

Grímsvötn: Vatnsgeymir, jökulhlaup, upphaf og rennsli



ICEYE
AIRBUS
cnes

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Vincent Drouin³, Gunnar Sigurðsson³, Jan Wuite⁴ og Etienne Berthier⁵*

1:



HÍ

JARÐVÍSINDASTOFNUN

2:



3:



4:

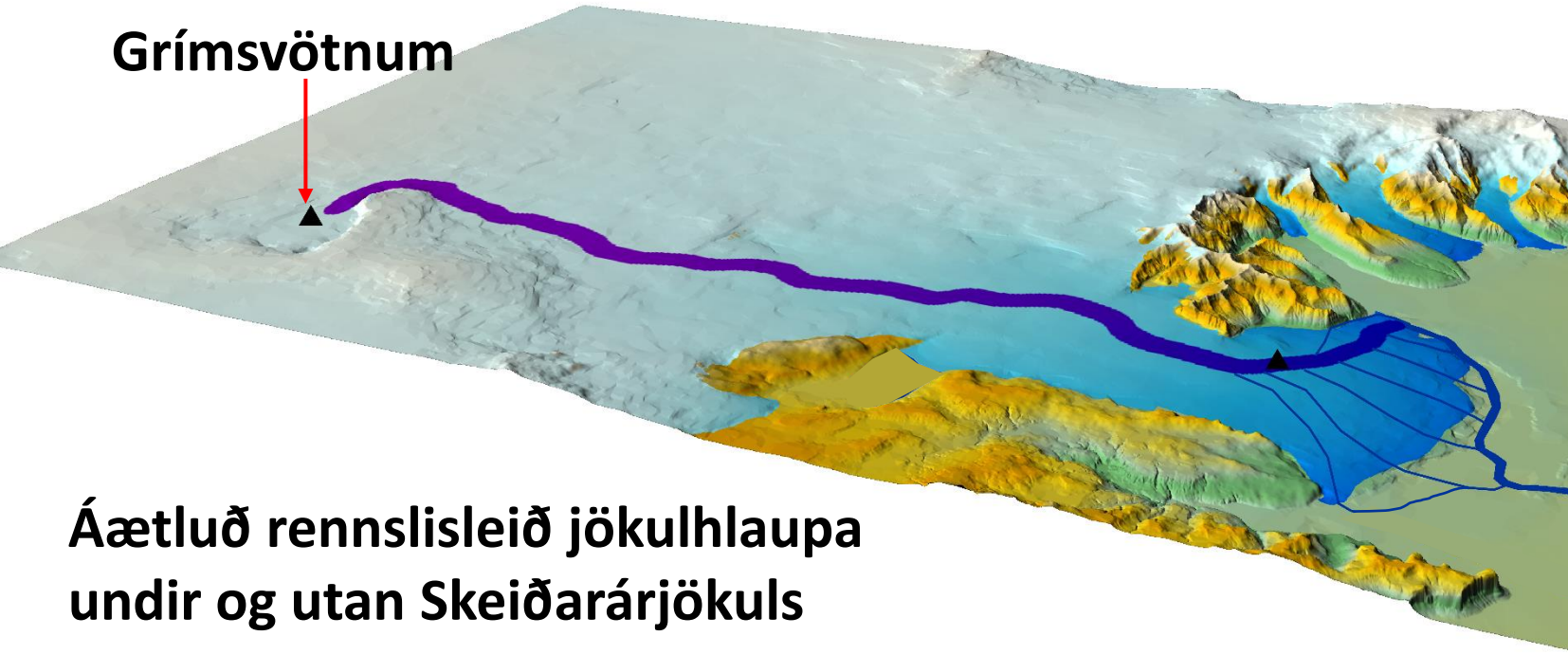


5:

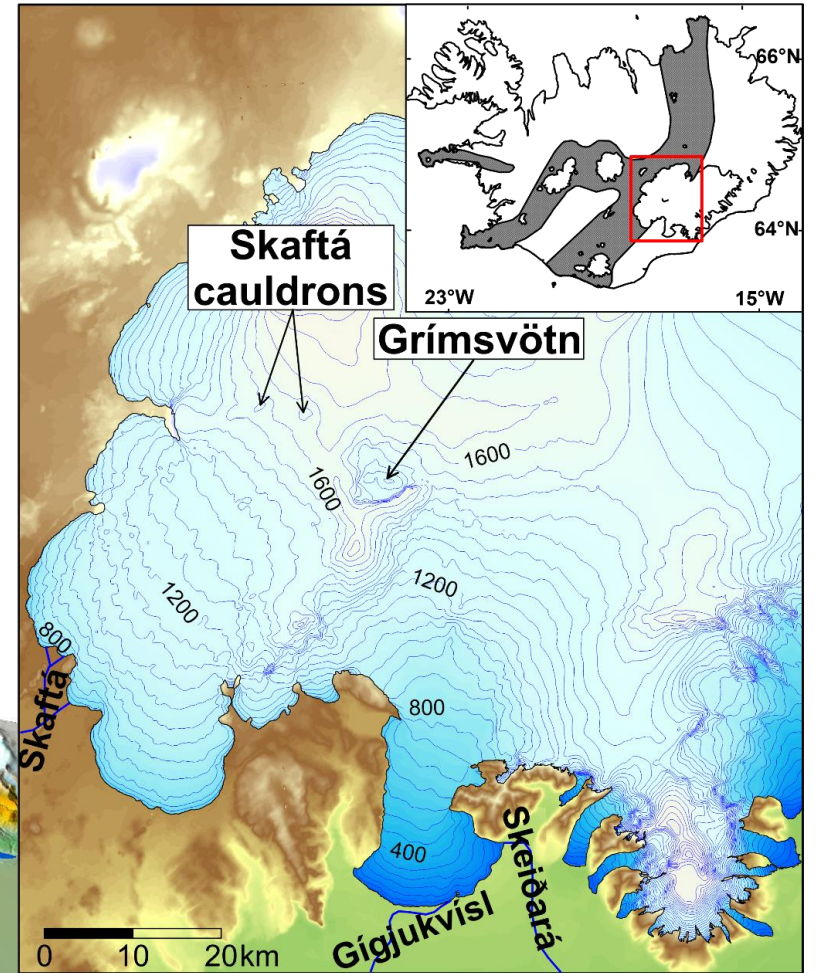


Staðsetning Grímsvatna og áhrifasvæði jökulhlaupa

Mælistöð í Grímsvötnum

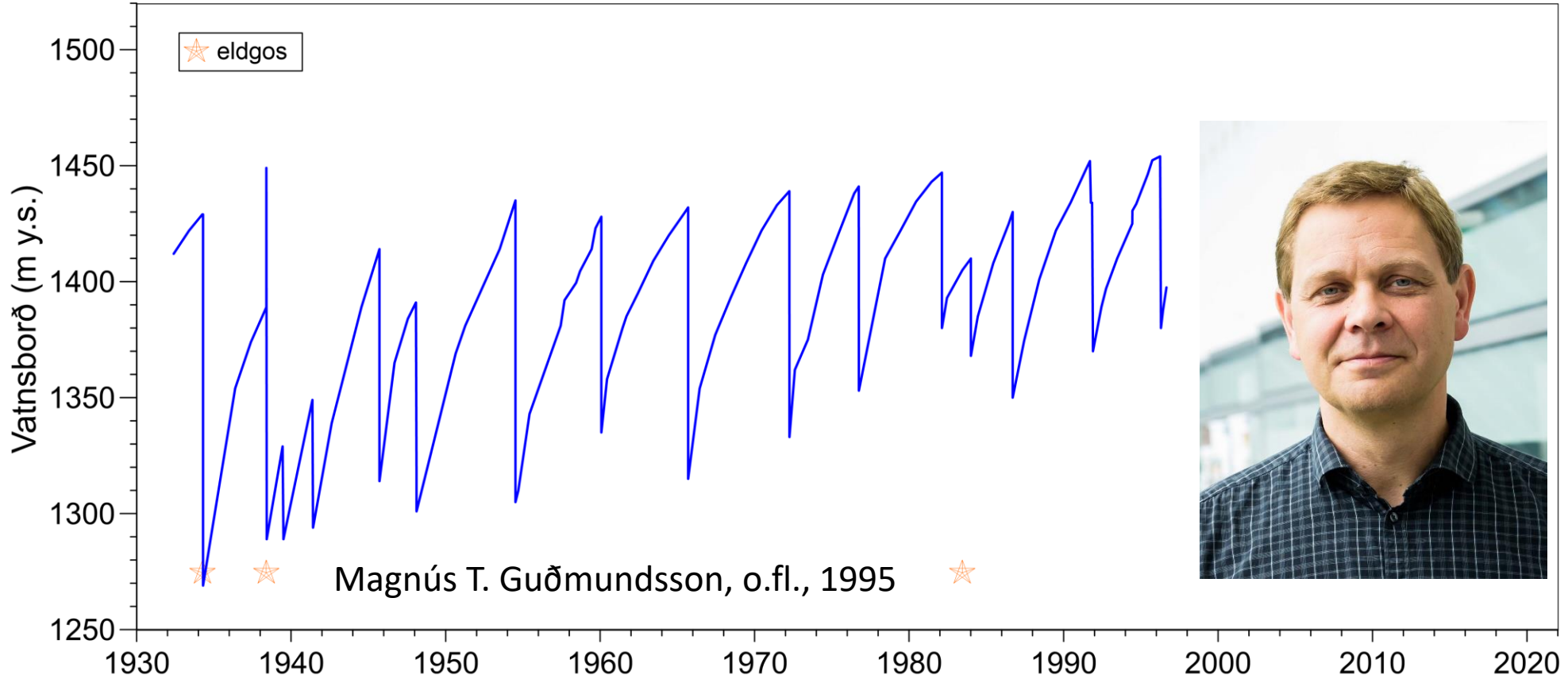


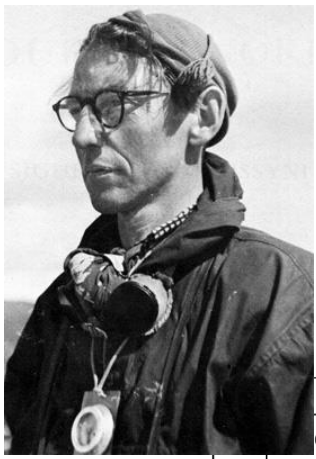
Áætluð rennslisleið jökulhlaupa undir og utan Skeiðarárfjökuls



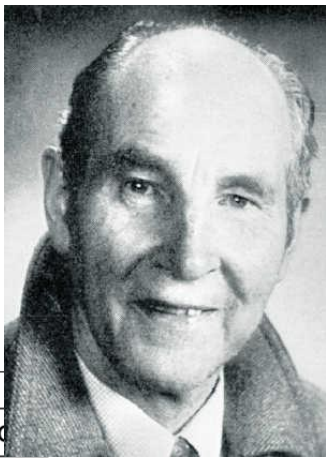
Brúin yfir Gígju

Grímsvötn fundust 1919 og rannsókuð svo til síðan þá





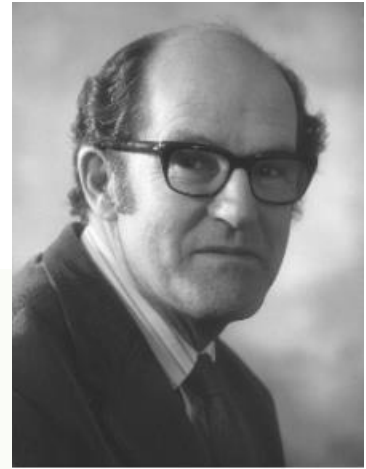
Sigurður Þórarinnsson



Sigurjón Rist



Helgi Björnsson



John Nye

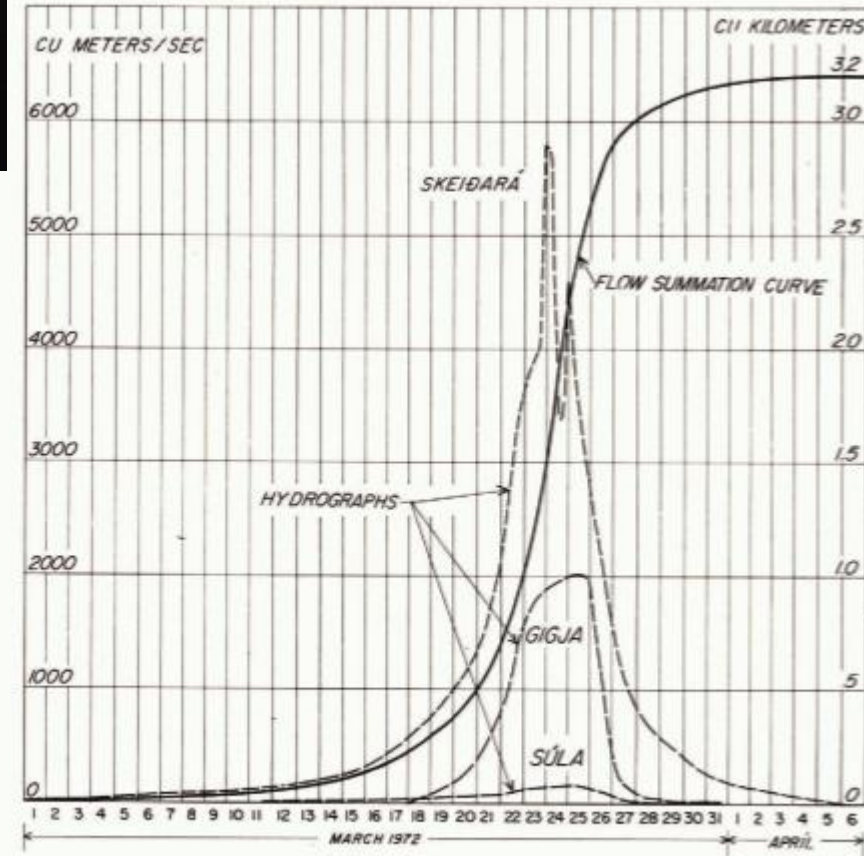
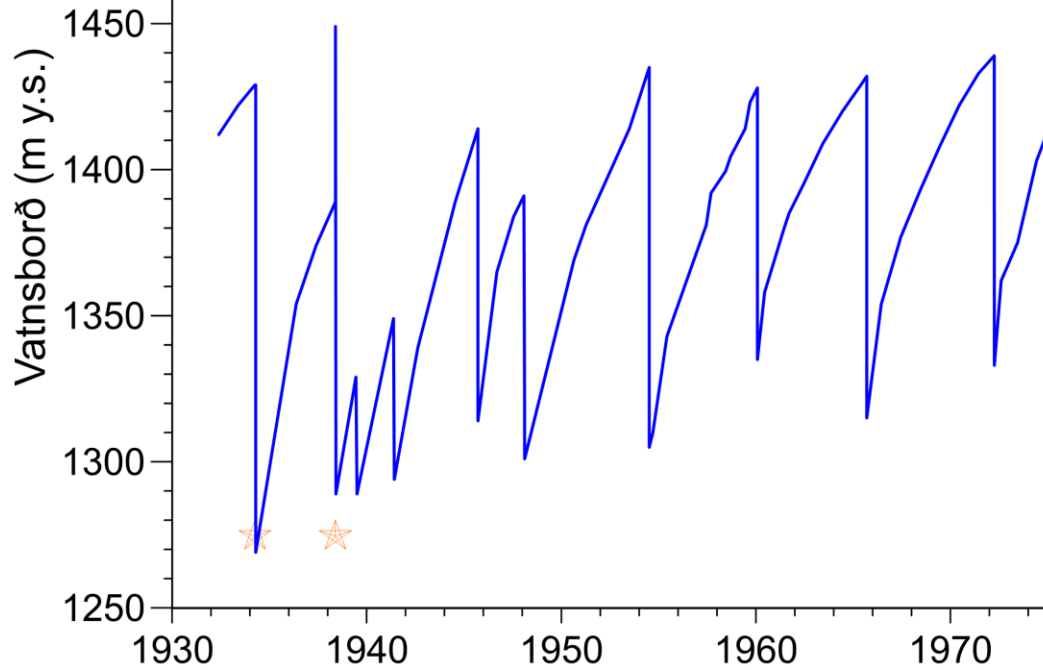
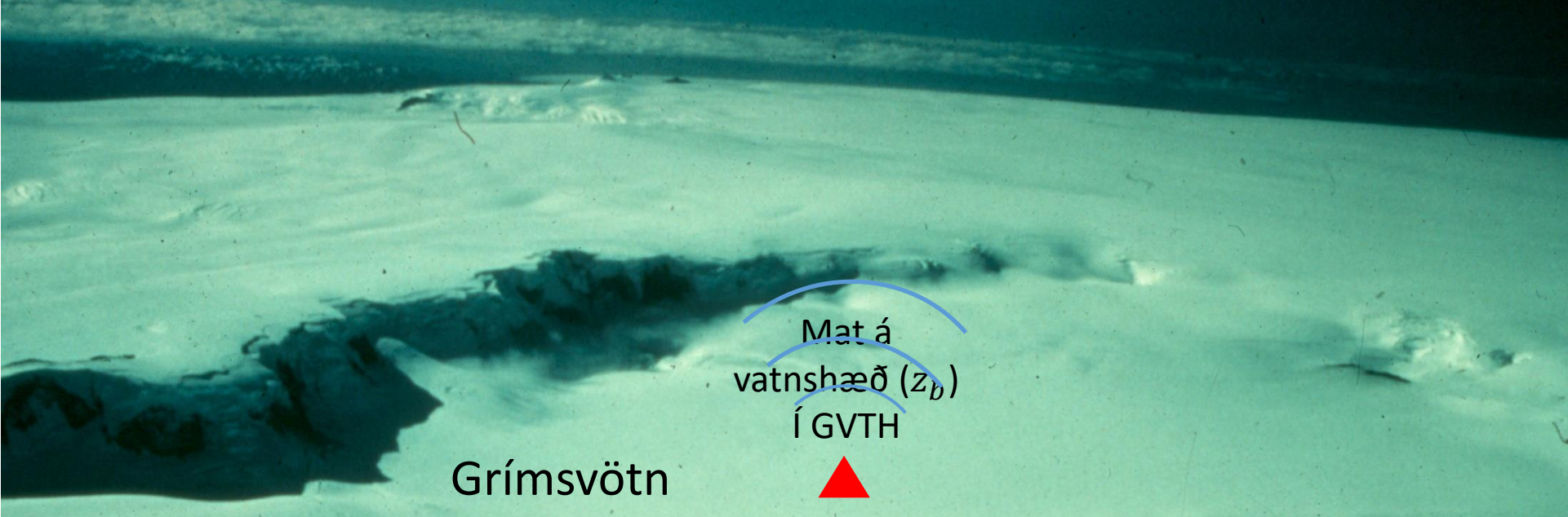


Fig. 6. Hydrograph for the 1972 jökulhlaup. The discharges of the three main outlet rivers Skeiðará, Gígja and Súla are shown separately by the broken curves. Measurements by Sigurjón Rist (reproduced from fig. 3 of Rist ([1974]) by permission of the editors of Jökull).

Jökulhlaup úr Grímsvötn grundvöllur að eðlisfræðilegu líkani fyrir hægt vaxandi jökulhlaup, þar sem vatnið rennur í gegnum göng brædd með núningsvarma vatnsins (Nye, 1976)

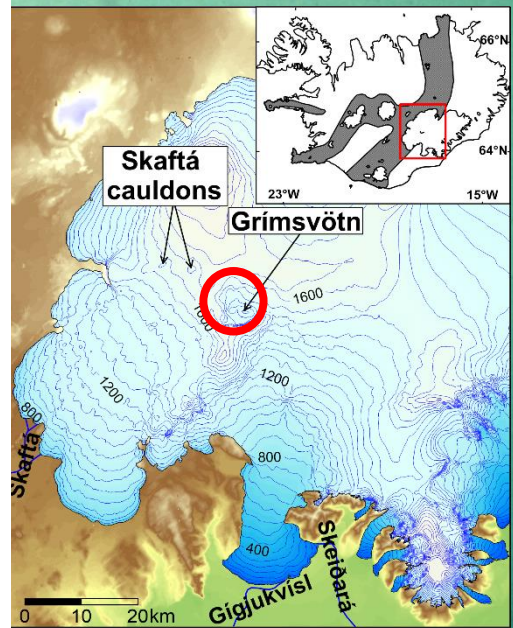
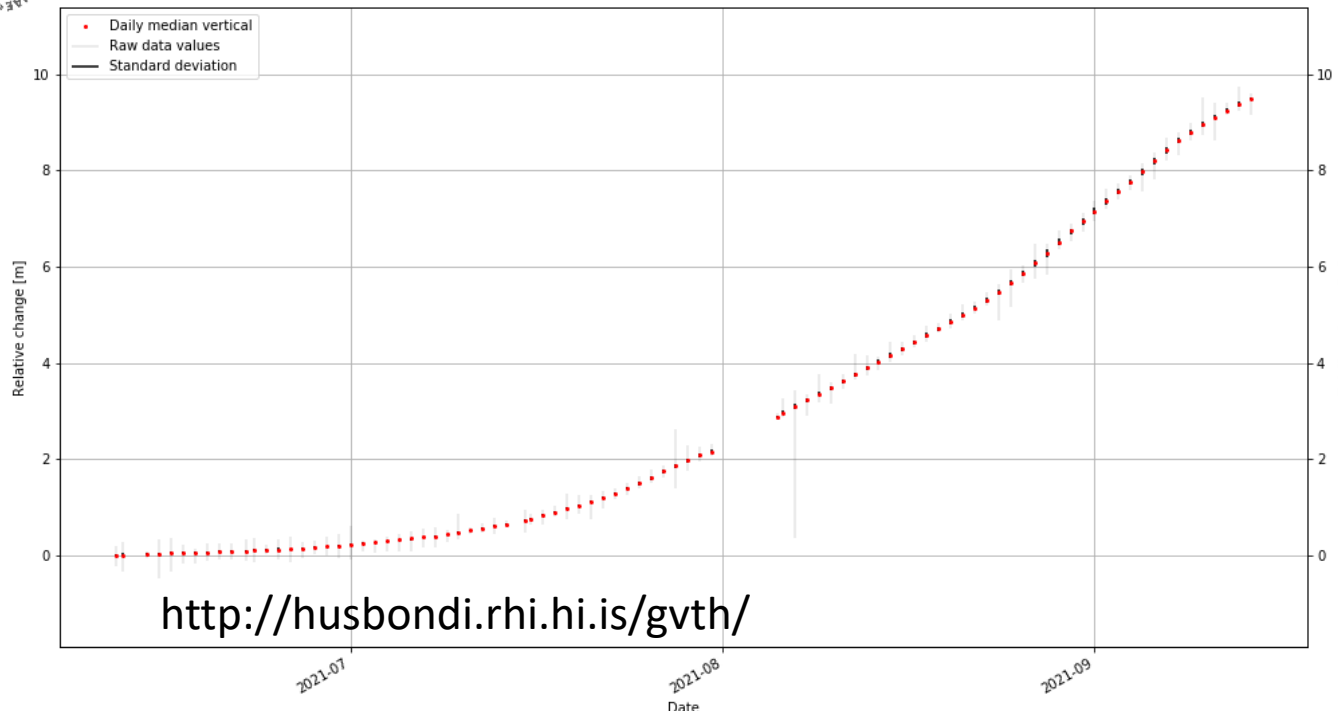
Eftir næstum 100 ár af rannsóknum af hverju erum við enn að rannsaka Grímsvötn?

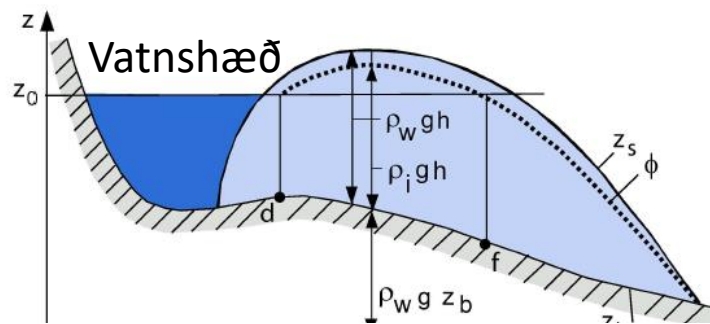
1. Grímsvötn eru alltaf að breytast. Sú vitneskja sem var gild fyrir 30 árum er ekki endilega í gildi lengur
2. Mælitæki og mæliaðferðir alltaf að batna. Getum nú mælt hluti og svarað spurningum sem við gátum ekki áður



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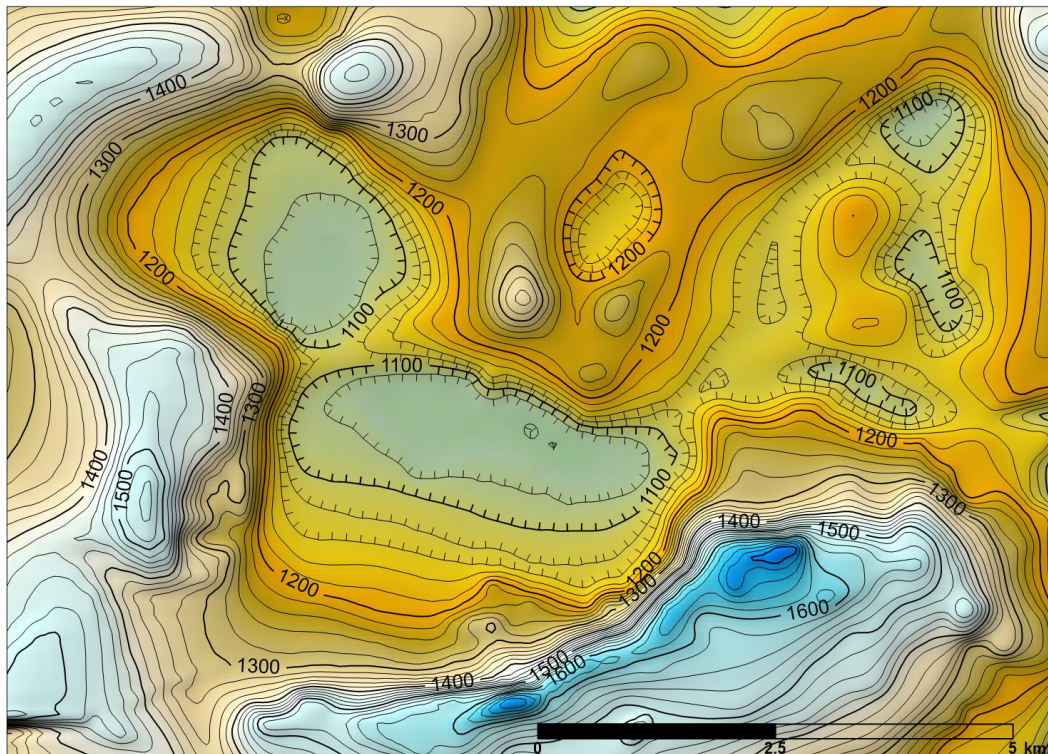
Station: GVTH, relative vertical displacement.
Samples grouped per day and corrected from base station GFUM
Last measurement: 2021-09-14 12:59:45 GPST



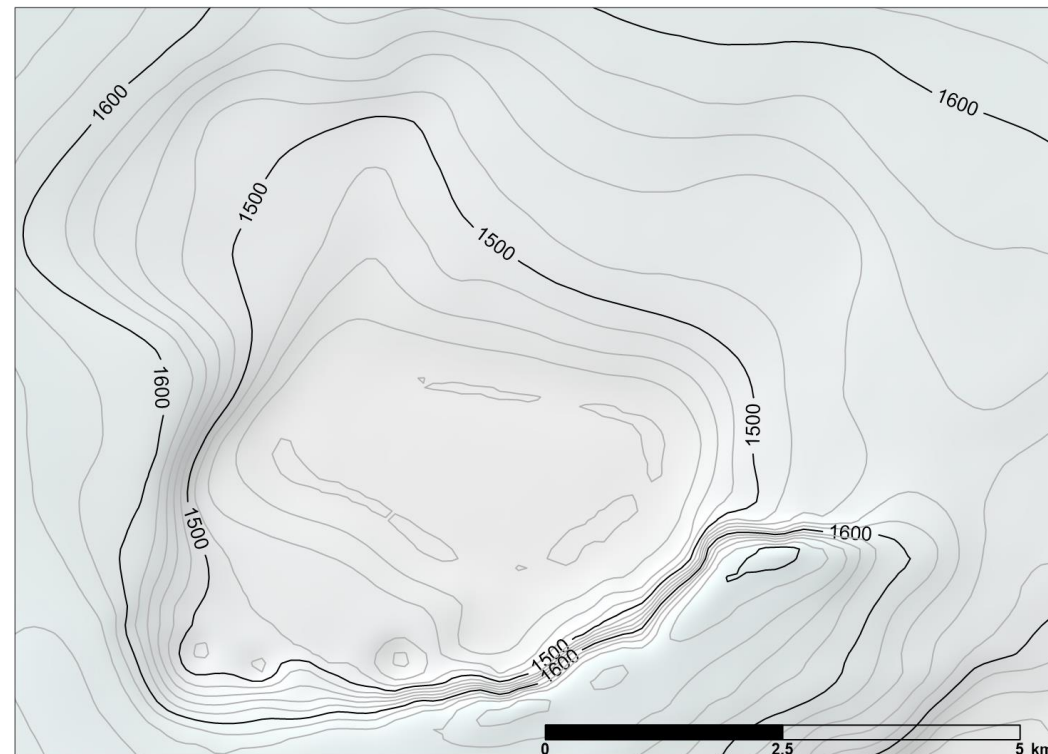


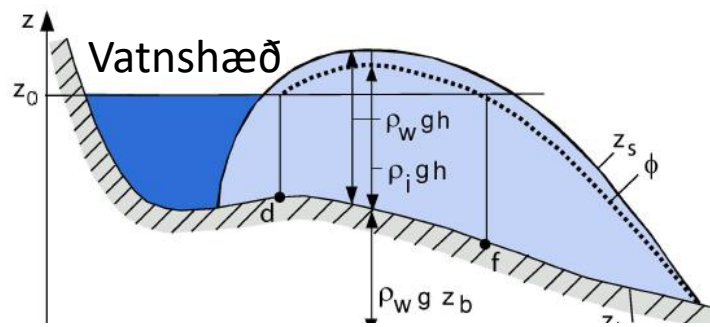
Grímsvötn ná yfir svæði þar sem vatnsþrýstingur er nægur til að jökullinn fljóti upp

Botnkort (z_b) unnið eftir íssjármælingum ~1988



Jökulyfirborð (z_s) 1996

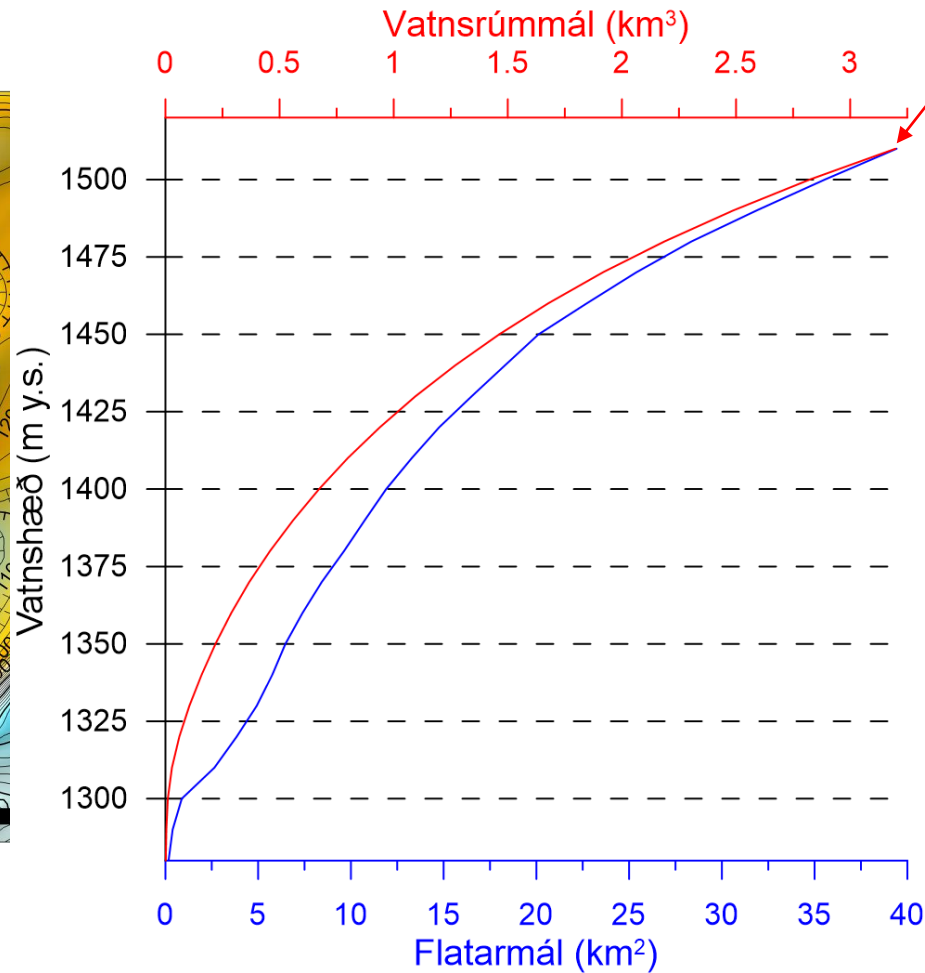
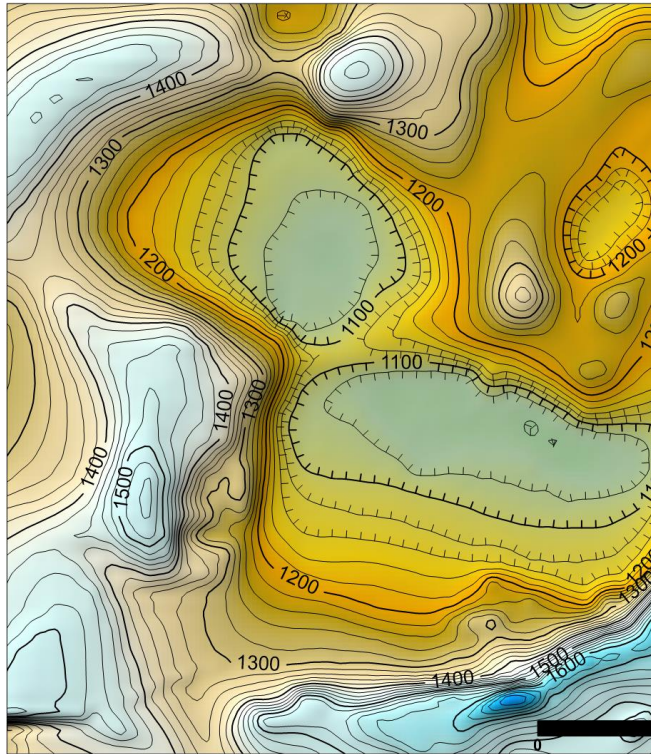




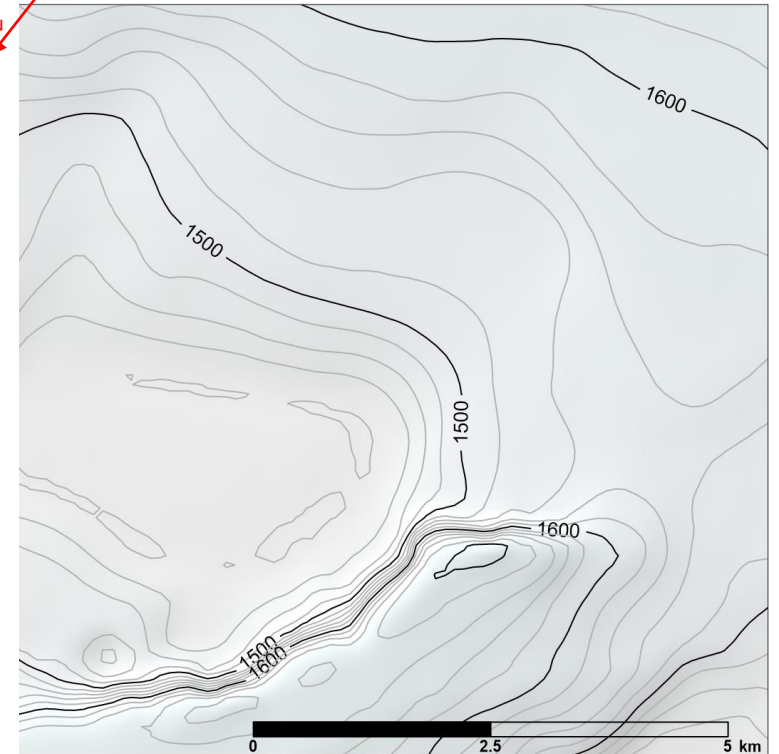
Grímsvötn ná yfir svæði þar sem vatnsþrýstingur er nægur til að jökullinn fljóti upp

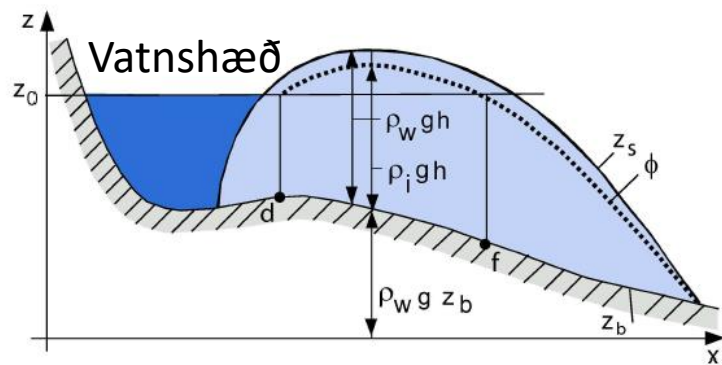
Metin uppsöfnun í Gjálpargosi 3,2 km³

Botnkort (z_b) ~1988

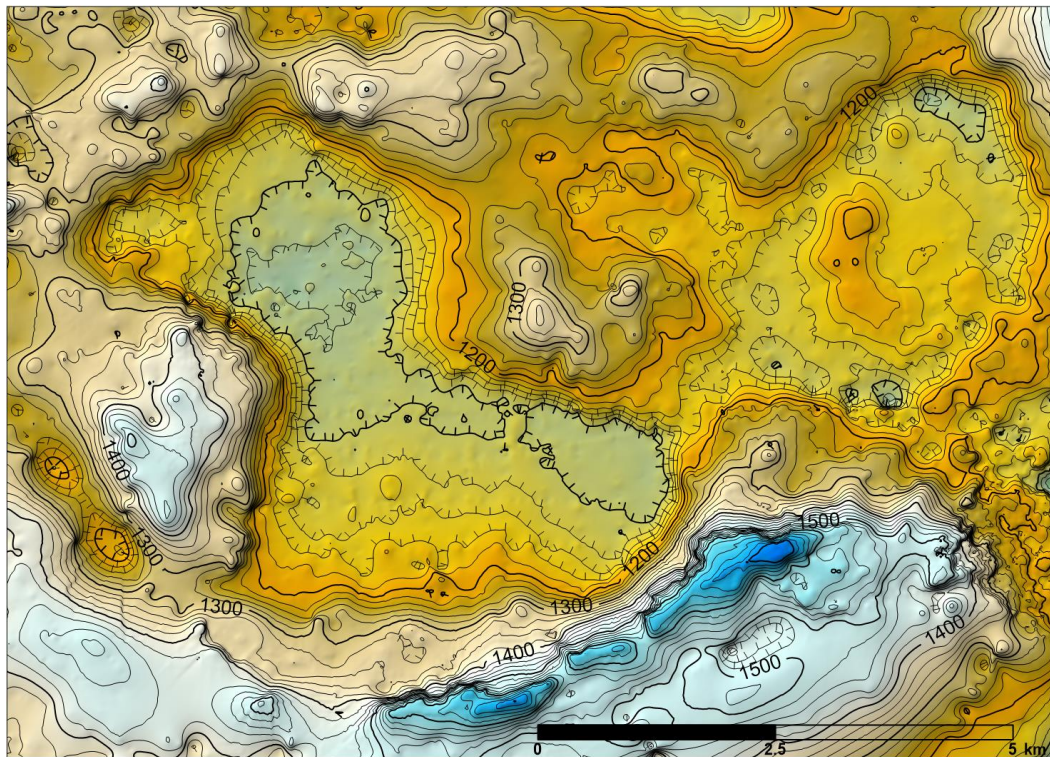


Jökulyfirborð (z_s) 1996

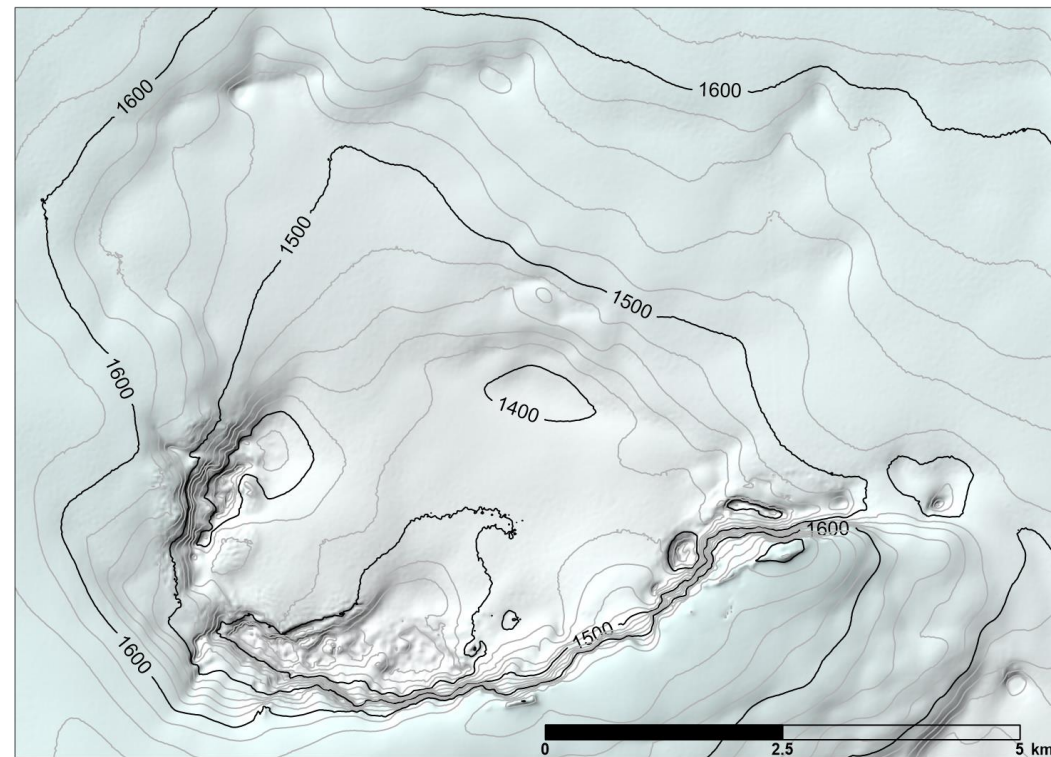


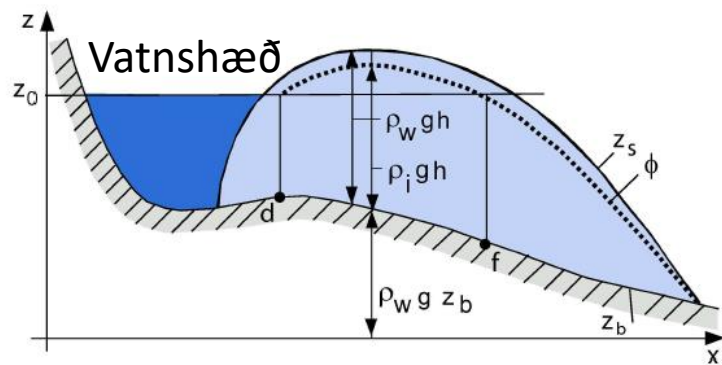


Botnkort (z_b) unnið eftir nýjum íssjármælingum

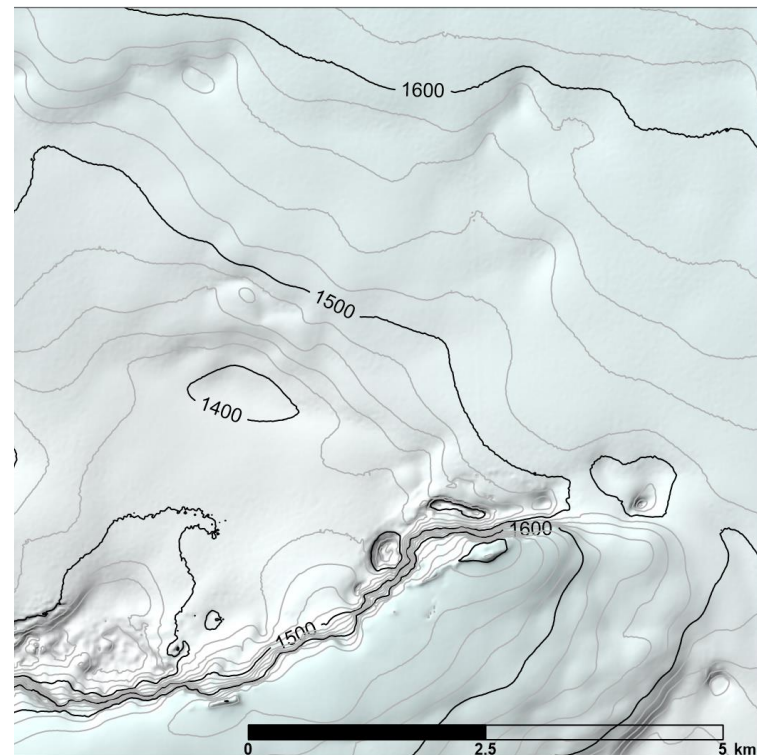
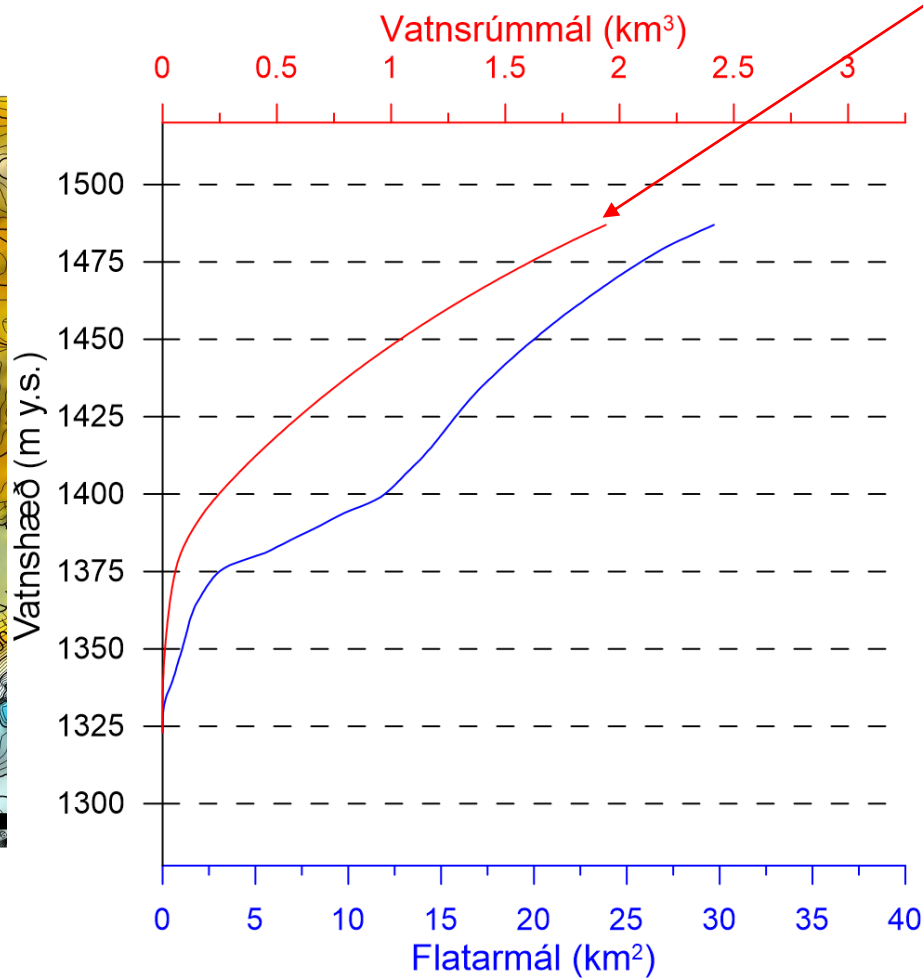
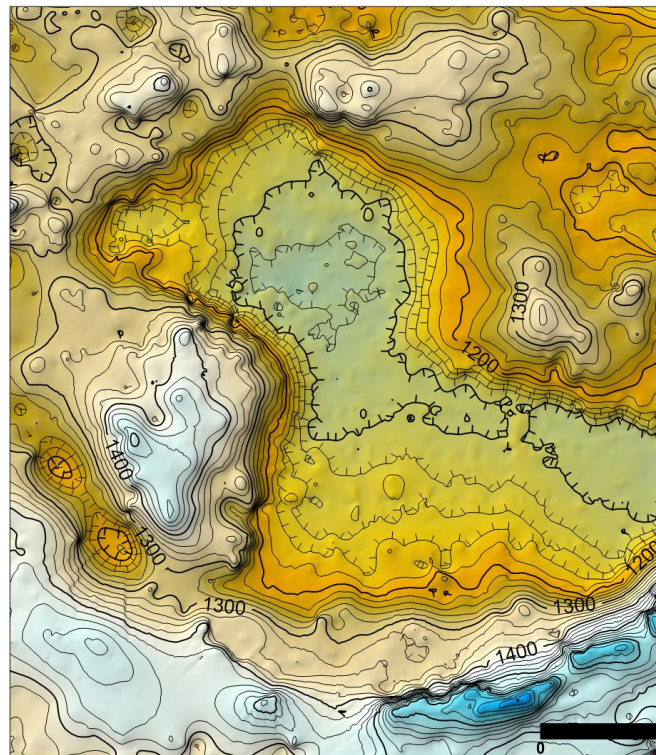


Jökulyfirborð (z_s) okt. 2022 (vötn tóm)

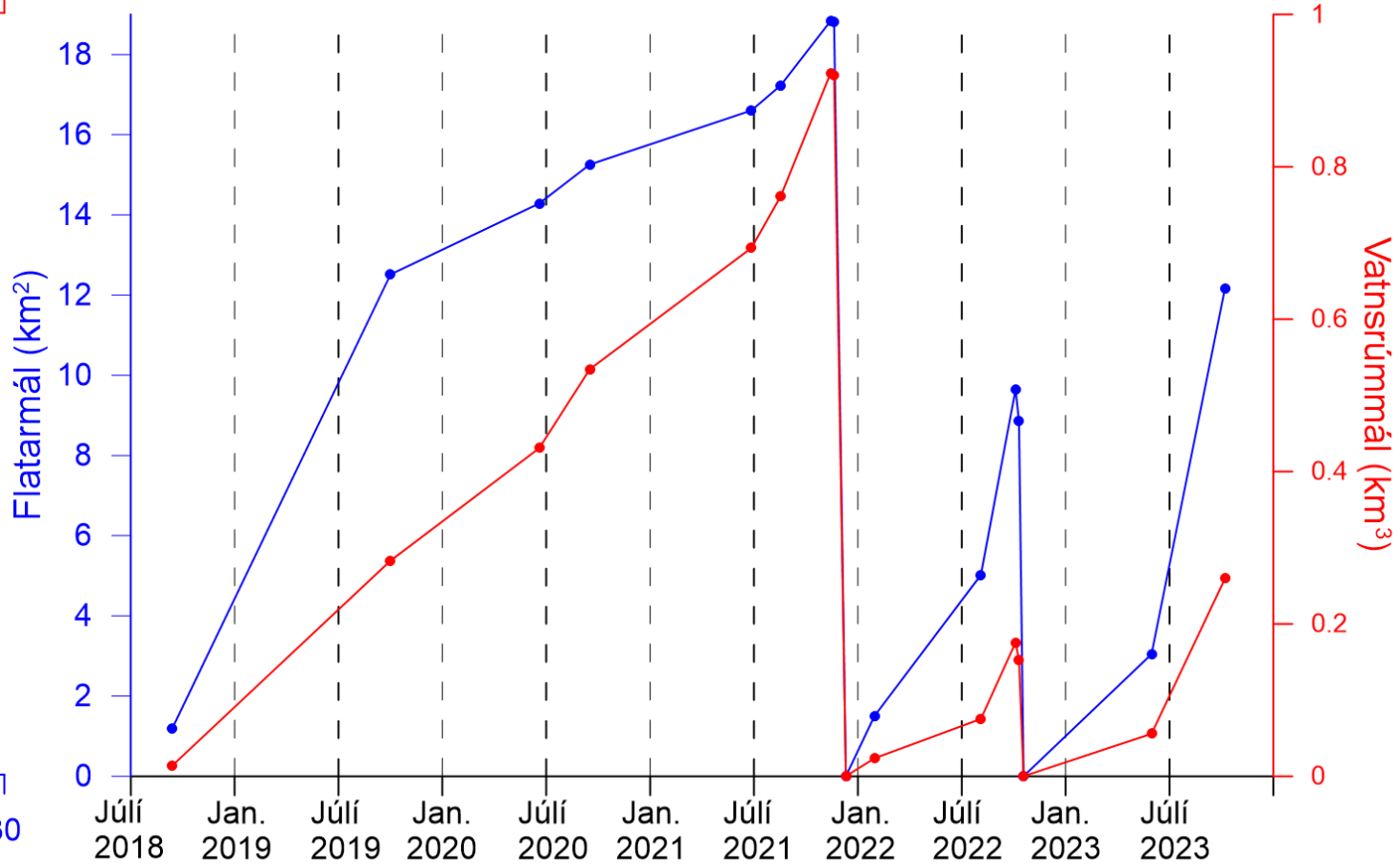
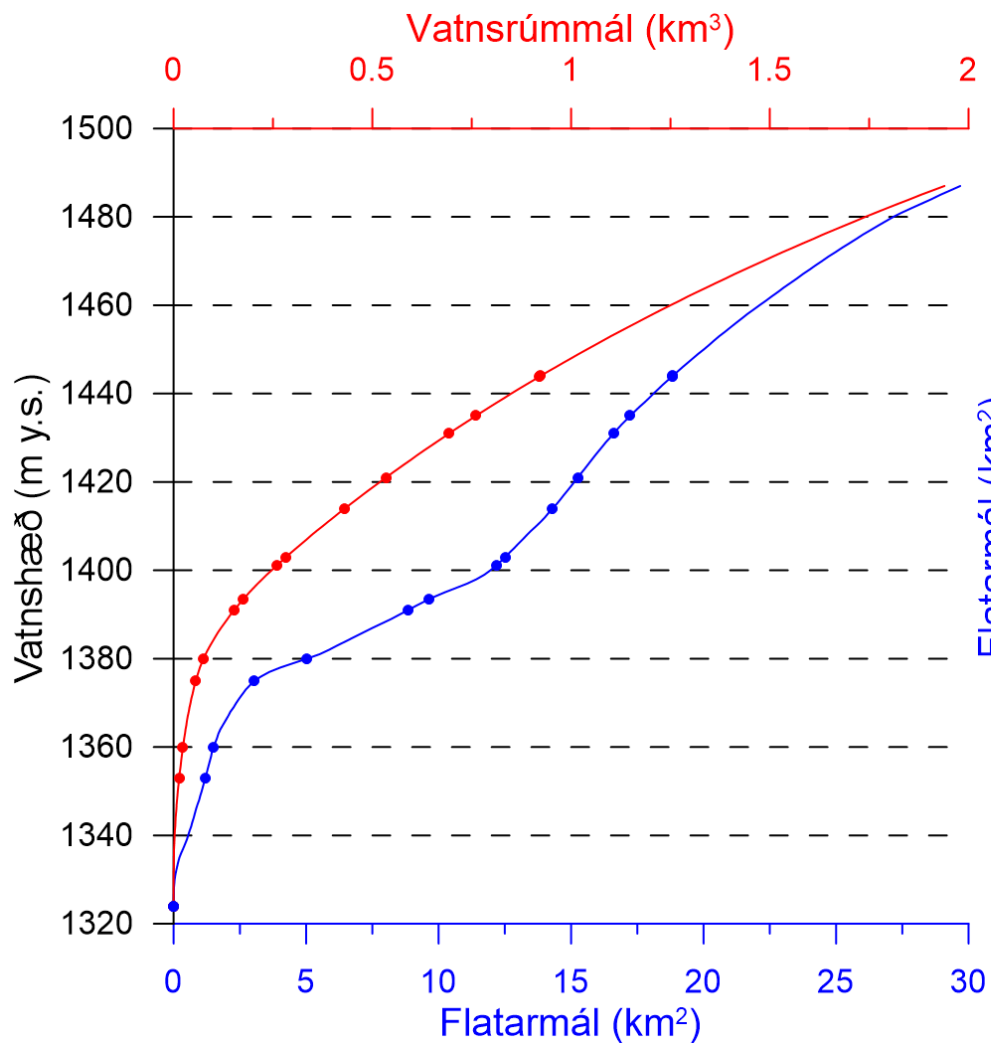




Gjálpargos nú
gæti aðeins komið
1,9 km³ fyrir í
Grímsvötnum

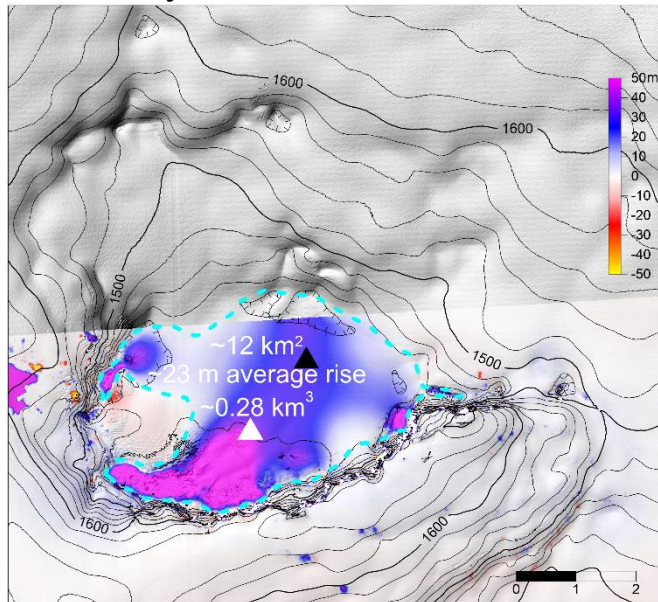


Rúmmál og flatarmál Grímsvatna út frá vatnshæð síðan 2018

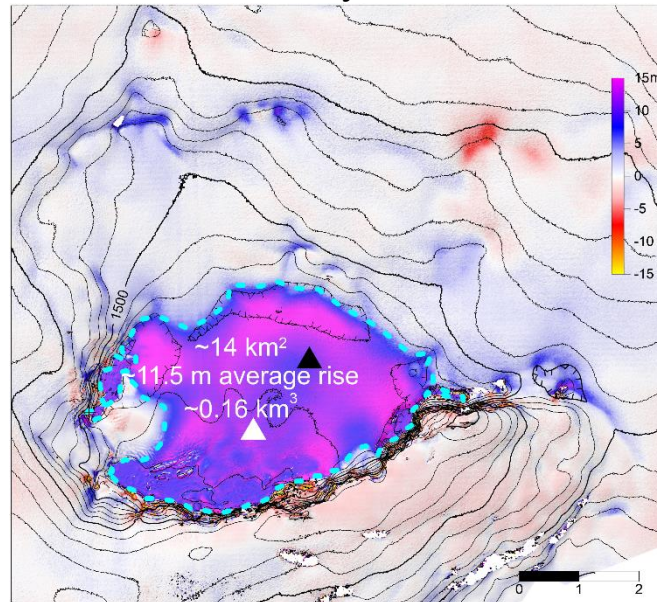


Þróun Grímsvatna 2018-2021 út frá mismun hæðarkorta

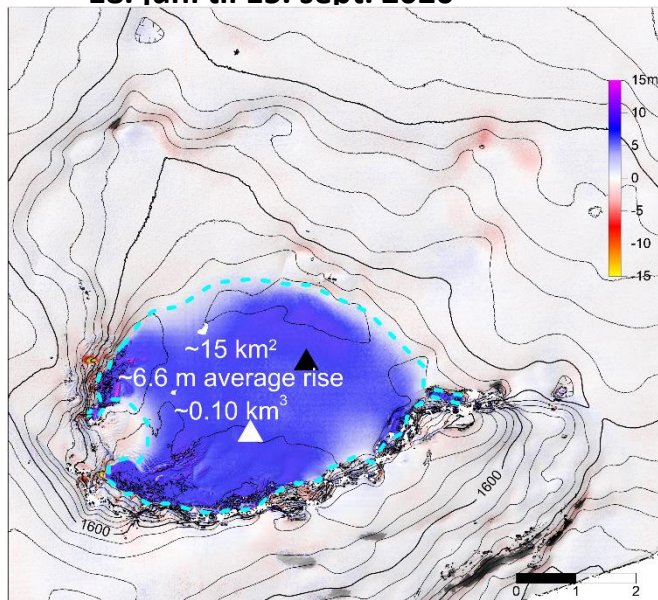
27. júlí 2018 til 1. okt. 2019



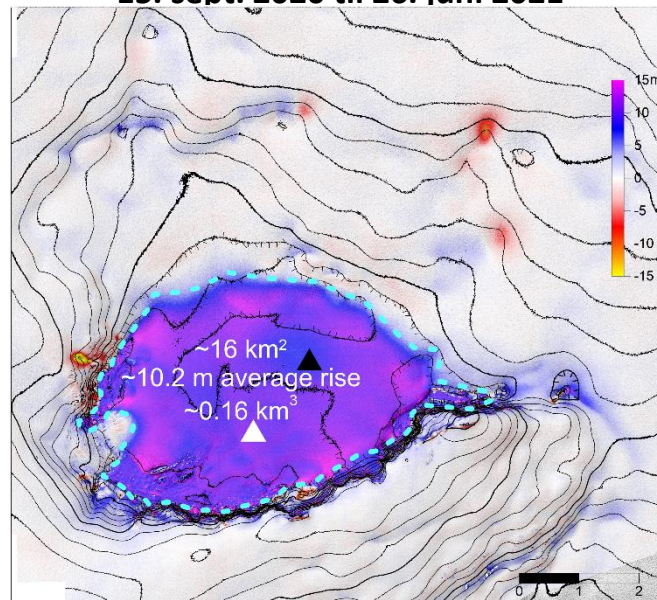
1. okt. 2019 til 18. júní 2020



18. júní til 15. sept. 2020



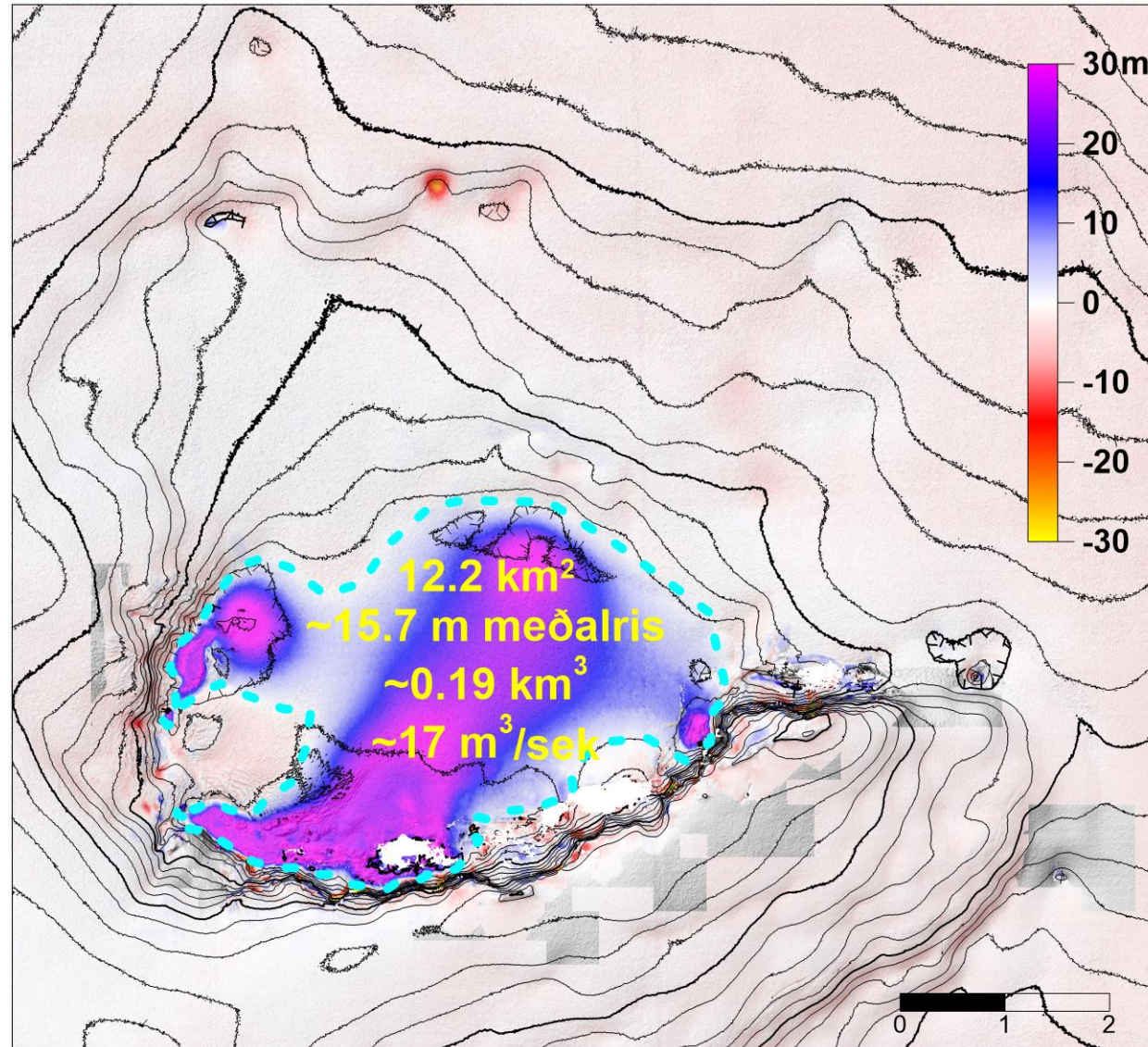
15. sept. 2020 til 26. júní 2021



*Hæðarkort eftir Pléiades
gervihnattamyndum gegnum CNES
með stuðningi CEOS við Iceland
Volcanoes Supersite verkefnið*

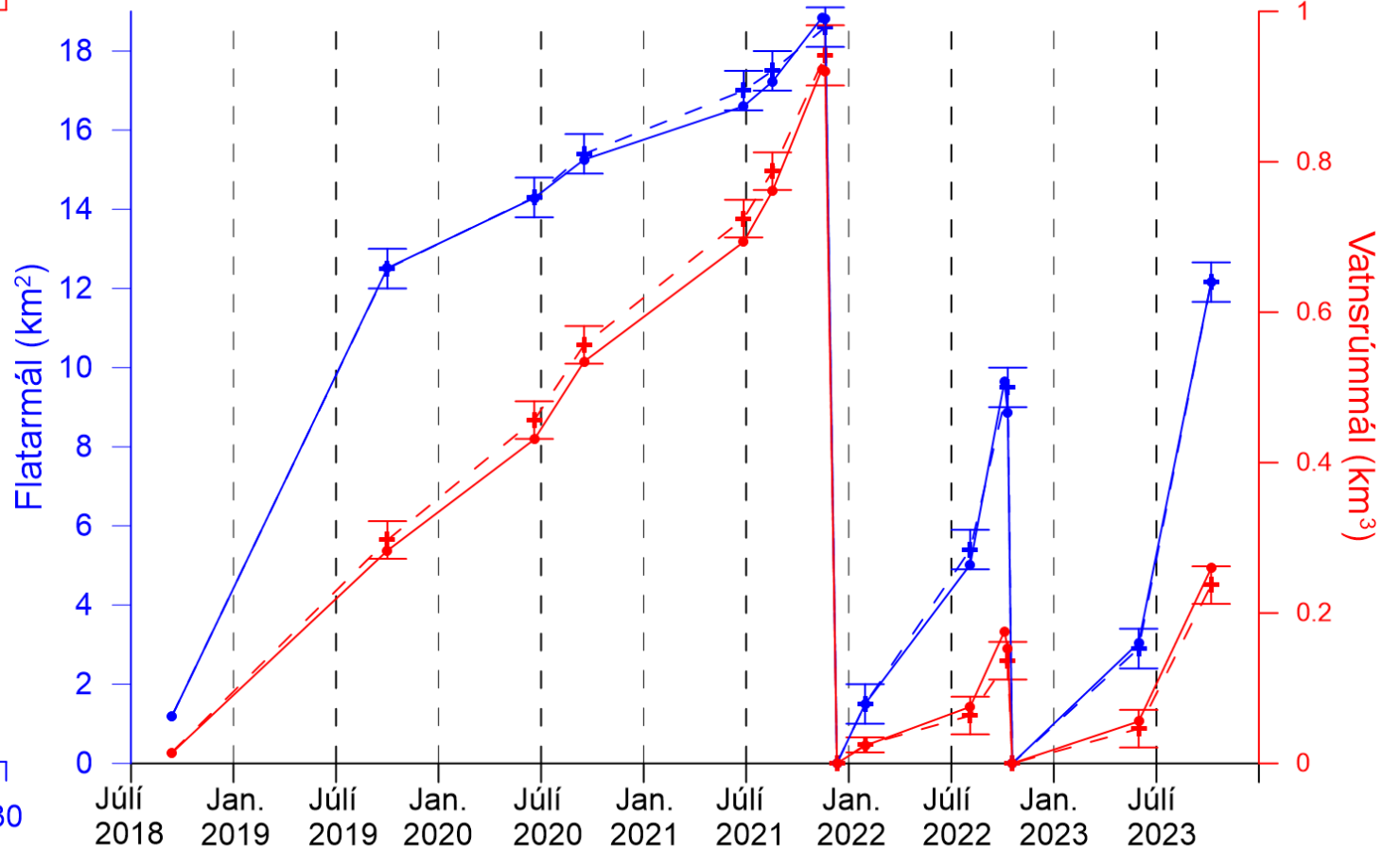
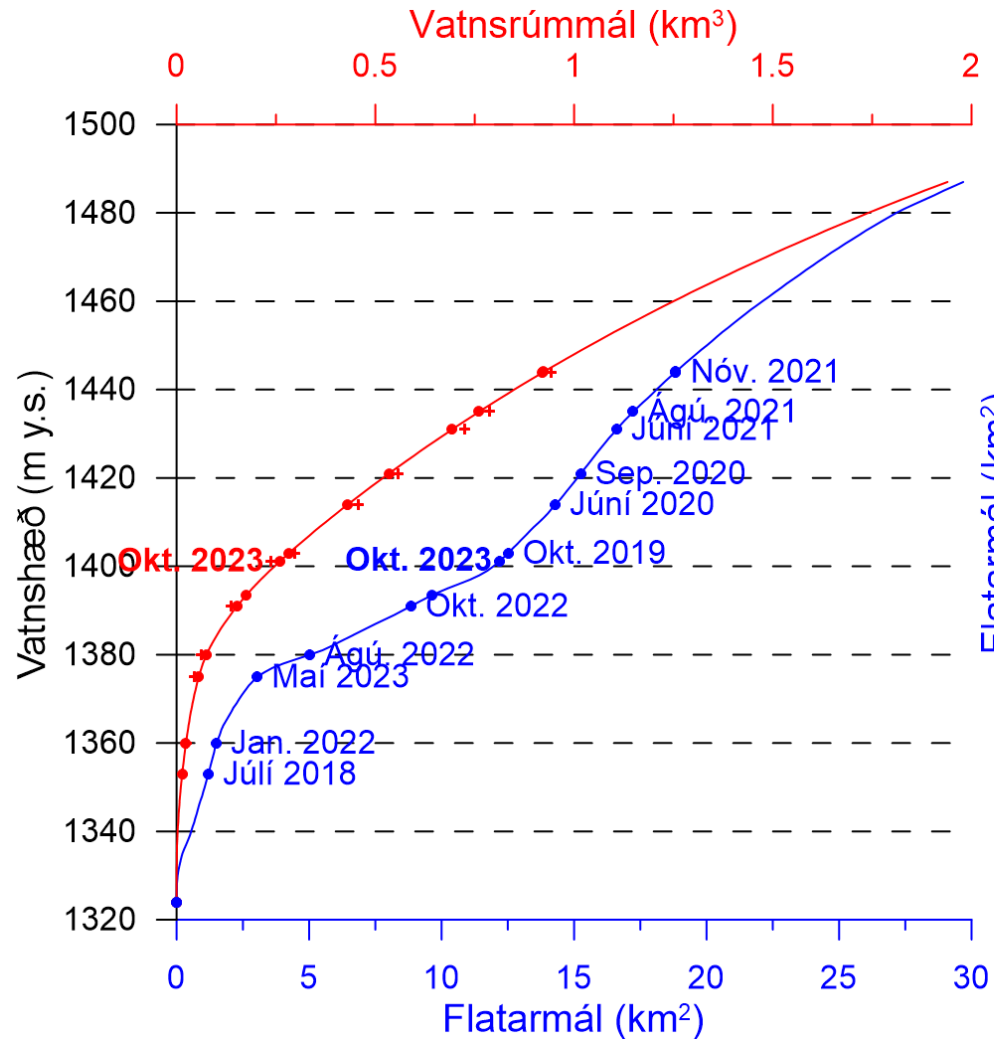
Hæðarbreytingar í Grímsvötnum í sumar

31. maí til 7. október, 2023



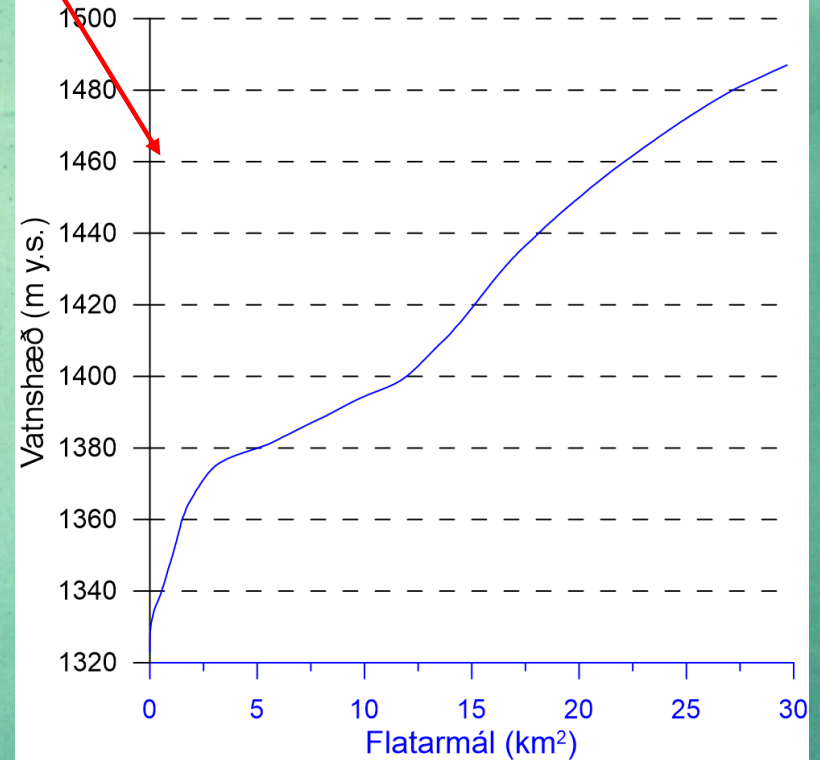
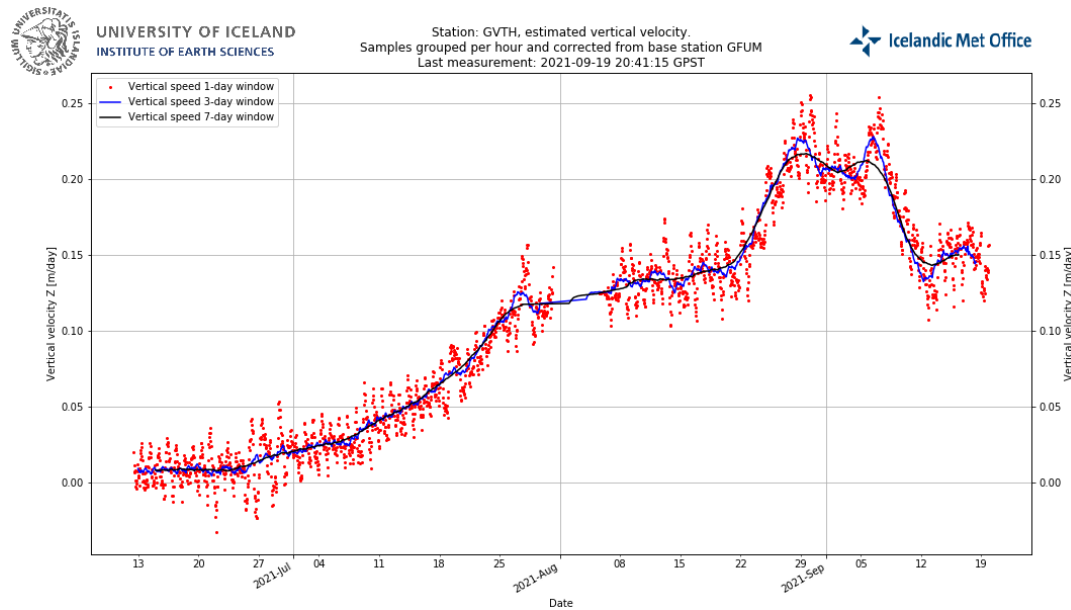
*Hæðarkort eftir Pléiades
gervihnattamyndum gegnum CNES
með stuðningi CEOS við Iceland
Volcanoes Supersite verkefnið*

Rúmmál og flatarmál Grímsvatna síðan 2018 út frá vatnshæð annars vegar og mismun hæðarkorta hins vegar



Getum metið rennsli (q) inn eða út úr
vötnunum sem

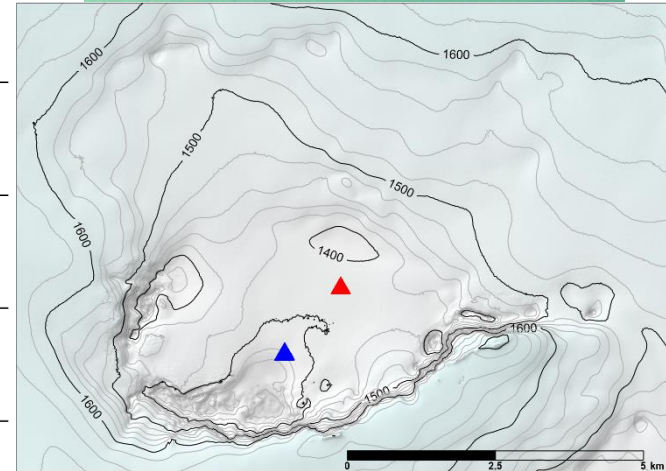
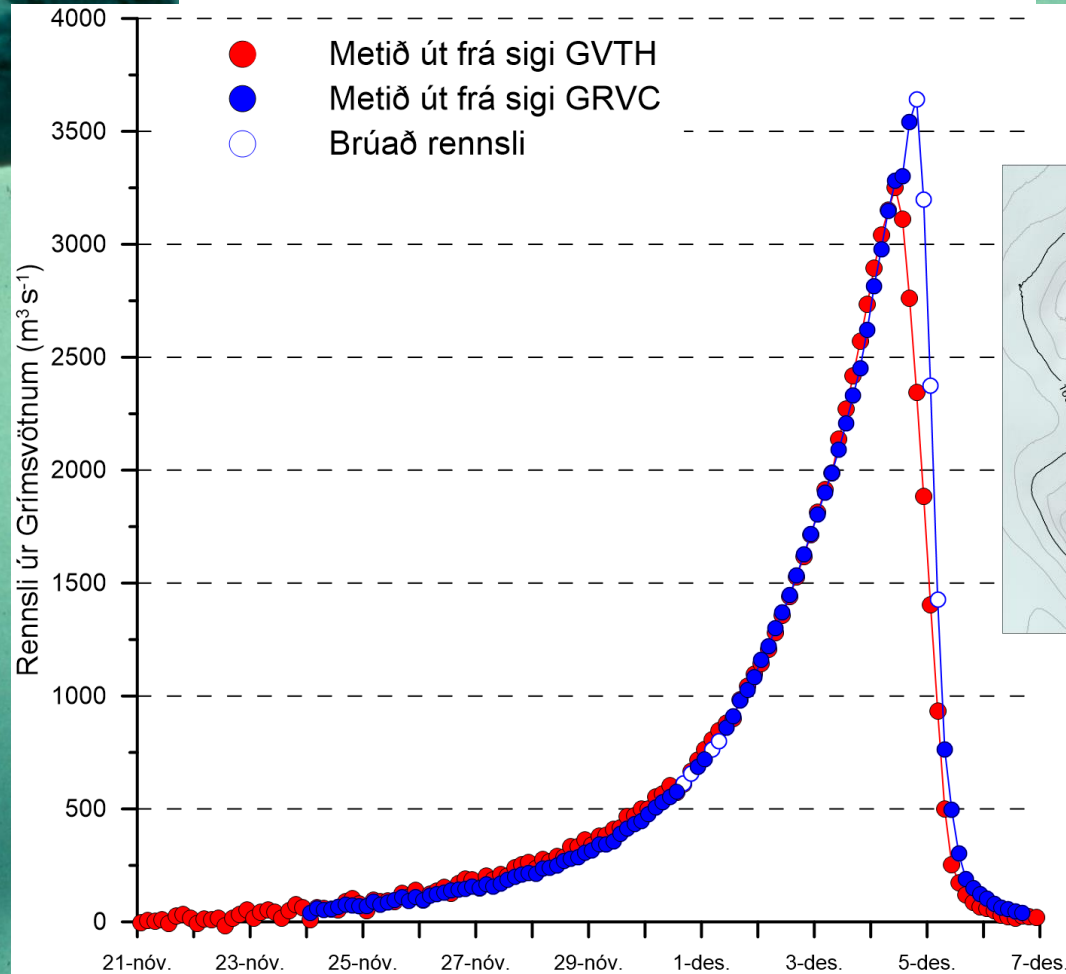
$$q = \frac{dz_0}{dt} * A_{Vötn}(z_0)$$



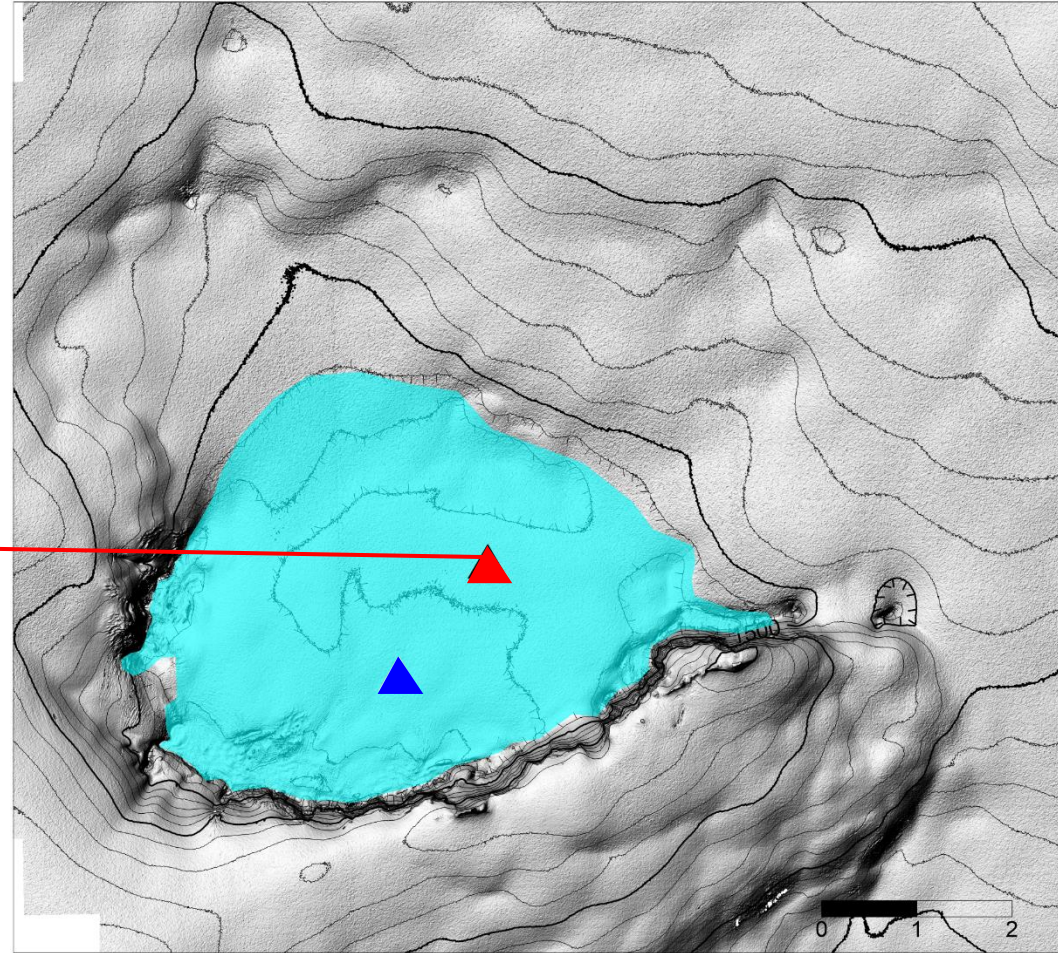
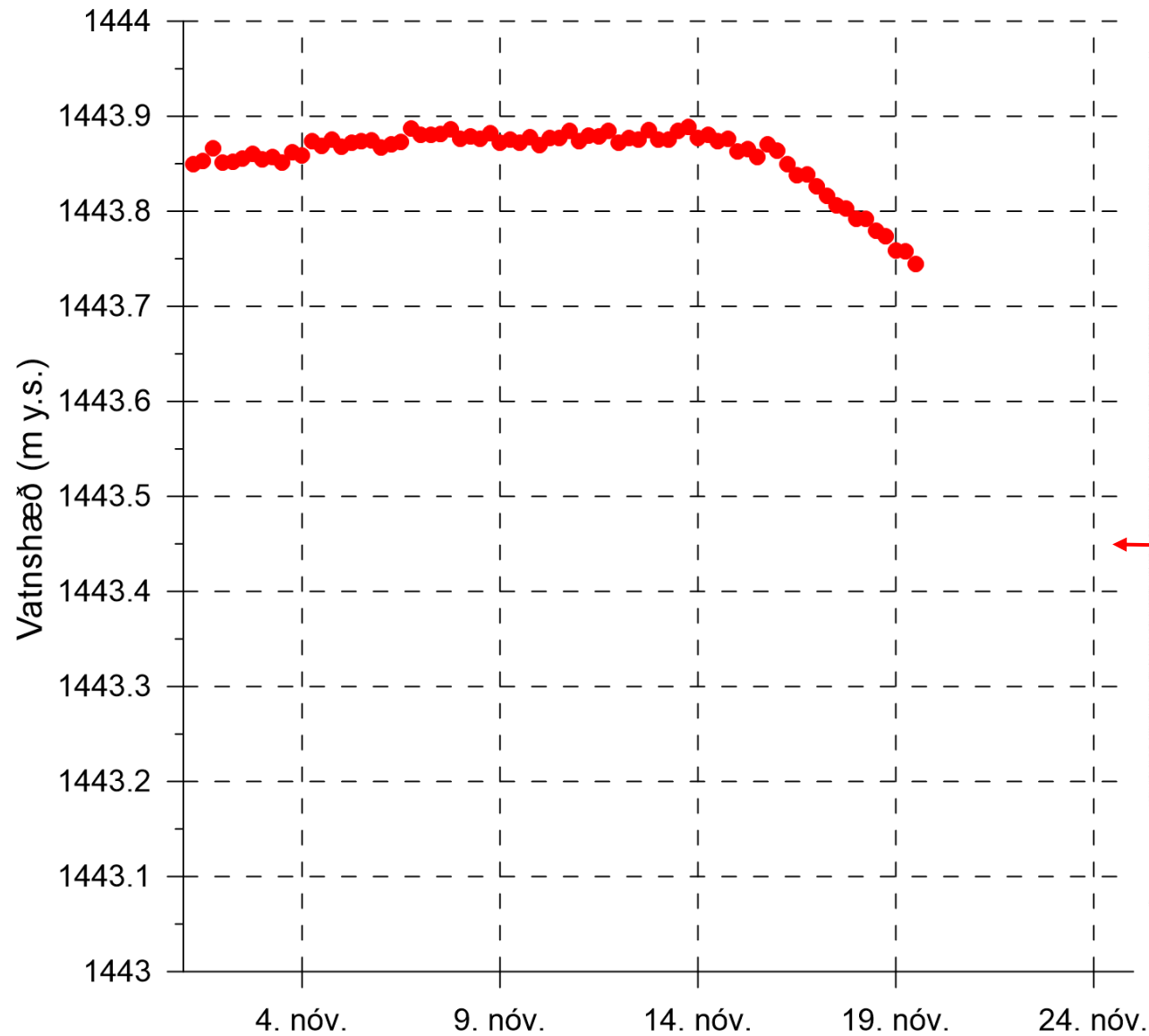
Getum metið rennsli (q) inn og út úr
vötnunum sem

$$q = \frac{dz_0}{dt} * A_{Vötn}(z_0)$$

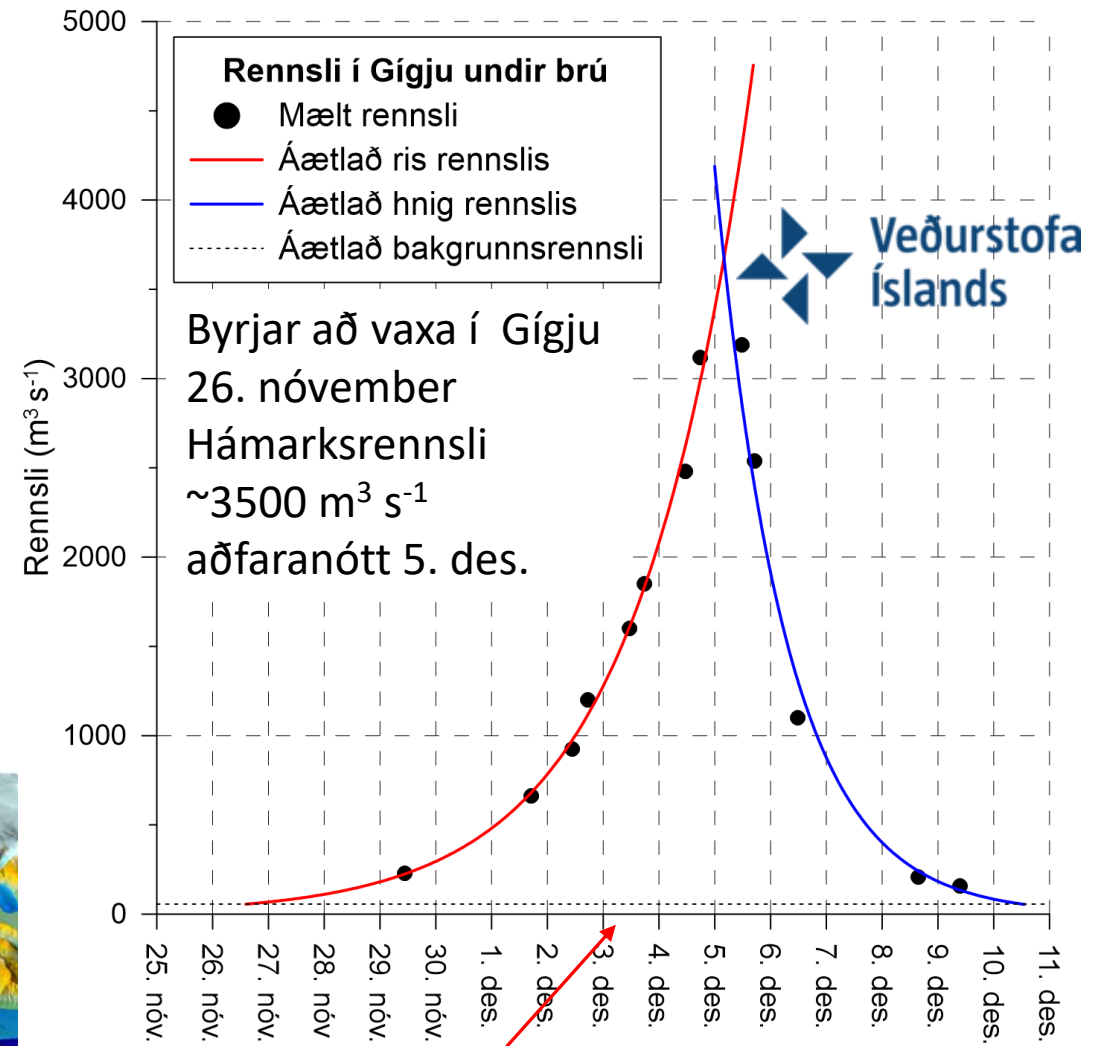
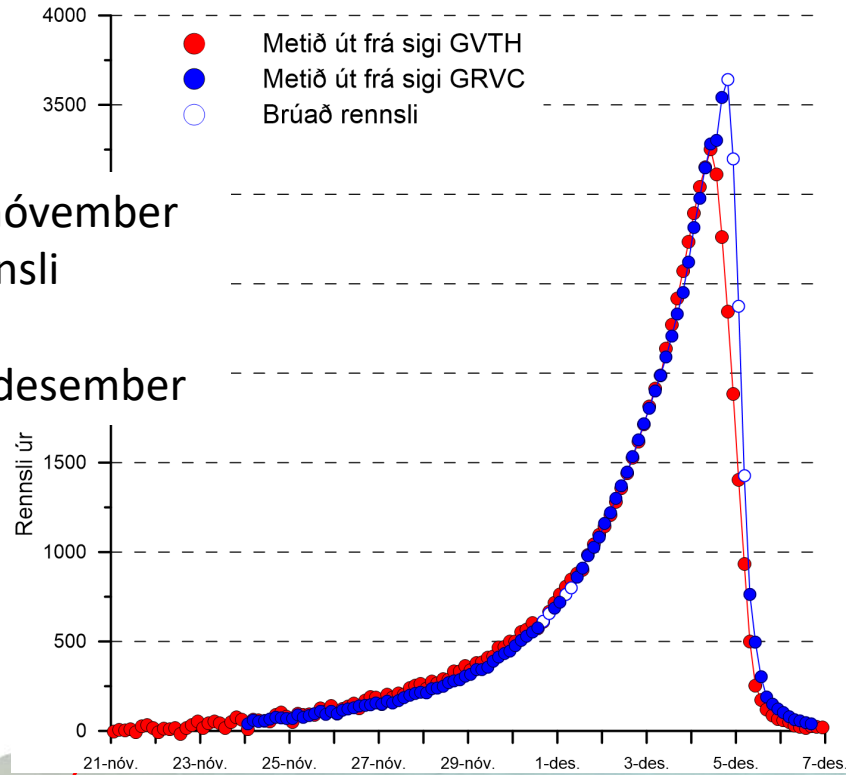
Rennsli í jökulhlaupinu 2021



Í hlaupinu 2021 í fyrsta sinn notast við landmælinga GPS með rauntímaúrvinnslu



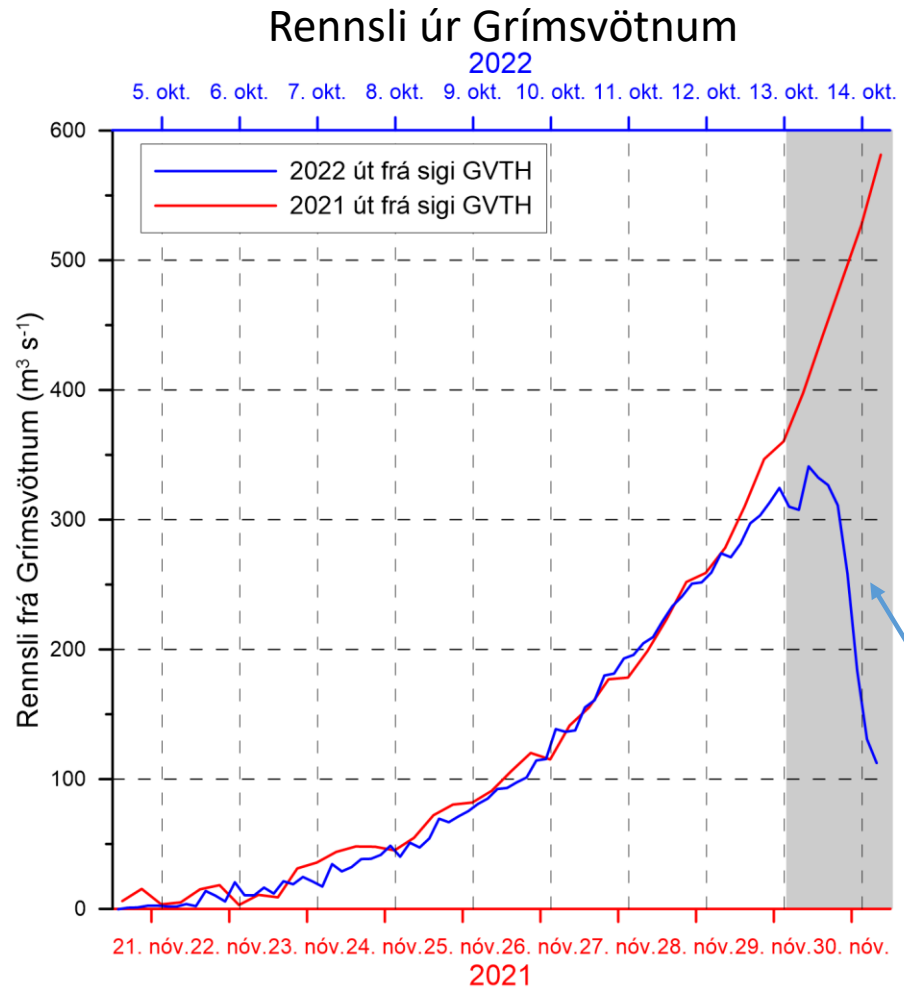
Byrjar ~14. nóvember
Hámarksrennsli
~3500 m³ s⁻¹
að kvöldi 4. desember



Stærsta hlaup frá 1996

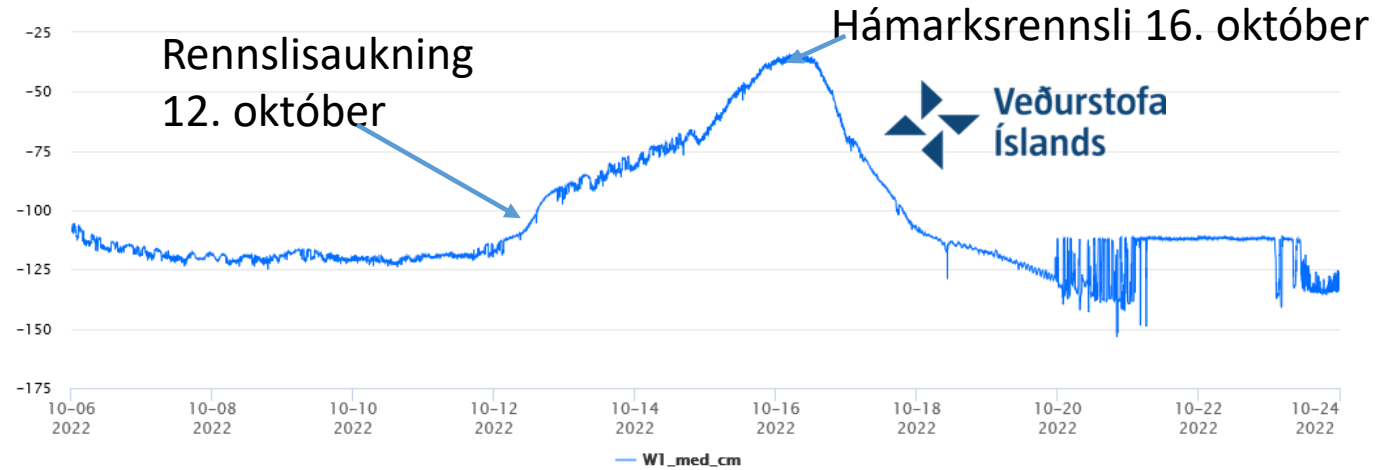
4. október 2022 byrjar aftur að síga, annað hlaup!

Upphaf þess mjög svipað 2021 þrátt fyrir að vera miklu minna

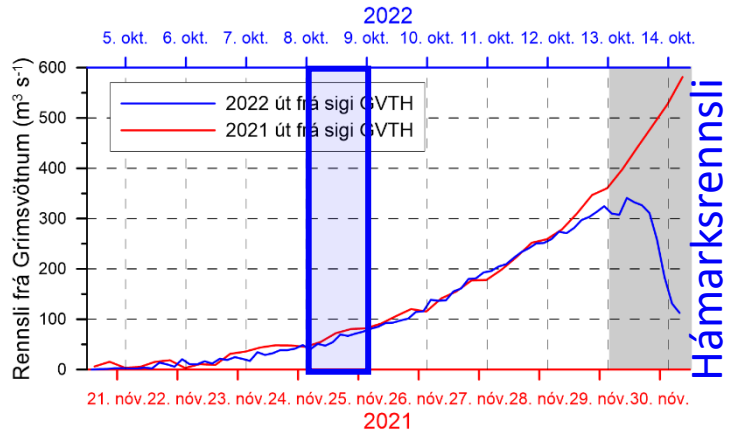


Íshella undir stöðinni steytir á botni í hlaupinu 2022 og nær því ekki hámarksrennslinu sem var líklega að kvöldi 14. október

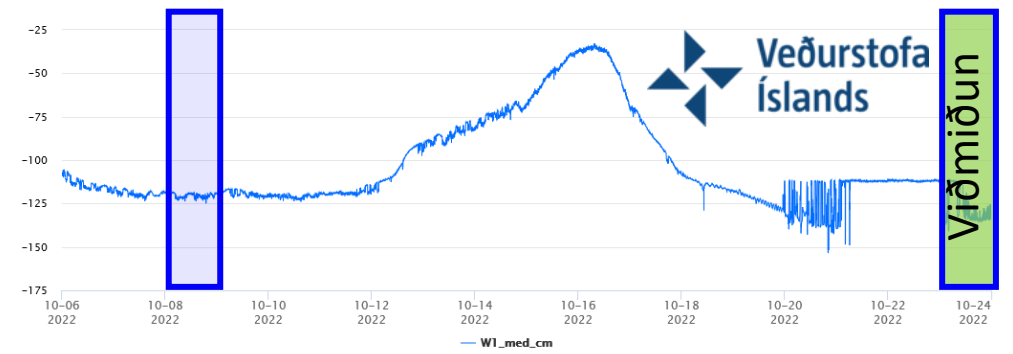
Vatnshæð (cm) í Gígjukvísl



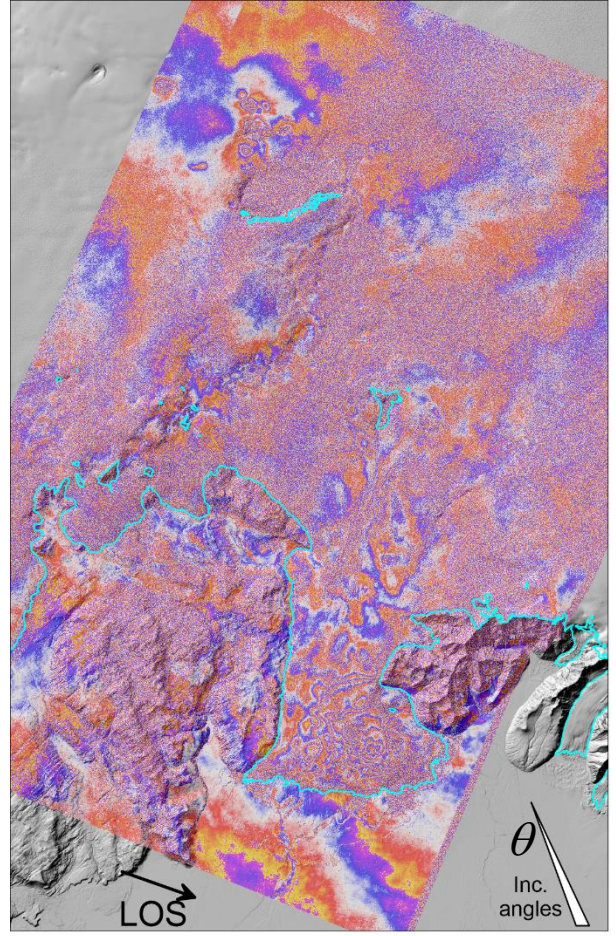
ICEYE



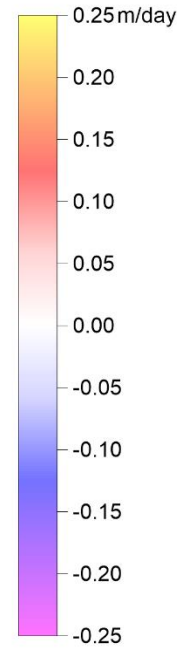
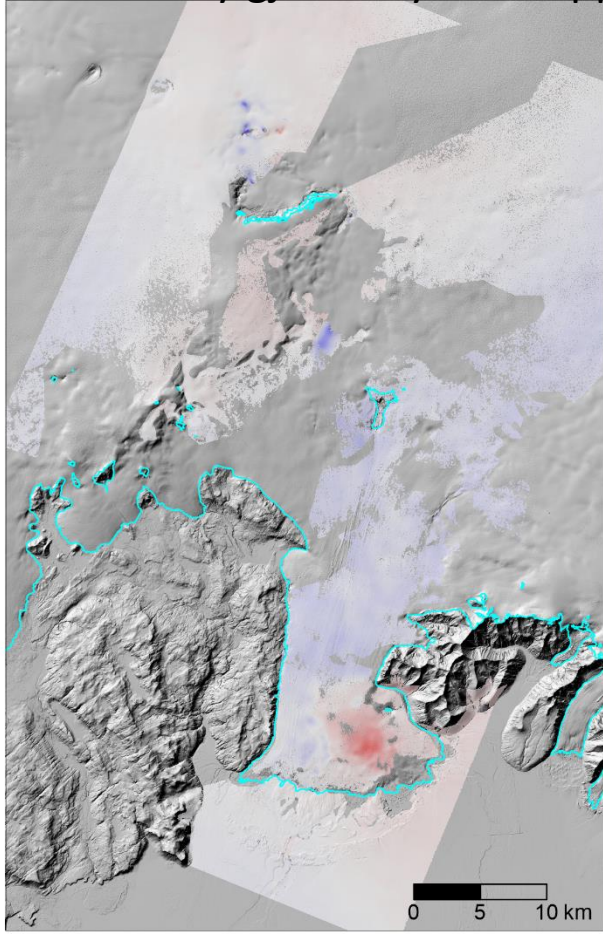
Vatnshæð (cm) í Gígjukvísl



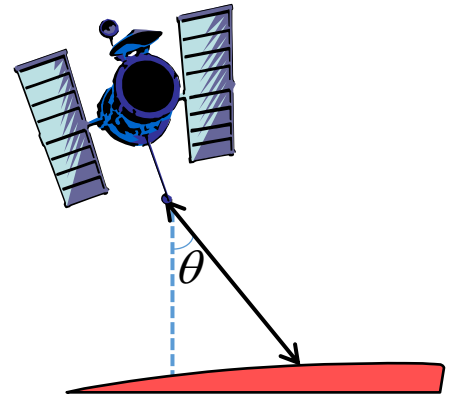
Mismunabylgjuvígmynd



Mismunabylgjuvígmynd afröppuð

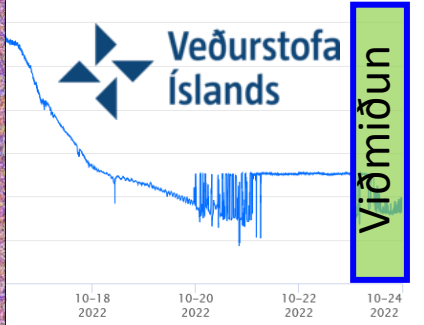
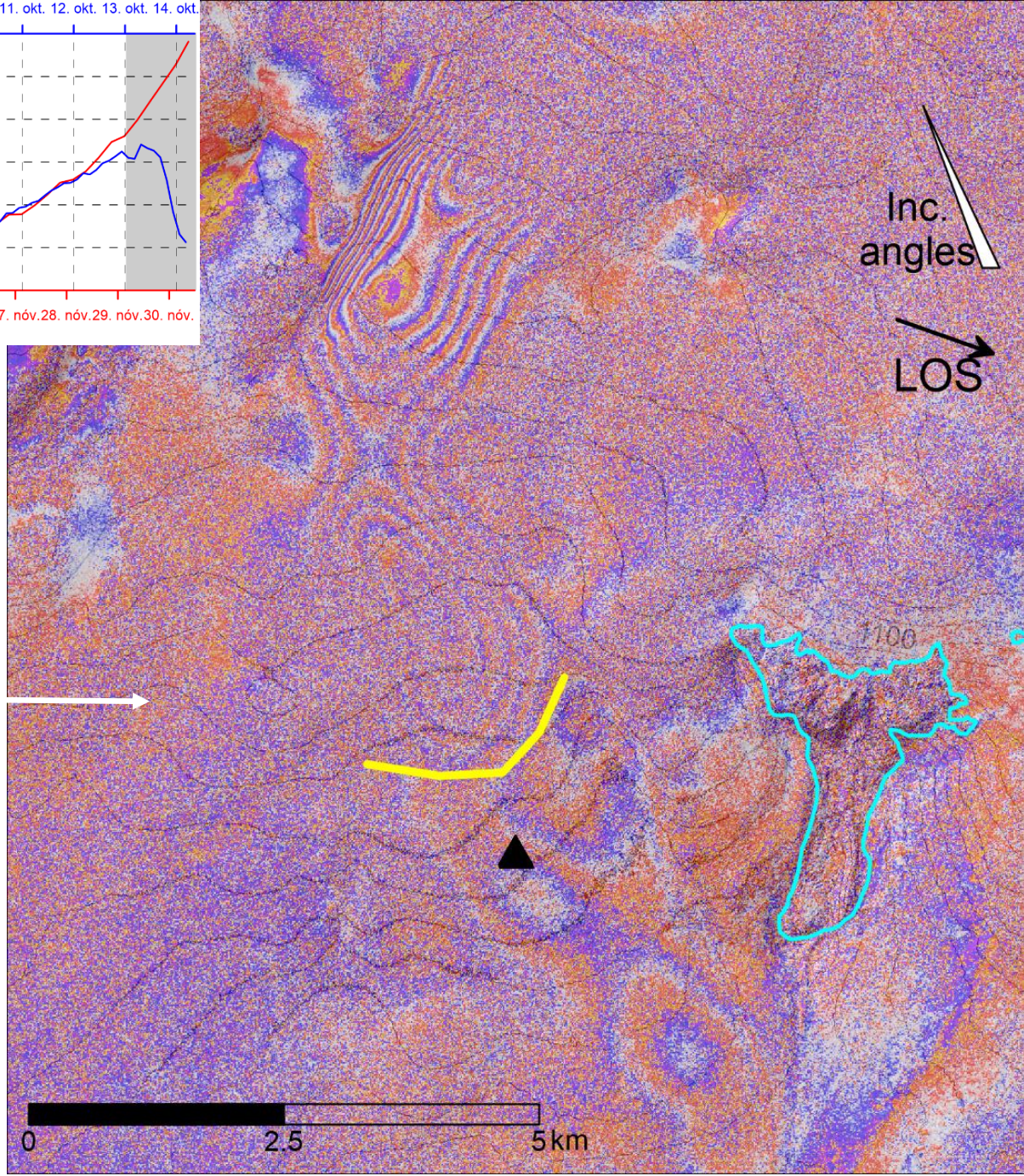
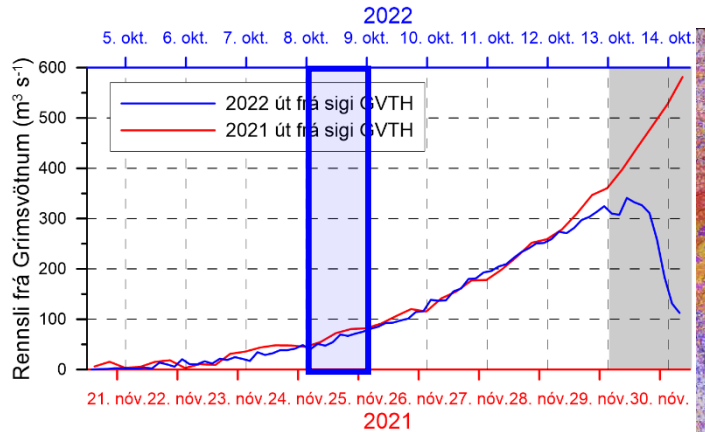
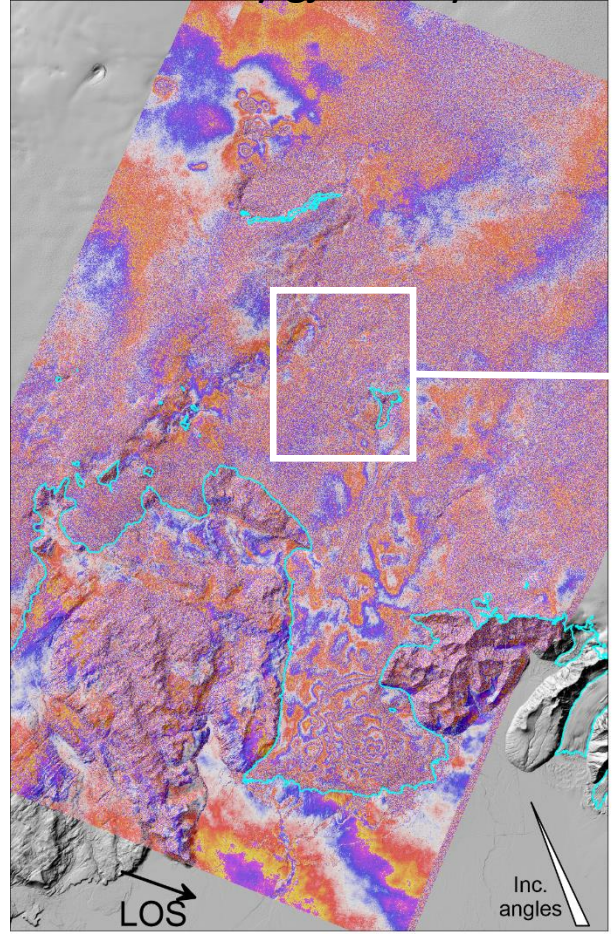


ICEYE Háupplausnar ratsjártungl

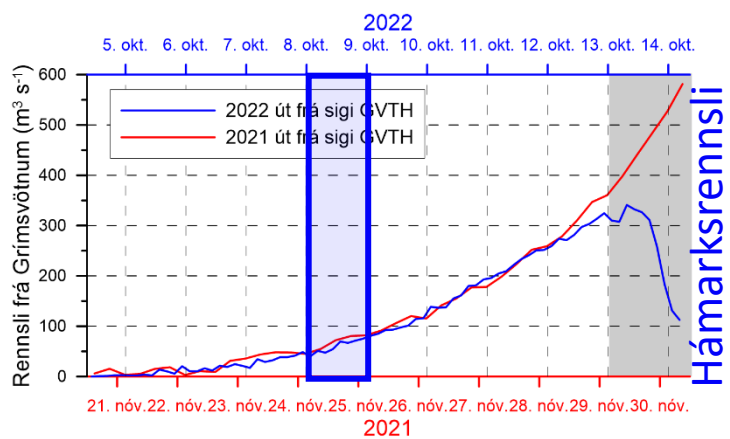


ICEYE

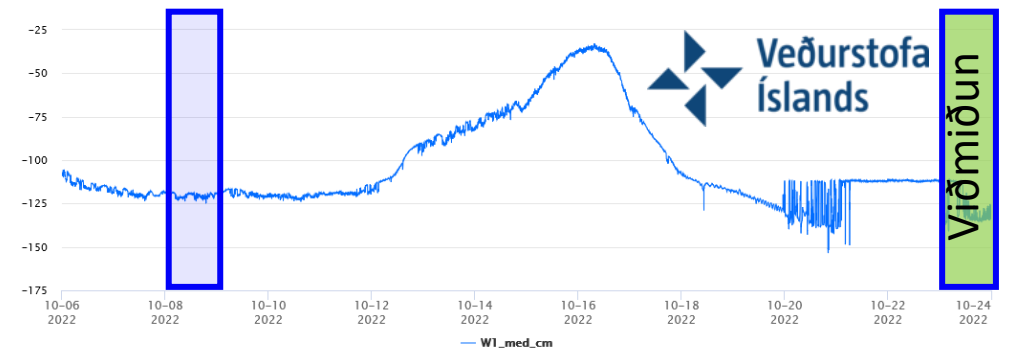
Mismunabylgjuvígmynd



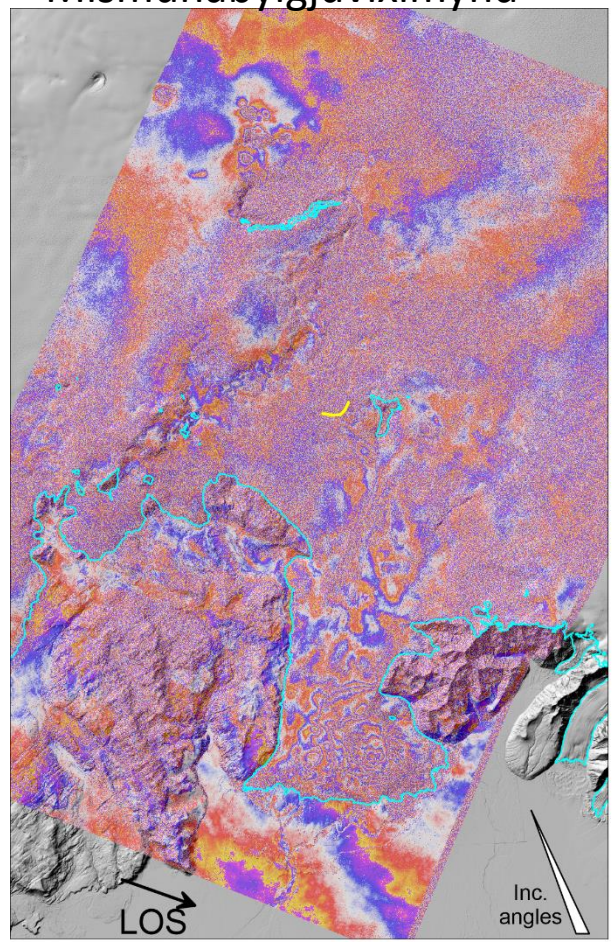
ICEYE



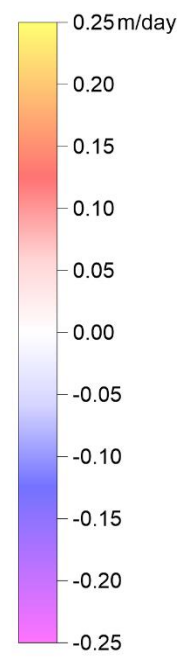
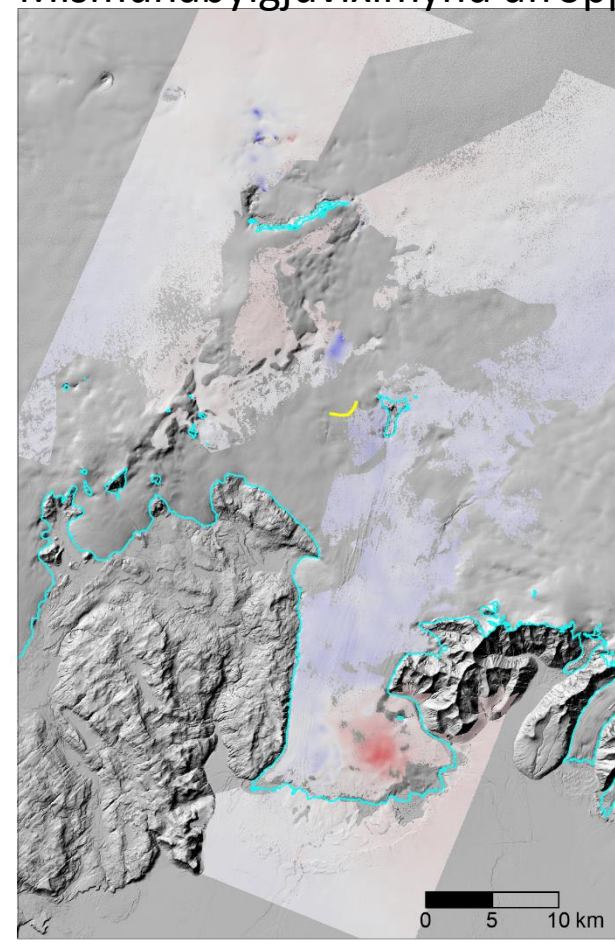
Vatnshæð (cm) í Gígjukvísl



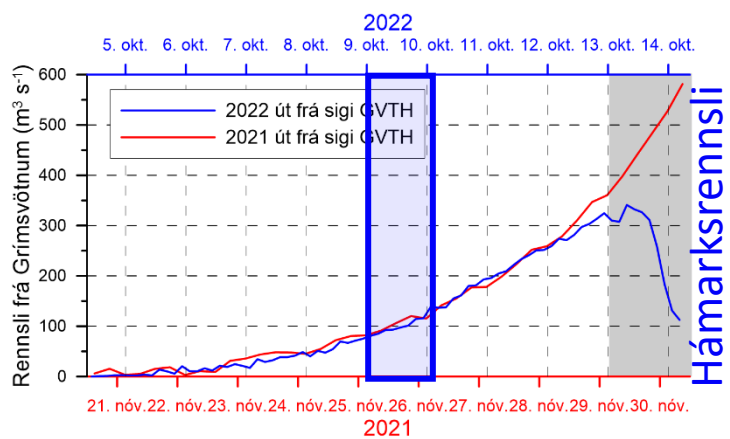
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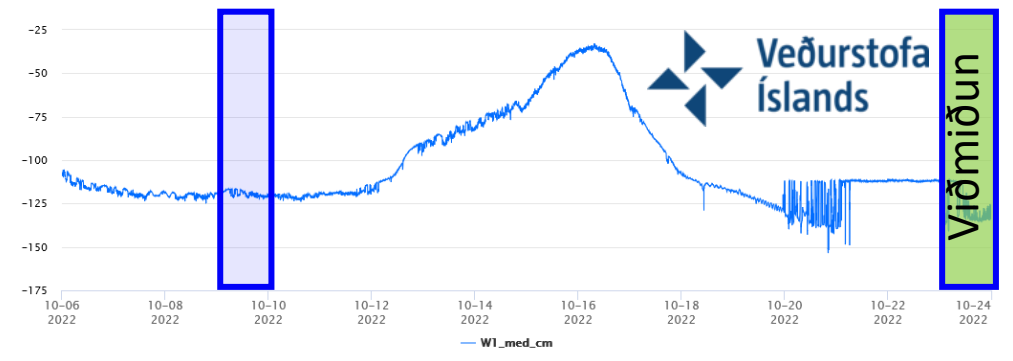
Mismunabylgjuvíxlmynd afröppuð



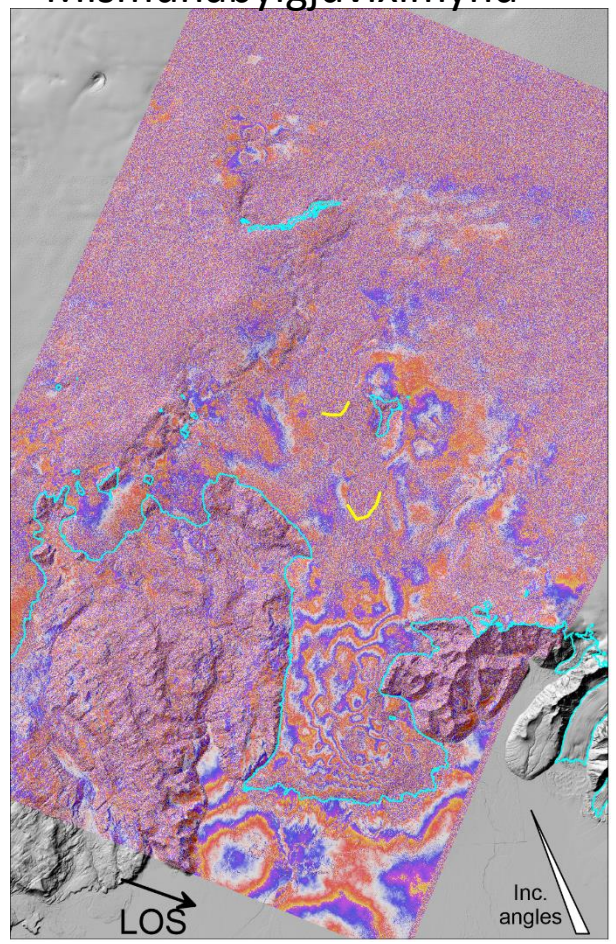
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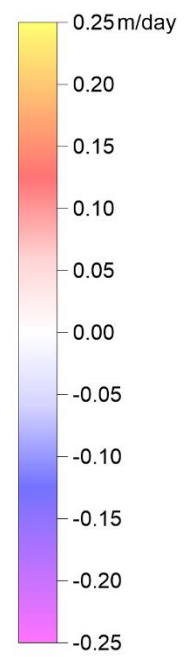
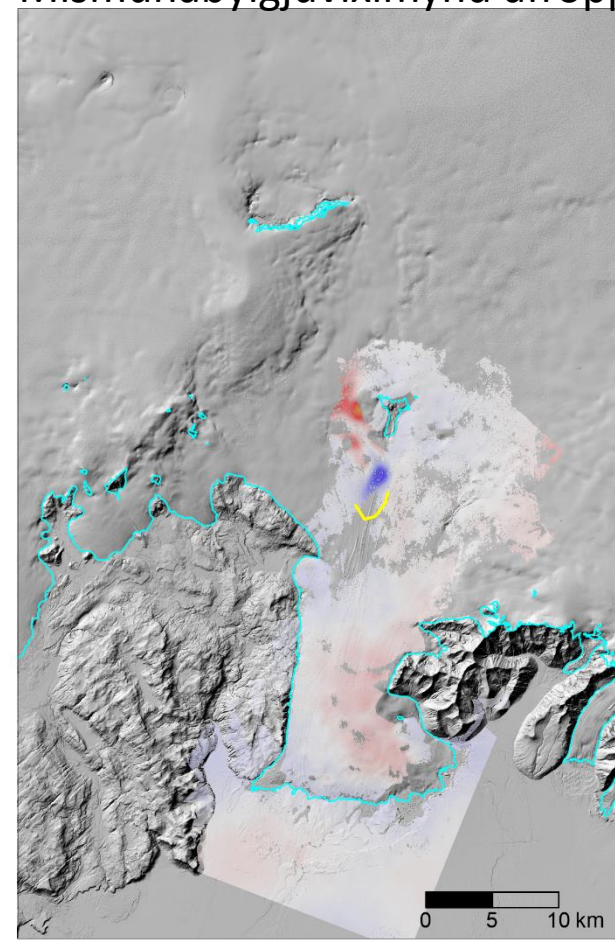
Vatnshæð (cm) í Gígjukvísl



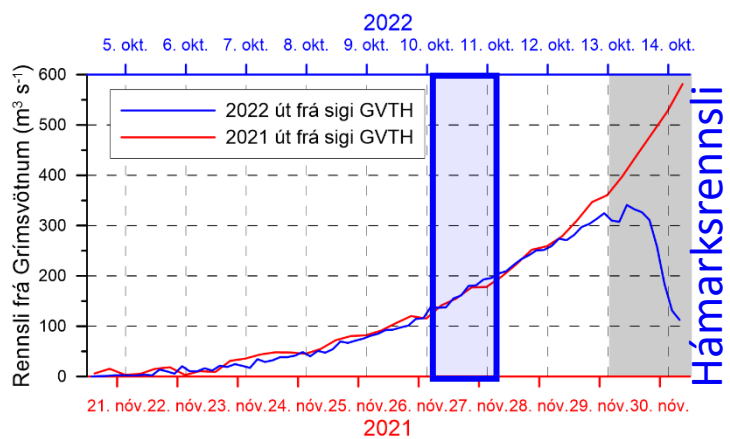
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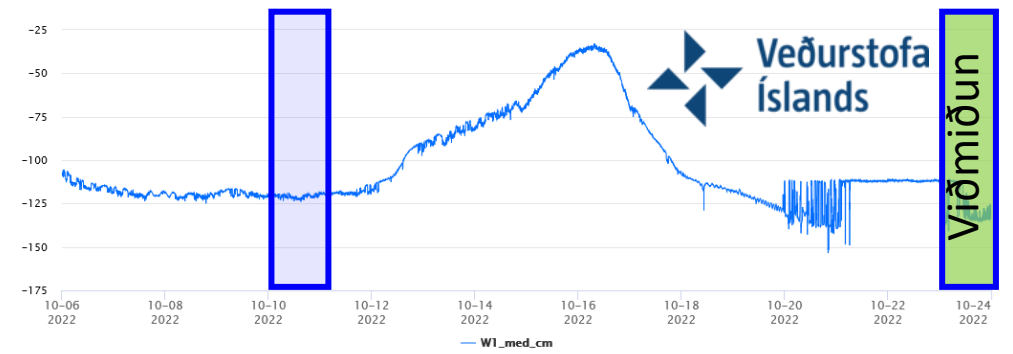
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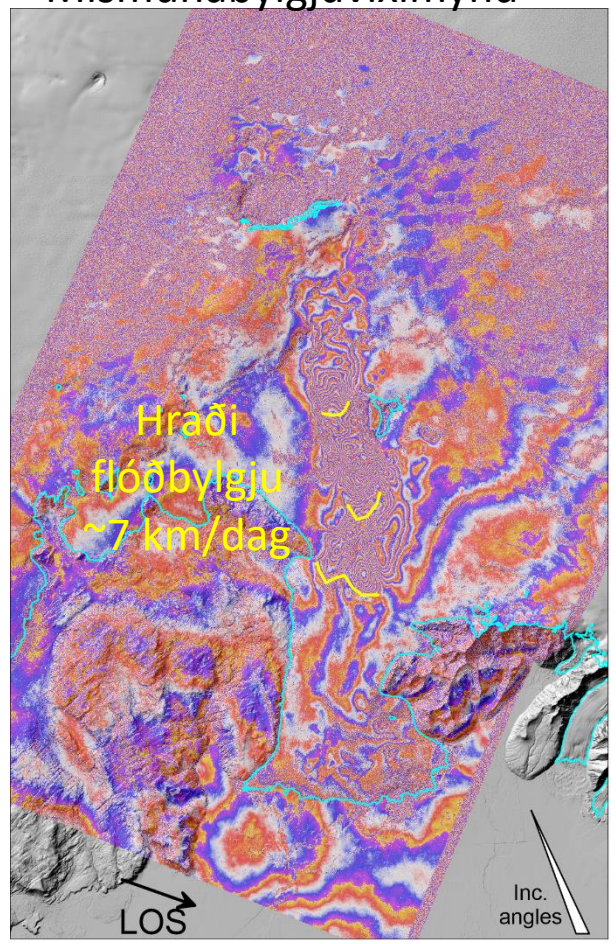
ICEYE



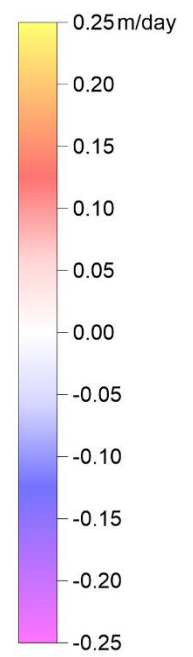
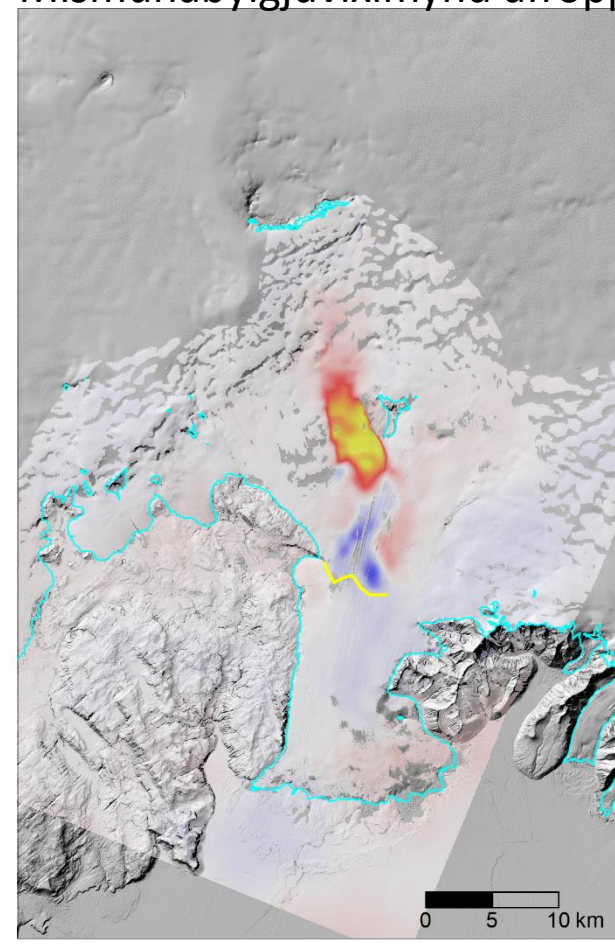
Vatnshæð (cm) í Gígjukvísl

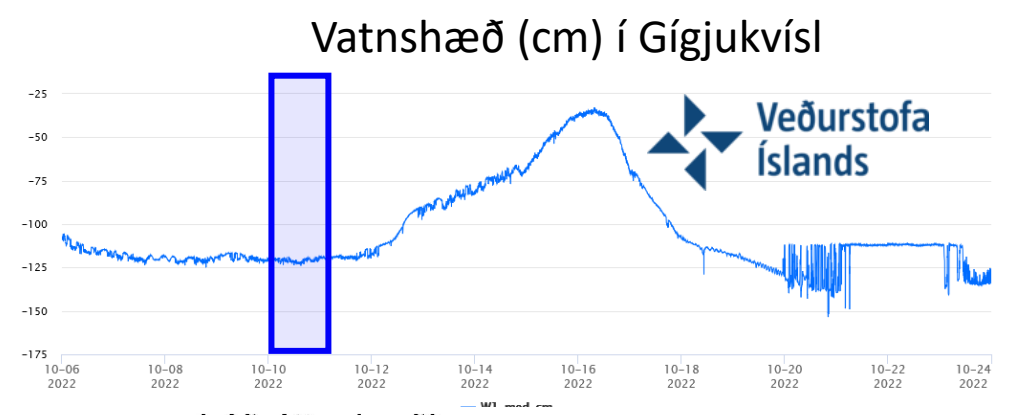
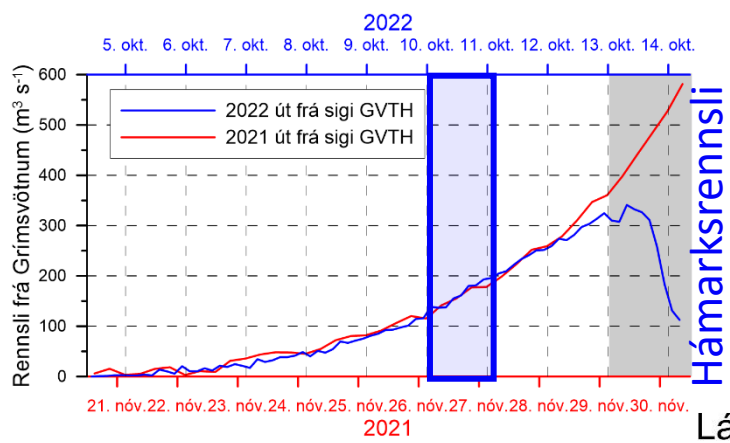


Mismunabylgjuvíxlmynd

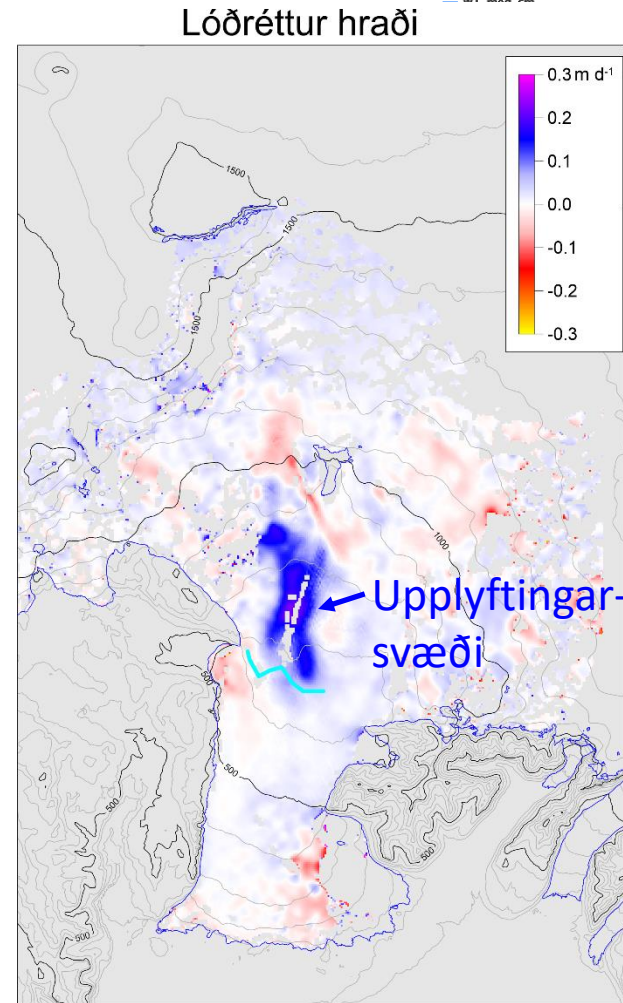
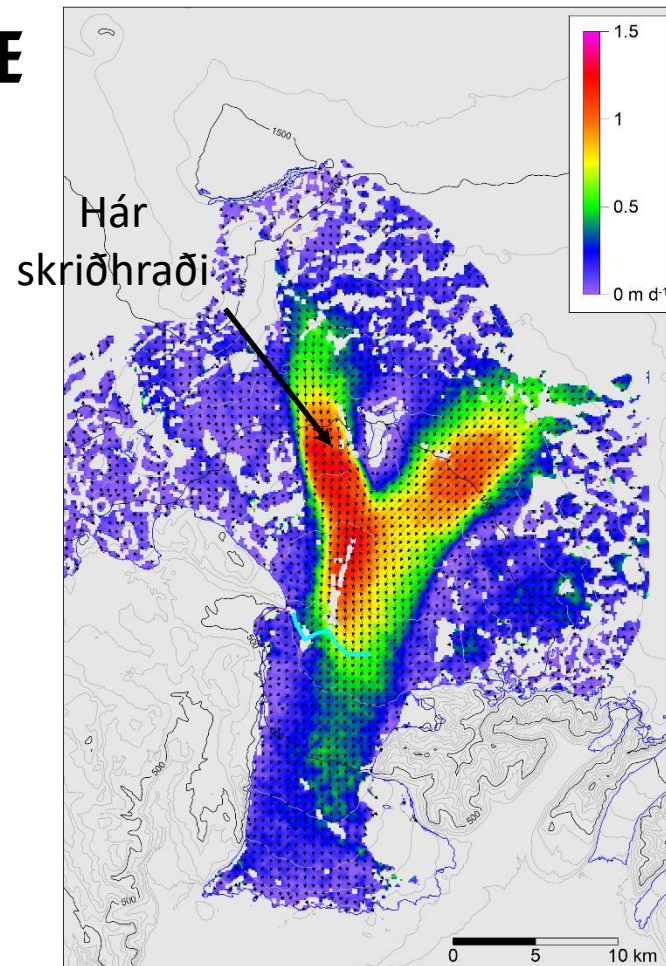


Mismunabylgjuvíxlmynd afröppuð



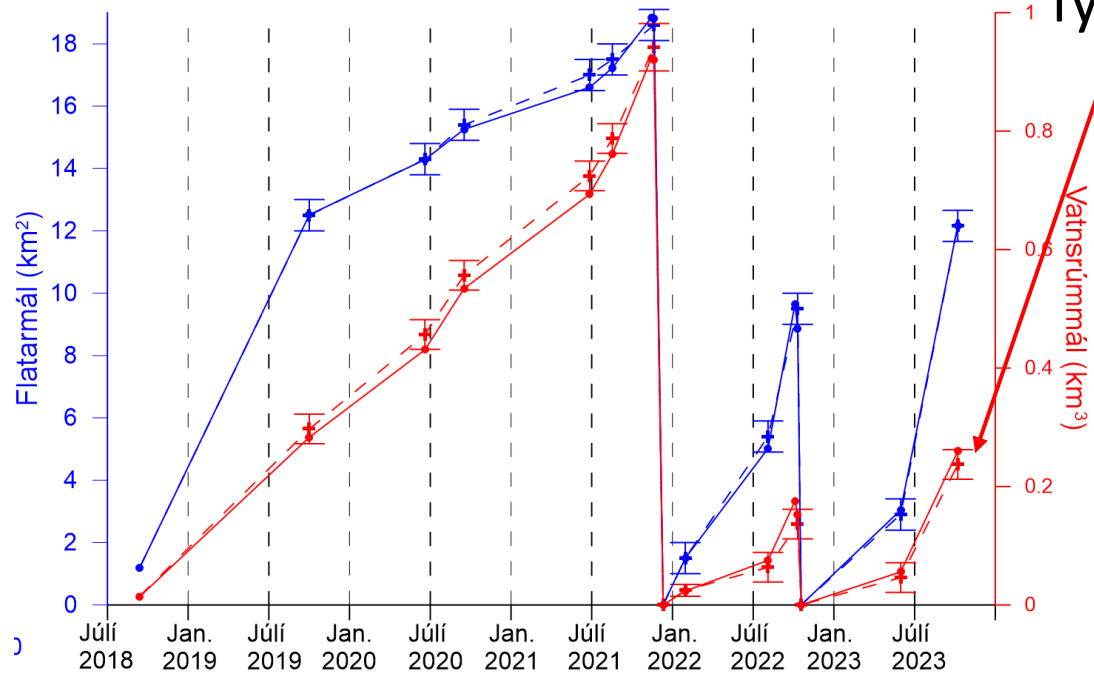


ICEYE



Hvað gerist næst?

Kemur hlaup í ár?



~0.25 km³
Meira
vatn en í
fyrra



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