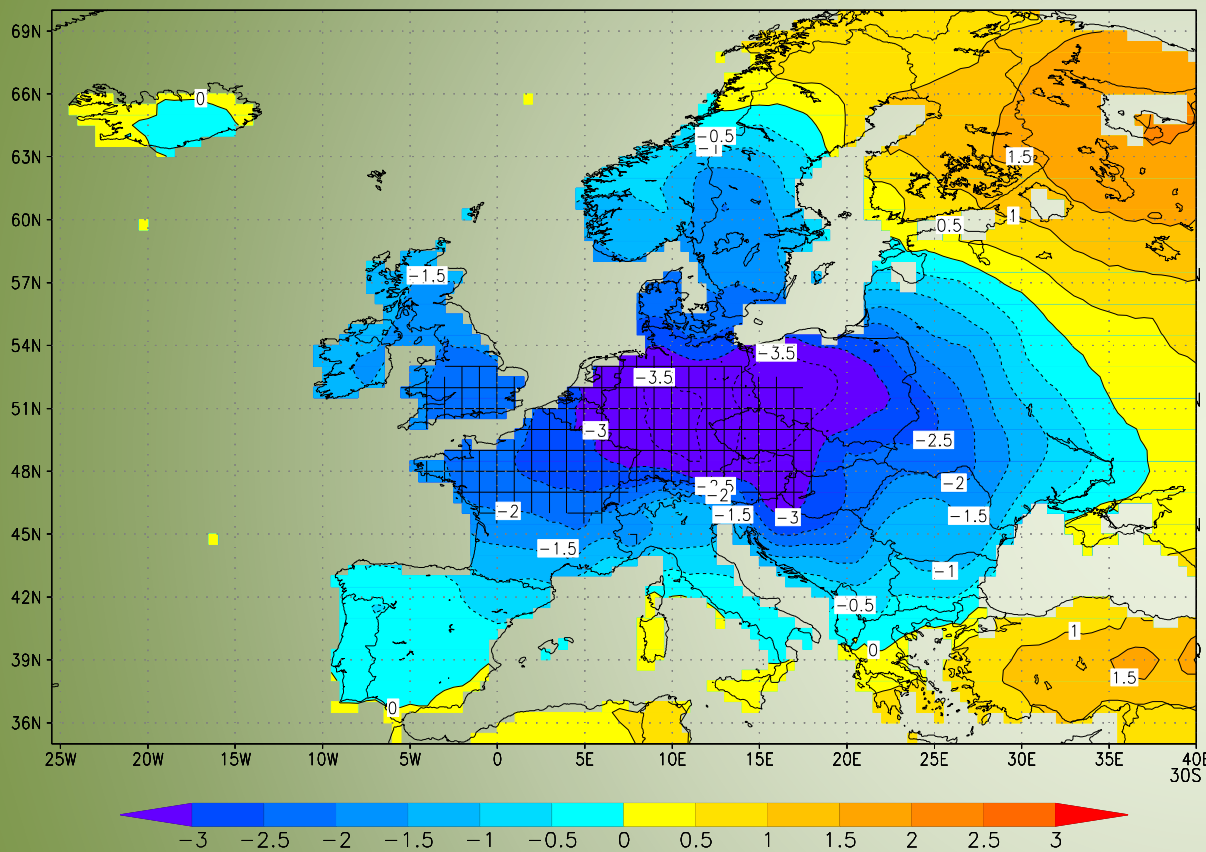


Skaftáreldar settu ~98 Mt af brennisteini upp í heiðhvolfið (>9 km hæð) og myndaði ~200 Mt af brennisteinsmóðu (= brennisteinssýra), sem dreifðist um allt norðurhvel.

Gosmekkir og móða Skaftárelda bárust með vestlægum háloftavindum inn yfir Evrasíu og þaðan yfir N-Ameríku. Þessi háloftamóða dreifðist til yfirborðs jarðar í niður-streymisbeltum háprýstikerfa.

Skaftáreldar (8 júní 1783 - 7 febrúar 1784)

DJF 1783–1784 Temperature Anomaly (°C)

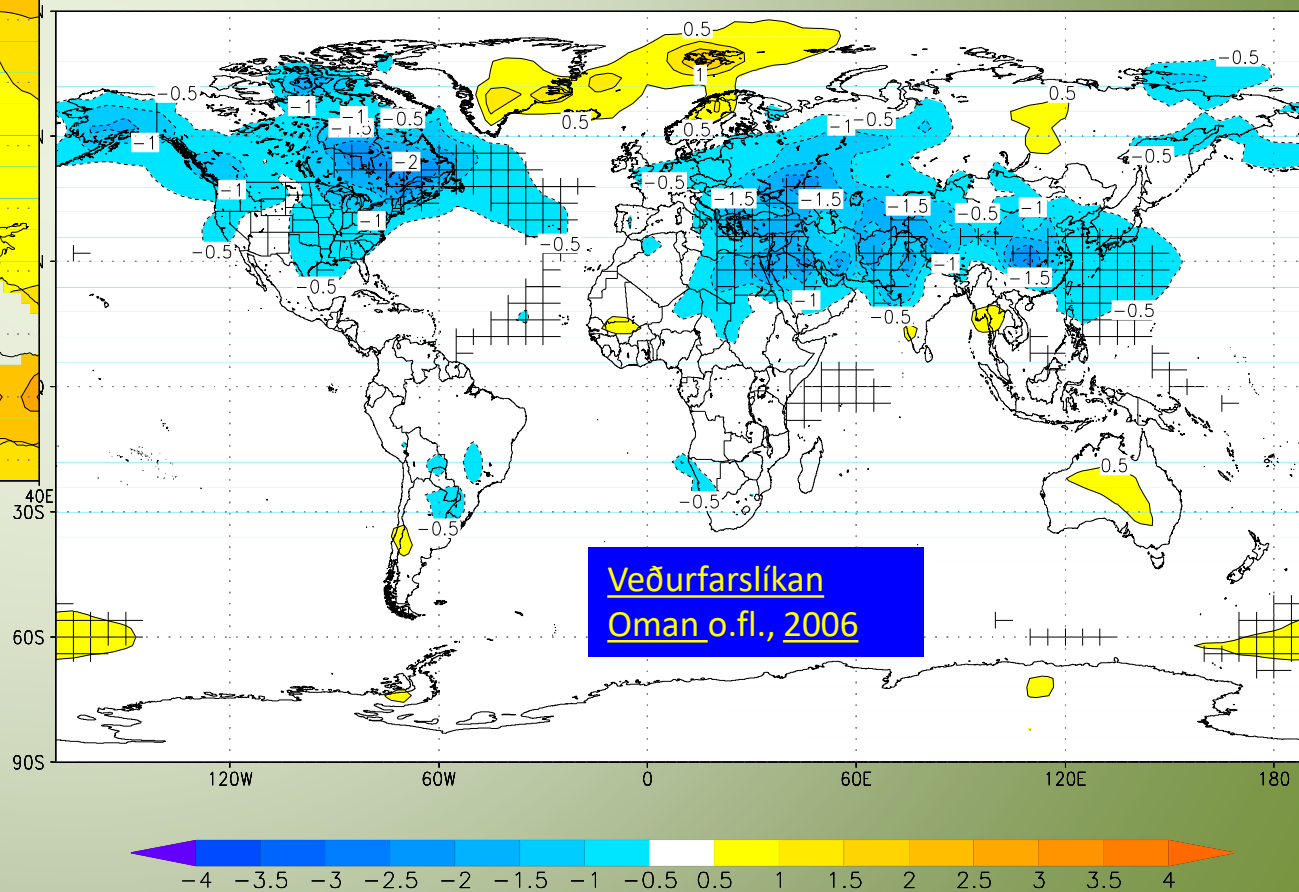


Luterbacher et al. (2004)

Frávik miðuð við 31 ára meðaltal, 1770-1800

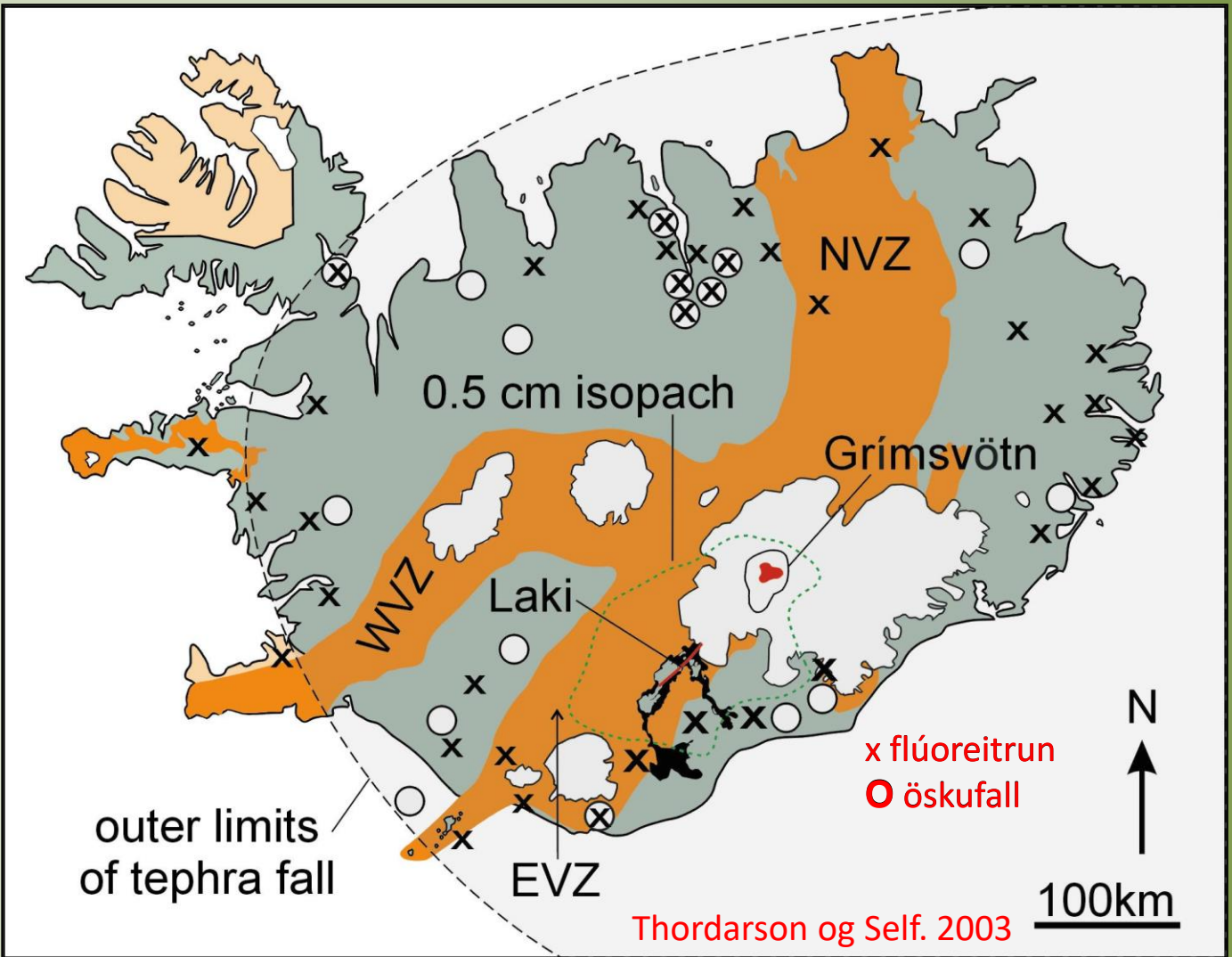
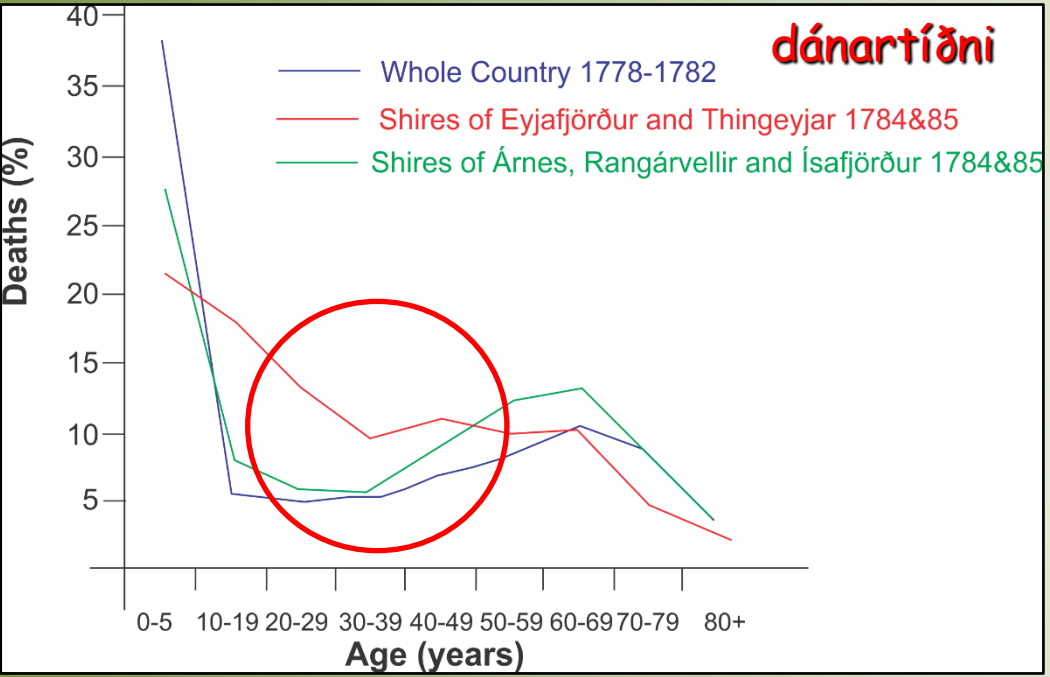
Kólnun vegna háloftamóðunnar
veturinn 1783-84

Laki SAT Anomaly (°C) DJF 83–84



Veðurfarslíkan
Oman o.fl., 2006

Skaftáreldar (8 júní 1783 - 7 febrúar 1784) - mengun



Brennisteins og flúor mengað öskufall var megin orsök móðuharðindanna, útrýmdi >75% af kvikfénaði sem beint og óbeint drap ~22% landsmanna

Hraungos og Hraunflæði

virkur
hraunjaðar



Hraun búa til
sitt eigið landslag

Hraun hylja og eyðileggja
það sem er í vegi þeirra



virkur hraunjaðar

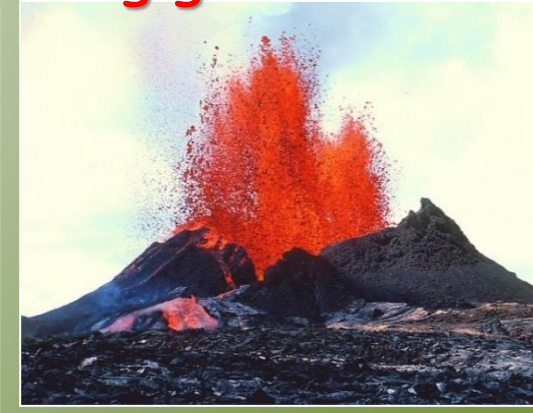


flutningskerfi



gígar

Við stoppum ekki flæði hrauns,
en hugsanlega getum stýrt því
upp að vissu marki.

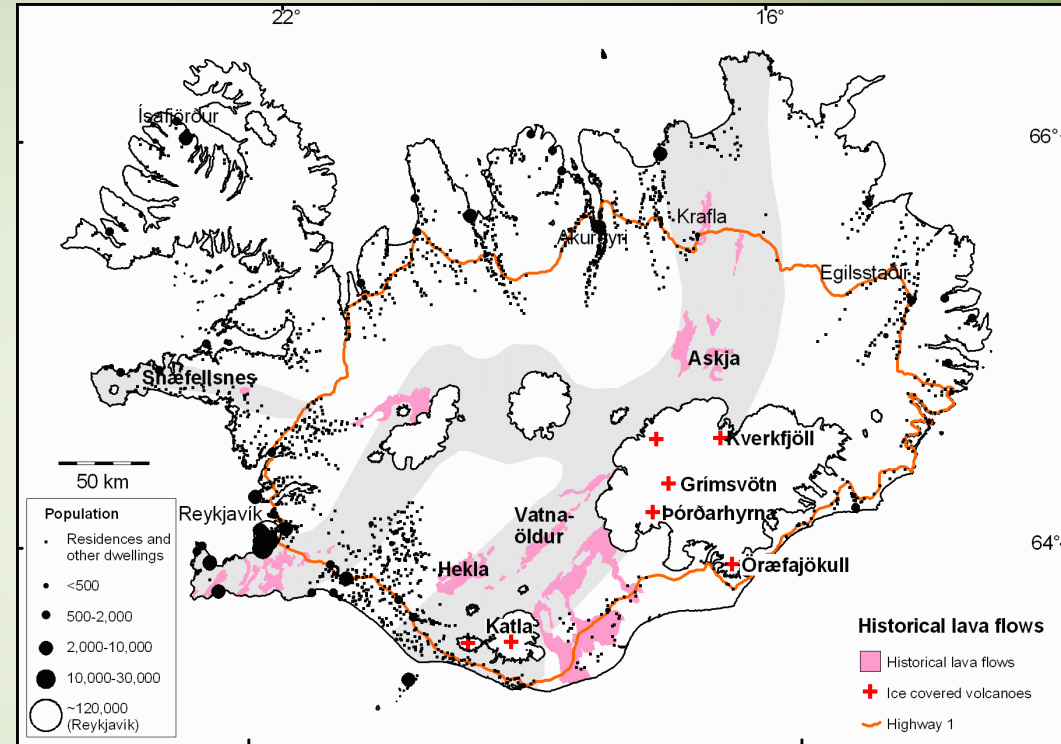
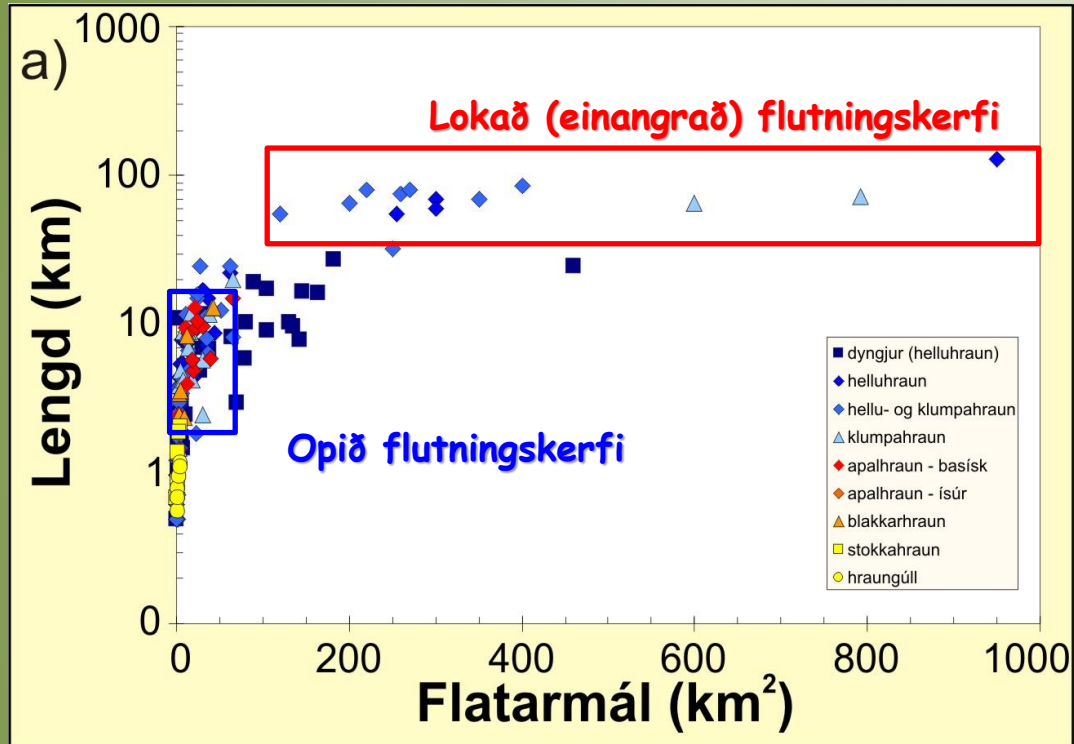


Hraunflæði

Nátthagi - innri flutningur og vöxtur hrauns



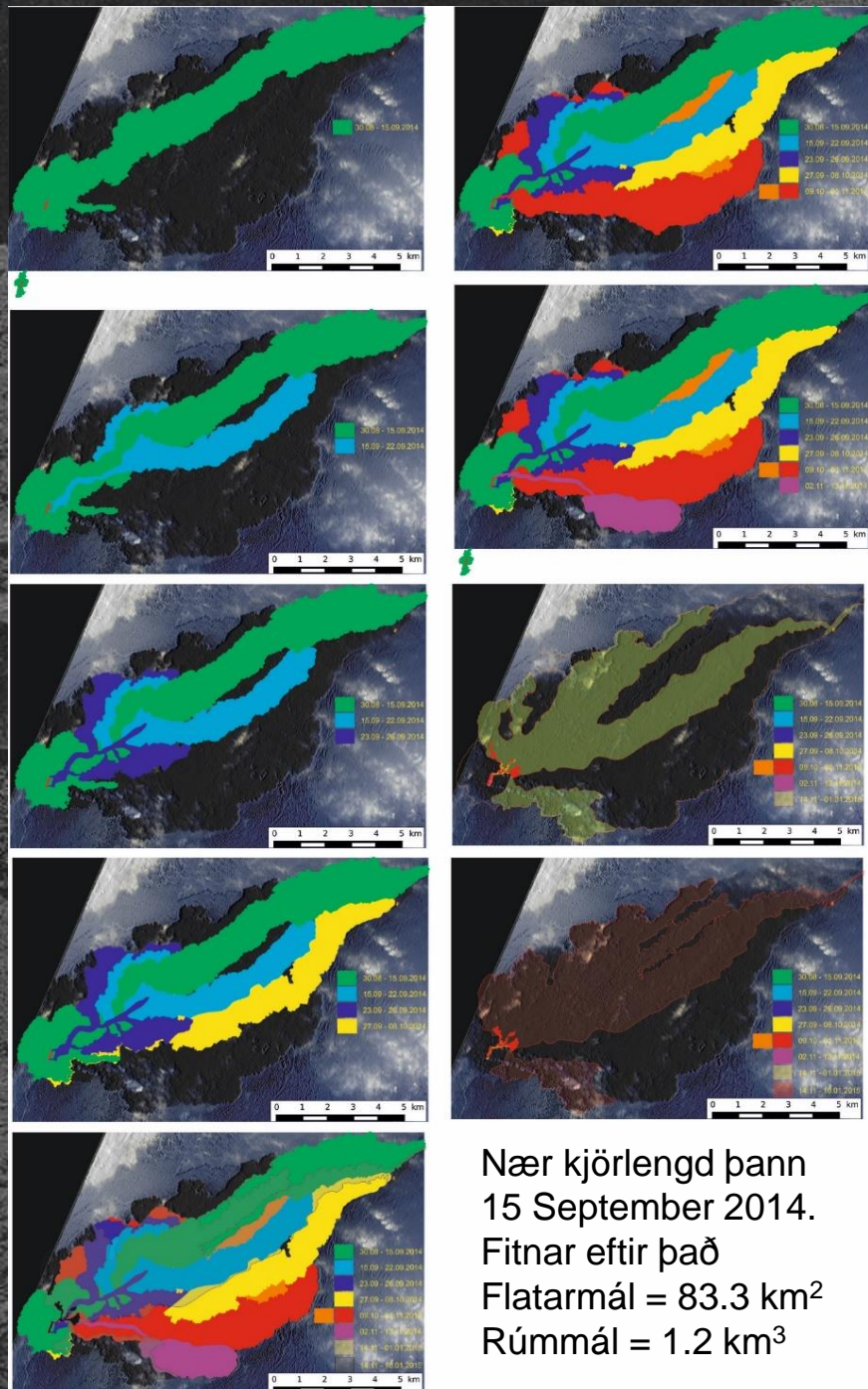
Rensilslengdir hraunbreiða á Íslandi



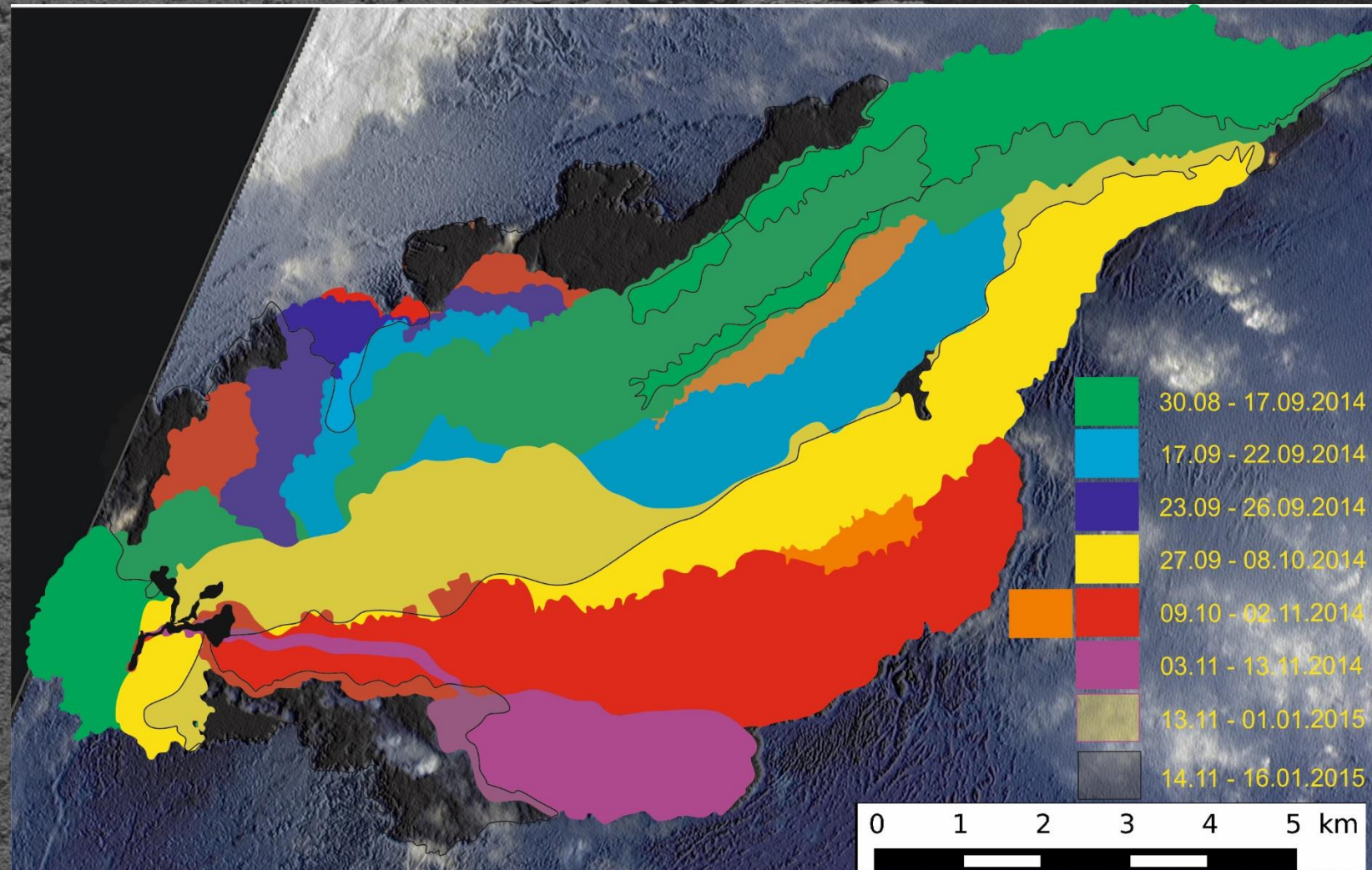
Íslenskar hraunbreiður hafa „kjörlengd“, þ.e. lengd sem hraunflæði nær við ákveðna kvikuframleiðni (m³/s).

Kjörlengd hrauna í aflmestu gosunum (t.d. Laki) er um 50-100 km
í millistærðinni (t.d. Ögmundarhraun) er algeng kjörlengd um 12-13 km

2014-15 Holuhraunsgosið



Nær kjörlengd þann
15 September 2014.
Fitnar eftir það
Flatarmál = 83.3 km²
Rúmmál = 1.2 km³



Innri vöxtur og hindranir



Hraunið í Nafnlausadal
Lava in „Valley with no Name“

vestari varnagarður
west dyke

eystri varnagarður
east dyke

c.a. 500 m

c.a. 100 m

Rennslisleið hraunsins 22052021
Flow path of the lava 22052021

Hraungos á Reykjaneskaganum

Sprungugos lang algengust á Reykjaneskaganum

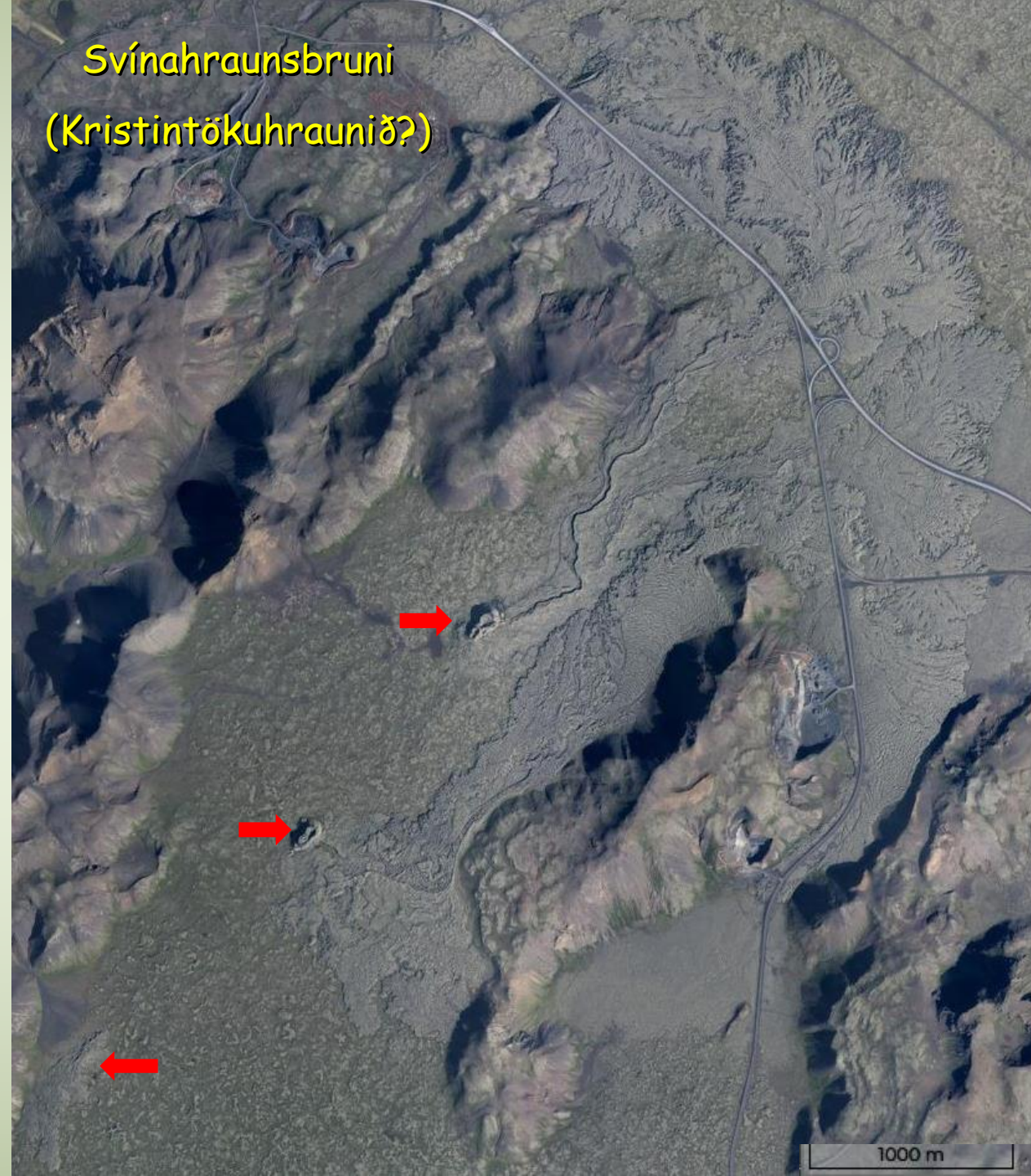
Meðaltal, há- og lágildi fyrir flatarmál, rúmmál og lengd hraunbreiða frá Nútíma (<14000 ár) sprungugosum á Reykjaneskaga.

N= 98	Flatarmál (km ²)	Rúmmál (km ³)	Mesta Lengd (km)
Meðaltal	7	0,075	4,5
Staðalfrávik	9	0,113	3,9
Hágildi	36	0,54	17,3
Lágildi	0,001	0,001	0,001

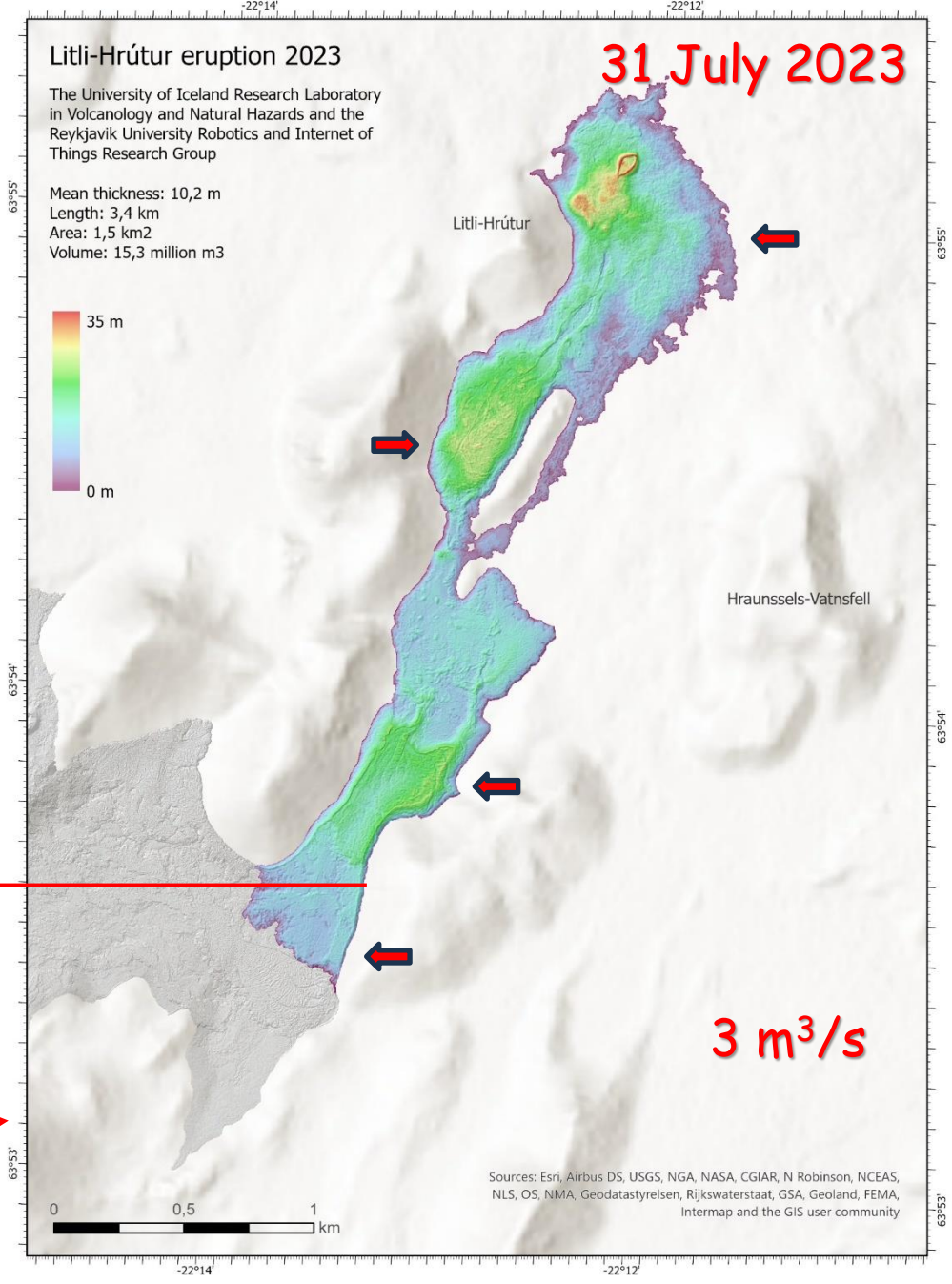
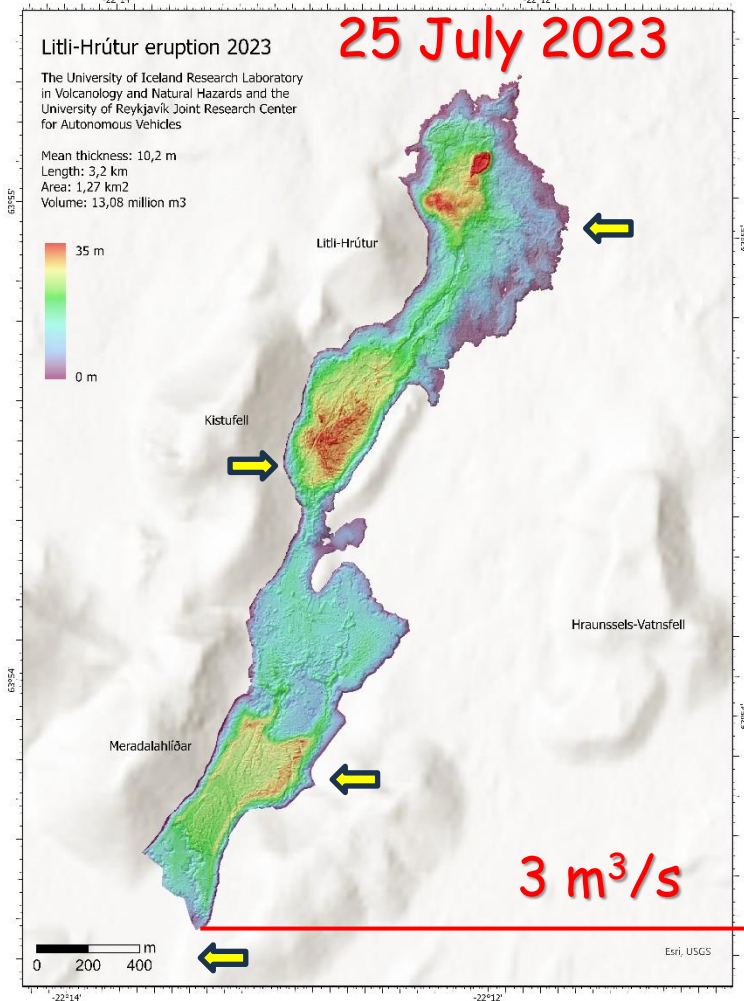
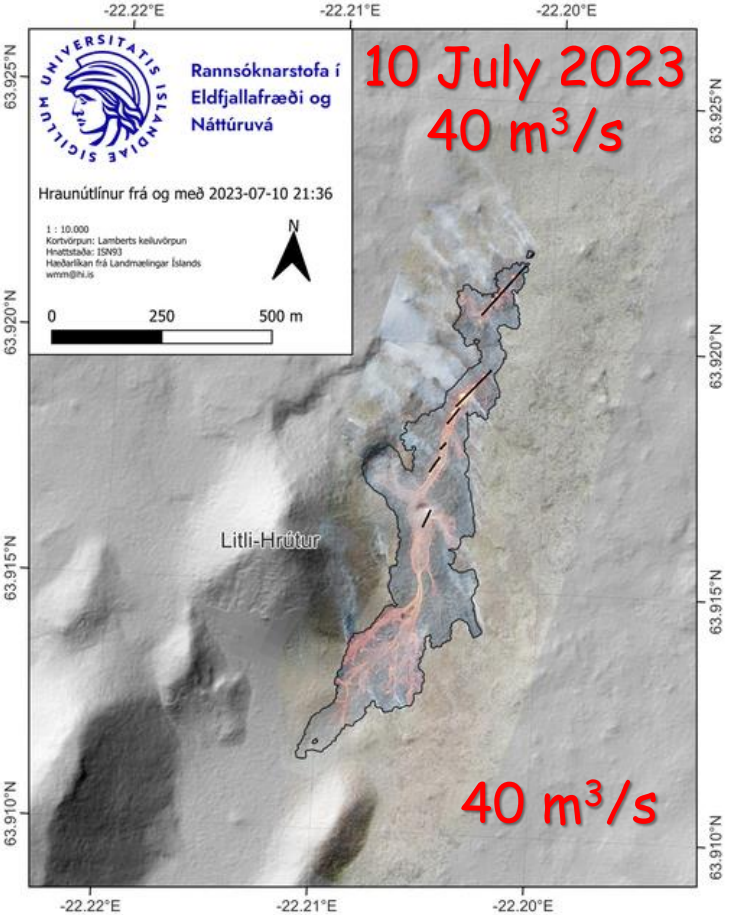
Meðaltal, há- og lágildi fyrir flatarmál, rúmmál og lengd hraunbreiða frá sögulegum sprungugosum á Reykjaneskaga.

N=22	Flatarmál (km ²)	Rúmmál (km ³)	Mesta Lengd (km)
Meðaltal	13	0,11	6
Staðalfrávik	10	0,11	4.5
Hágildi	35	0,45	17
Lágildi	0,001	0,001	0,001

Svínahraunsbruni
(Kristintökuhraunið?)



1000 m



Extent of the Litli-Hrútur lava flow field 25 July 2023

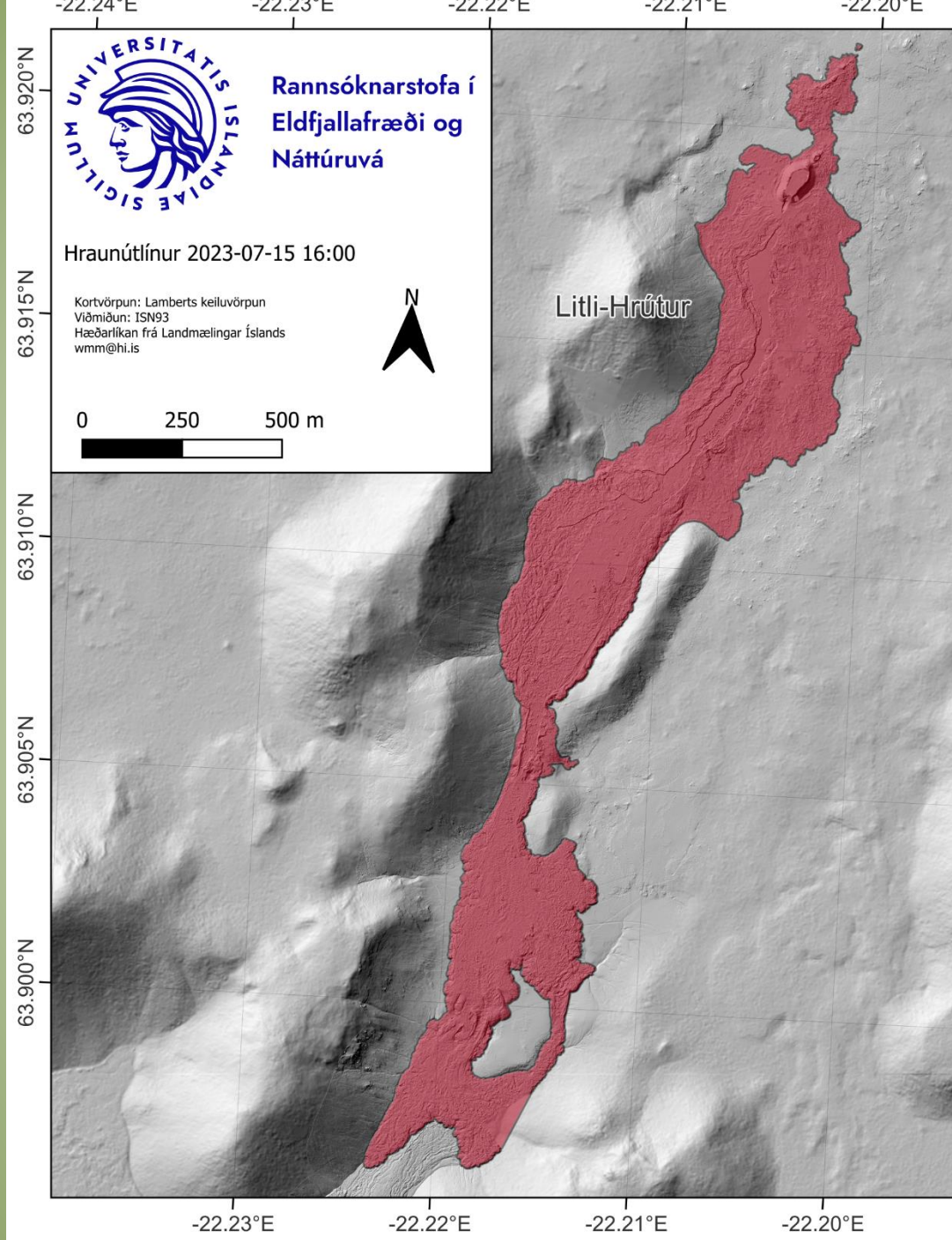
REN, unpubl. data 2023

Fyrstu 5 klst.

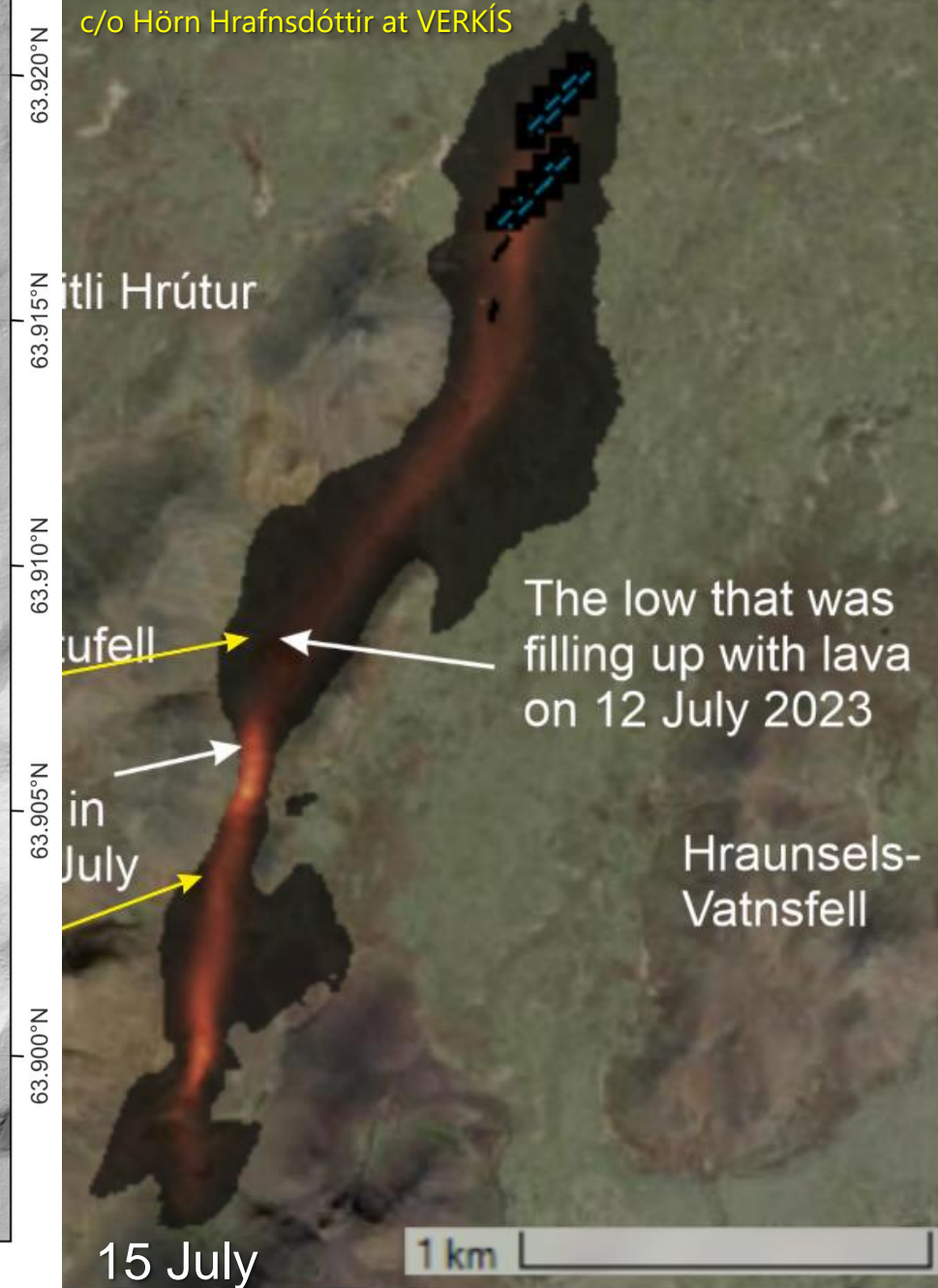
Innra flæði í Litla-Hrútsgosinu

Extent of the Litli-Hrútur lava field on July 31 2023

Hraunhermanir



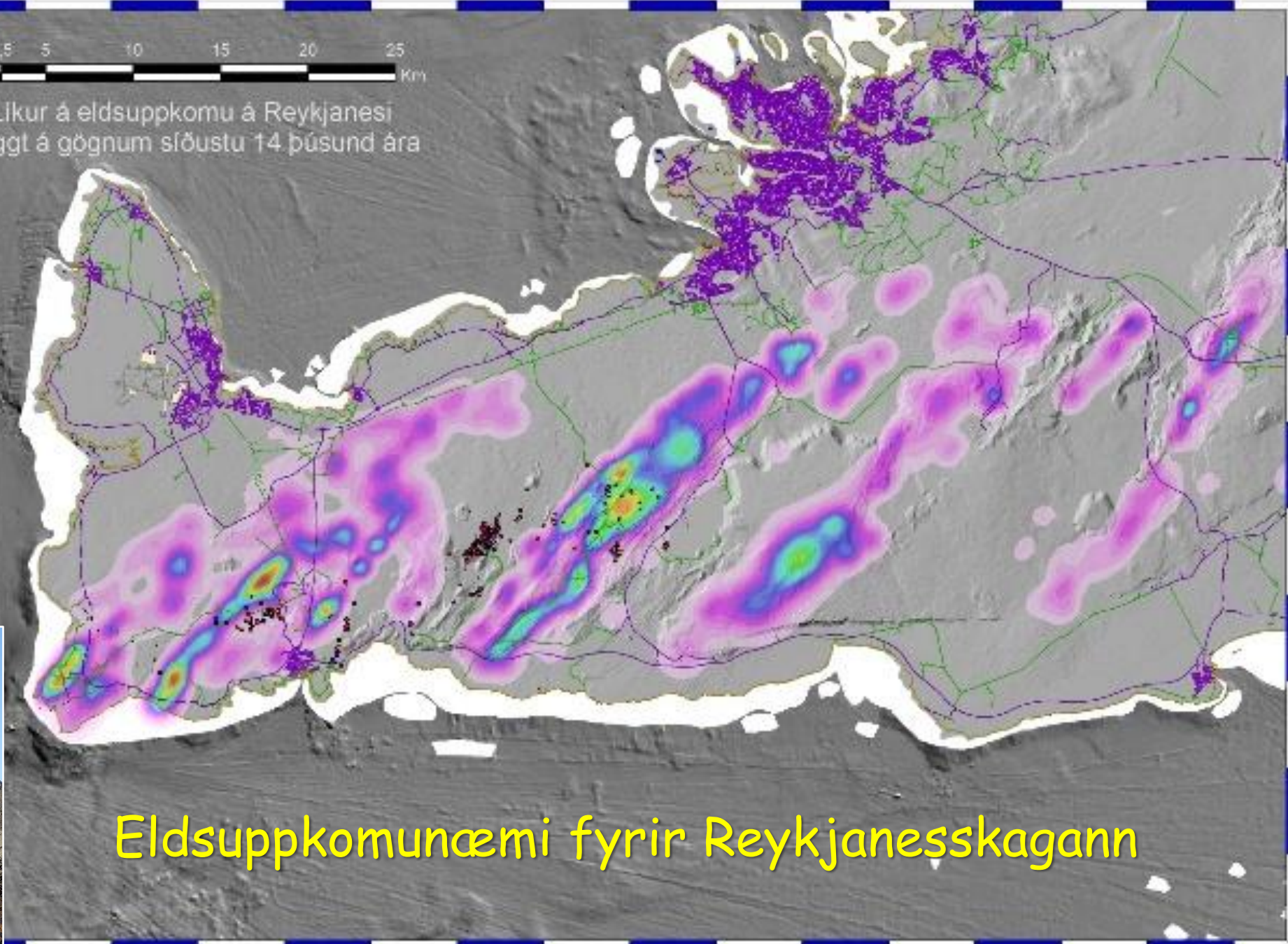
Government Infrastructure Group and REN, unpubl. data 2023
c/o Hörn Hrafnadóttir at VERKÍS



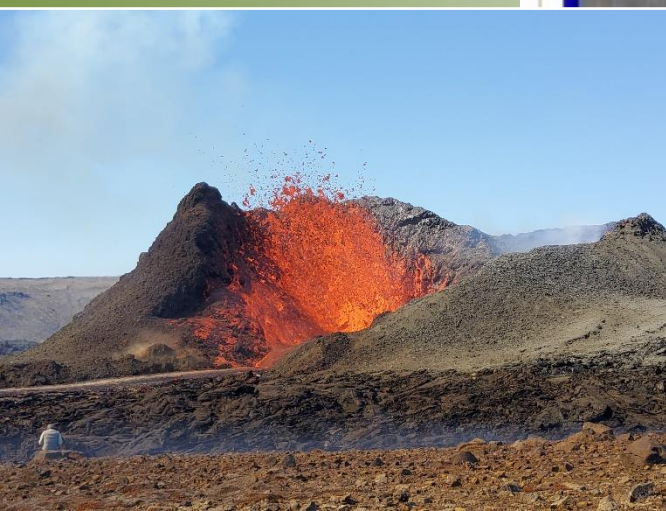
Langtíma-
hættumat
með
VETOOLS

0 2,5 5 10 15 20 25
Km

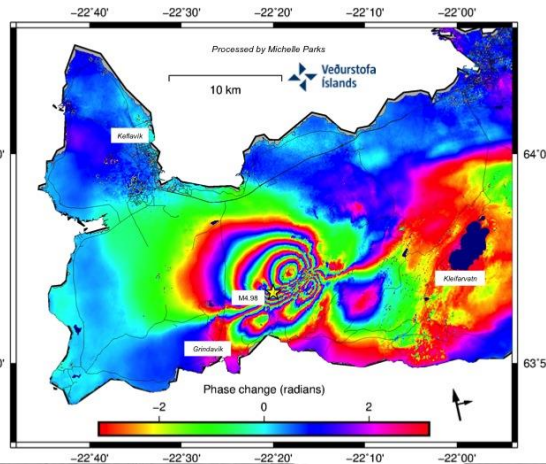
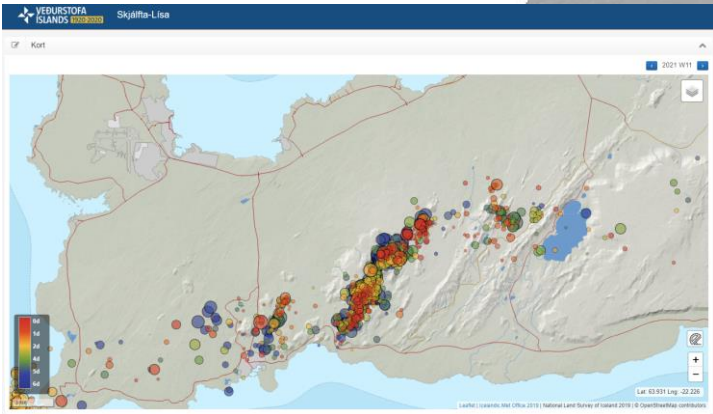
Likur á eldsuppkomu á Reykjanesi
Byggt á gögnum síðustu 14 þúsund ára



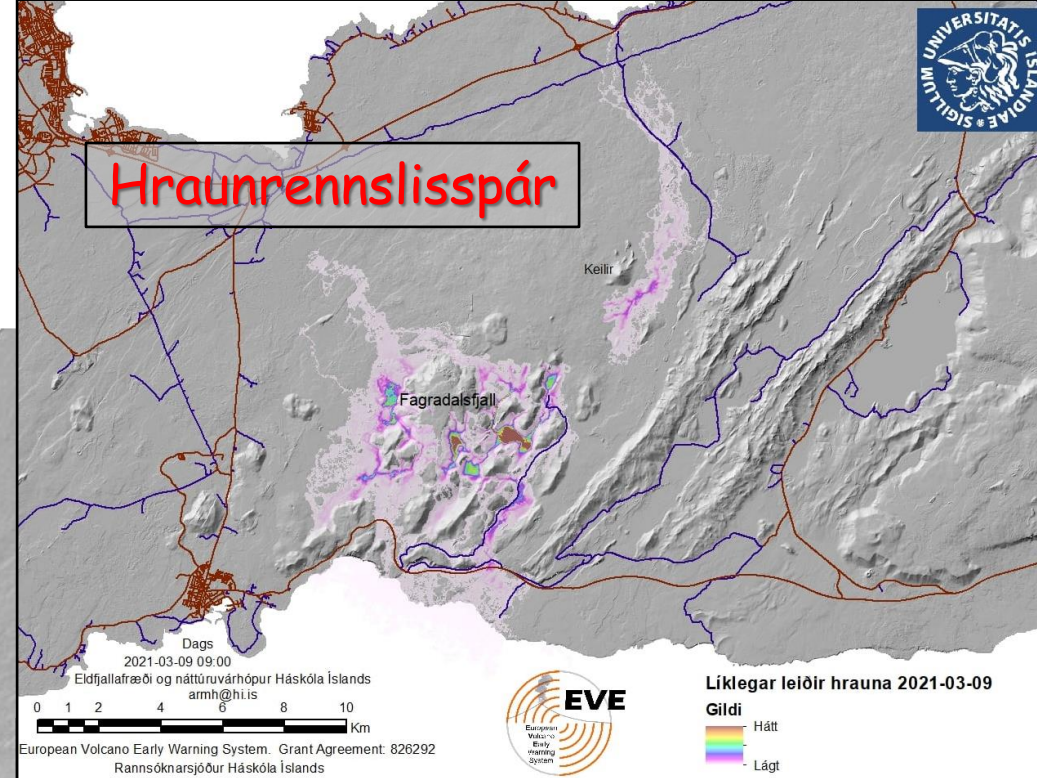
Eldsuppkomunæmi fyrir Reykjannesskagann



Ný gögn komu inn

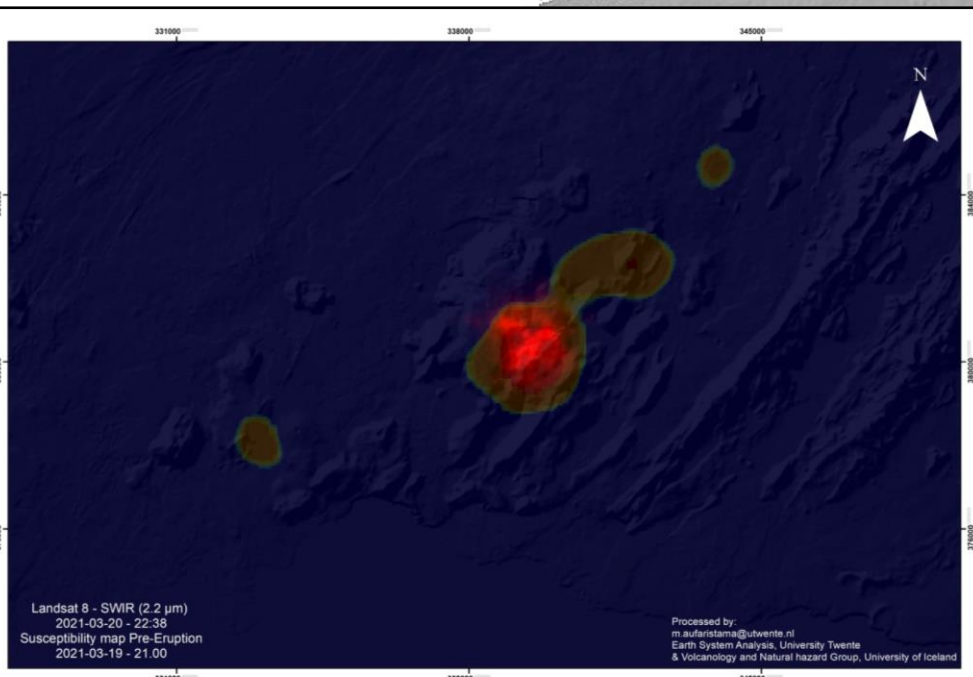


Hraunrennslisspár

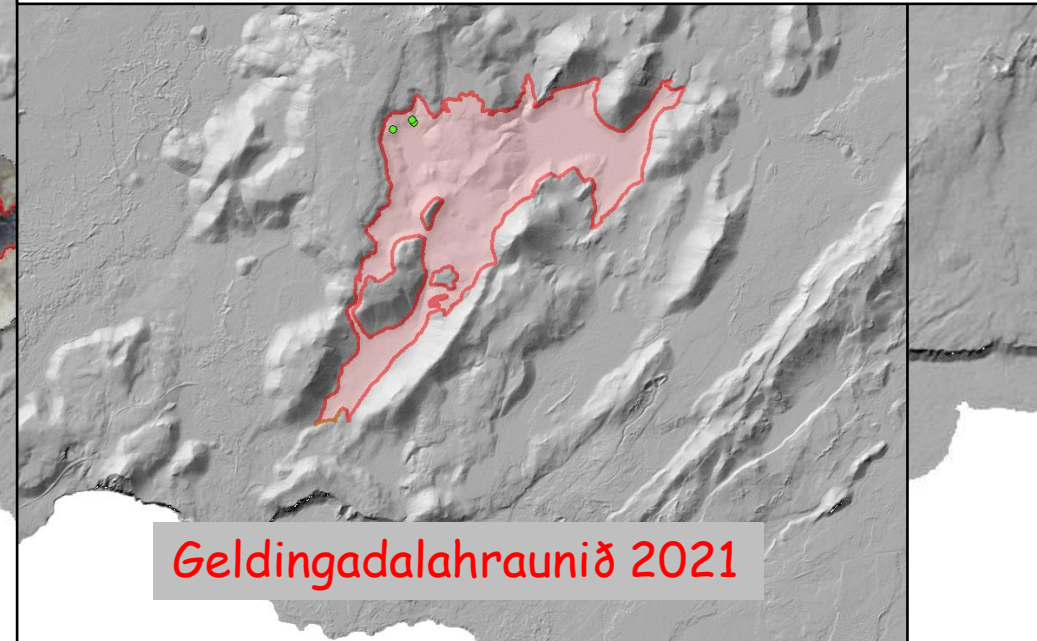


Skammtímahættumat með VETOOLS

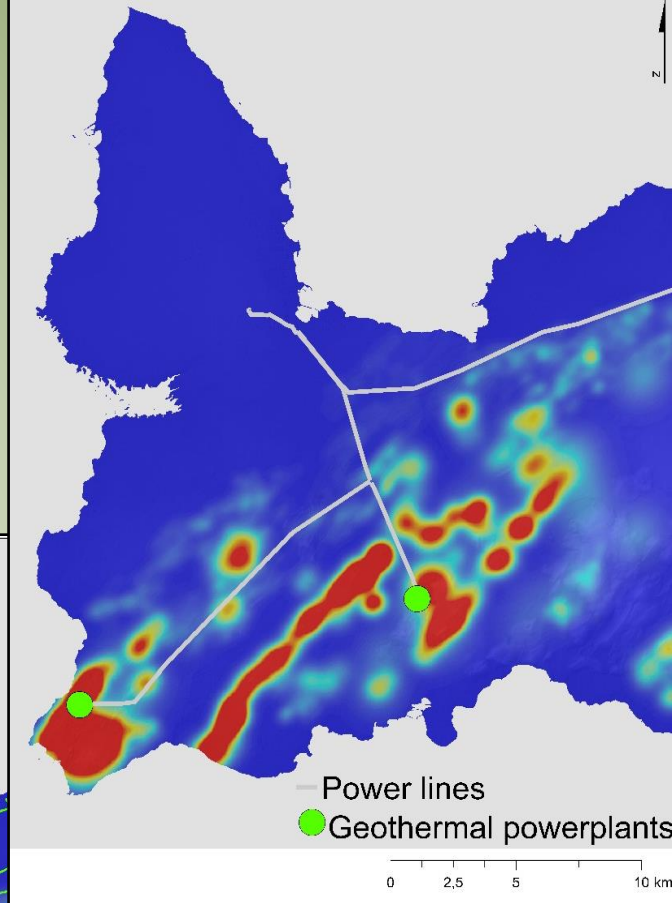
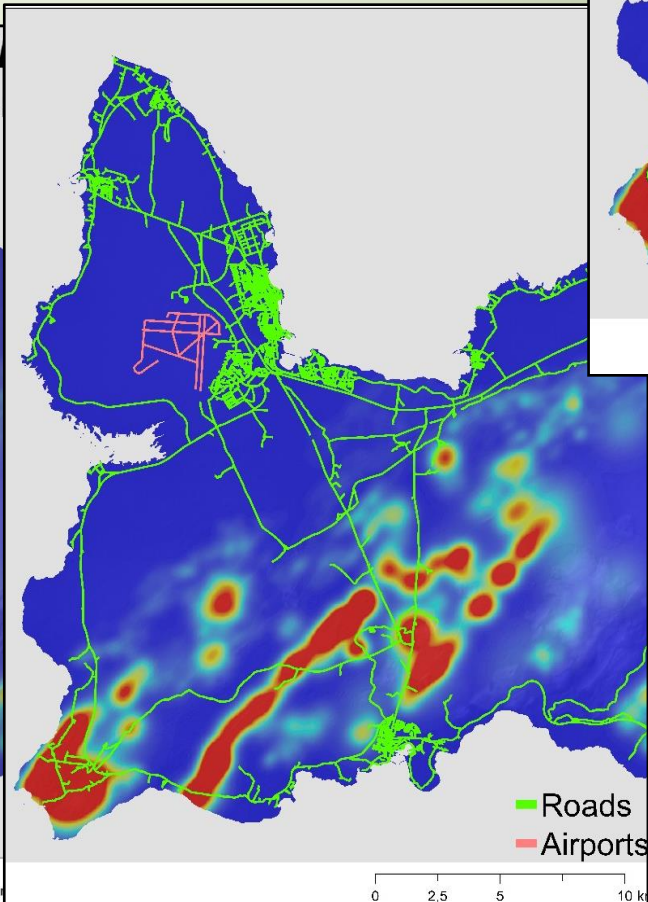
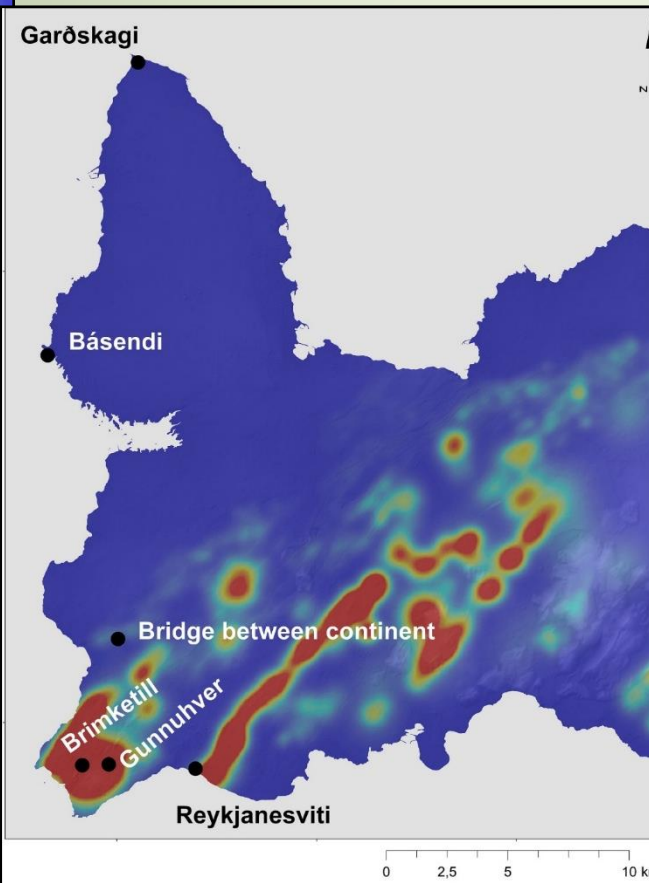
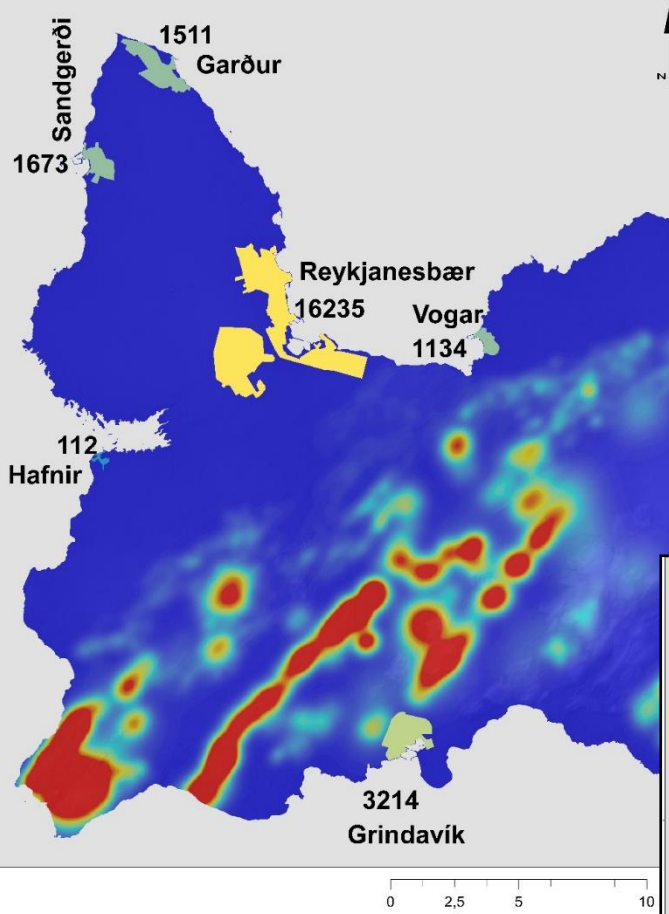
VETOOLS stóðst prófið



Geldingadalahraunið 2021

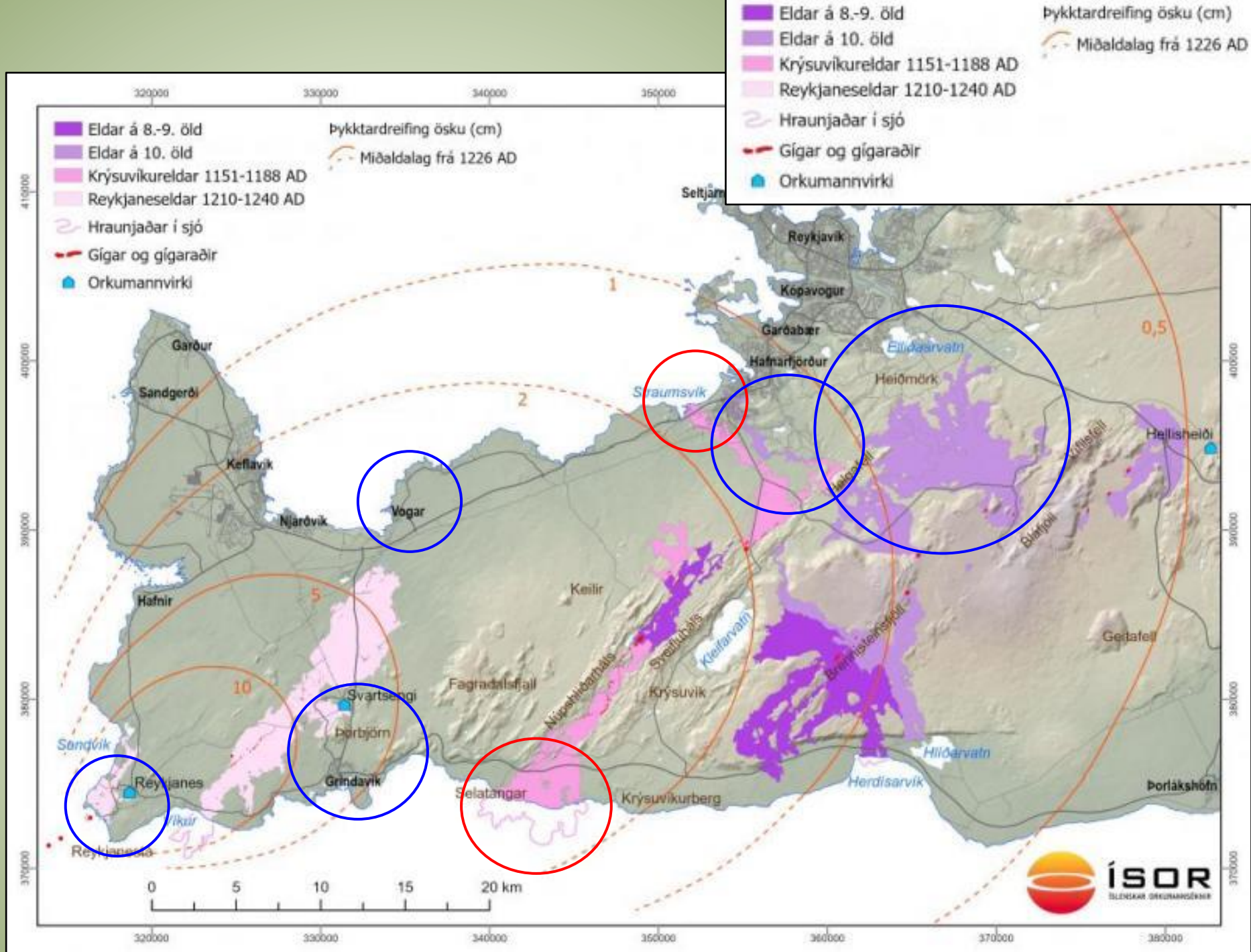


Eldsuppkomunæmni og Þéttbýli + Innviðir



Hver er skaðlegasta eldgosaváin á skaganum?

Líklegast að hún tengist hraunflæði



Takk fyrir að hlusta

