

# Veðurstofa Íslands



## **Vatnsauðlindir Íslands**

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**Árni Snorrason og  
samstarfsmenn á Veðurstofu  
og Háskóla Íslands**

**Norræna húsinu 2. maí 2012**

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# Yfirlit

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**Vatnafar**

**Vatnsauðlindin**

**Áhrif loftlagsbreytinga á vatnafar**

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# Vatnafar á Íslandi

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## Mikil áhrif jarðfræðinnar

- ▶ Dragár á blágrýtis- og grágrýtissvæðunum
- ▶ Lindár við hraun frá nútíma

## Mikil áhrif jökla

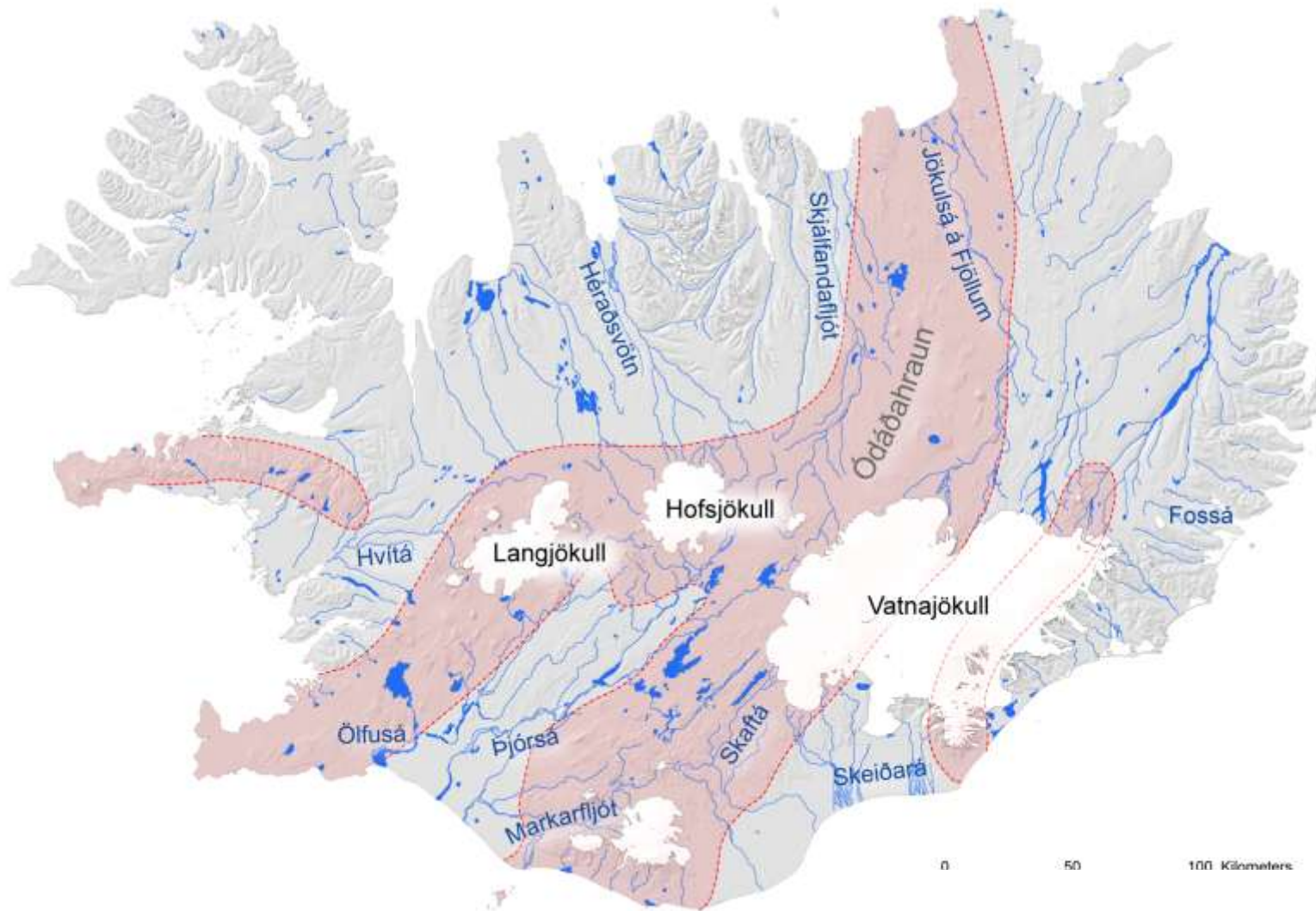
- ▶ Jökulár

## Lægðagangur, umhleyplingar og mikil úrkoma

## Mikil áhrif snævar

- ▶ Snjógeymsla á veturnum
  - ▶ Vorflóð
-

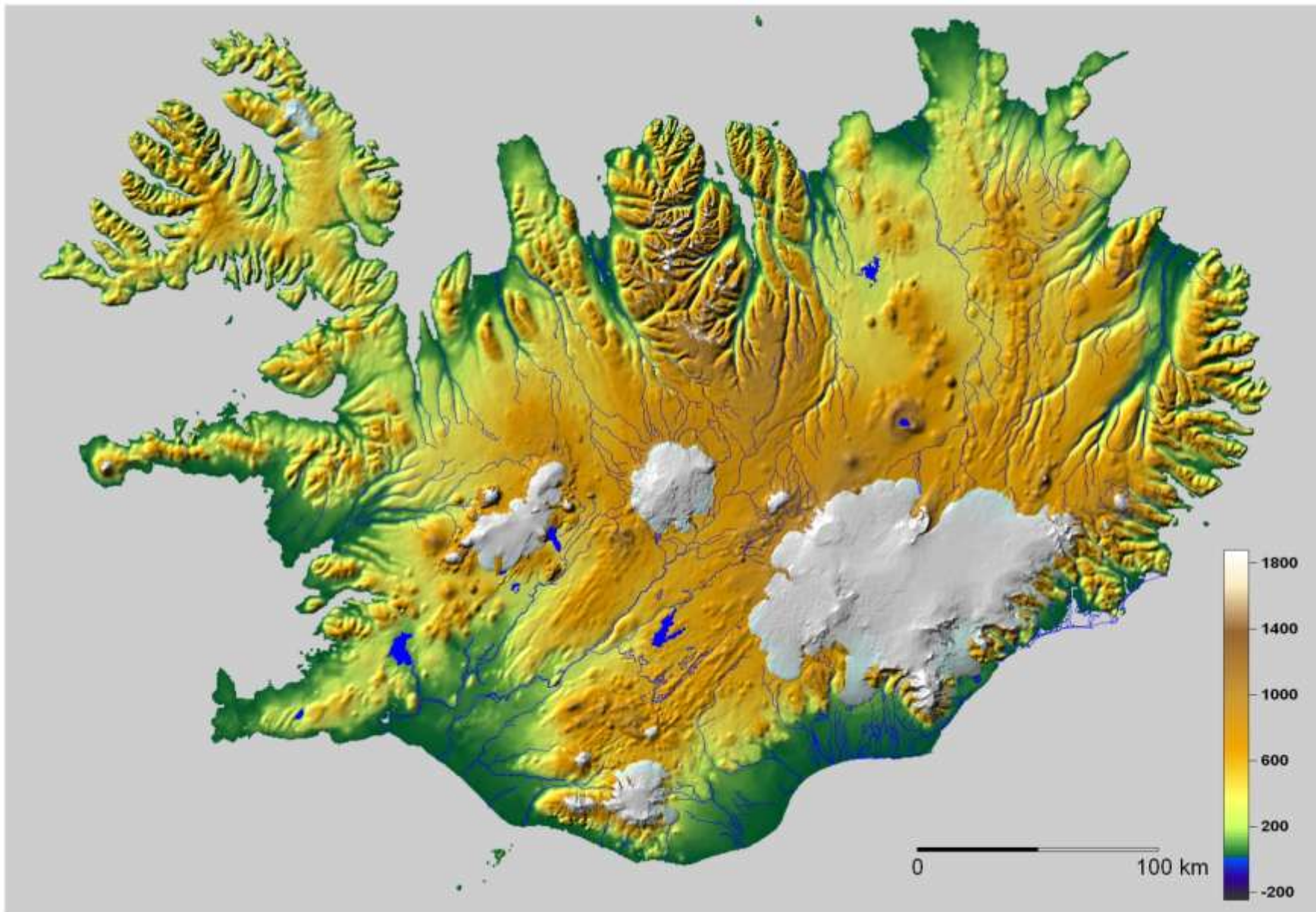
# Íslenskt vatnafar: Áhrif jarðfræði og jökla





Hraunfossar  
Photograph, Oddur Sigurðsson







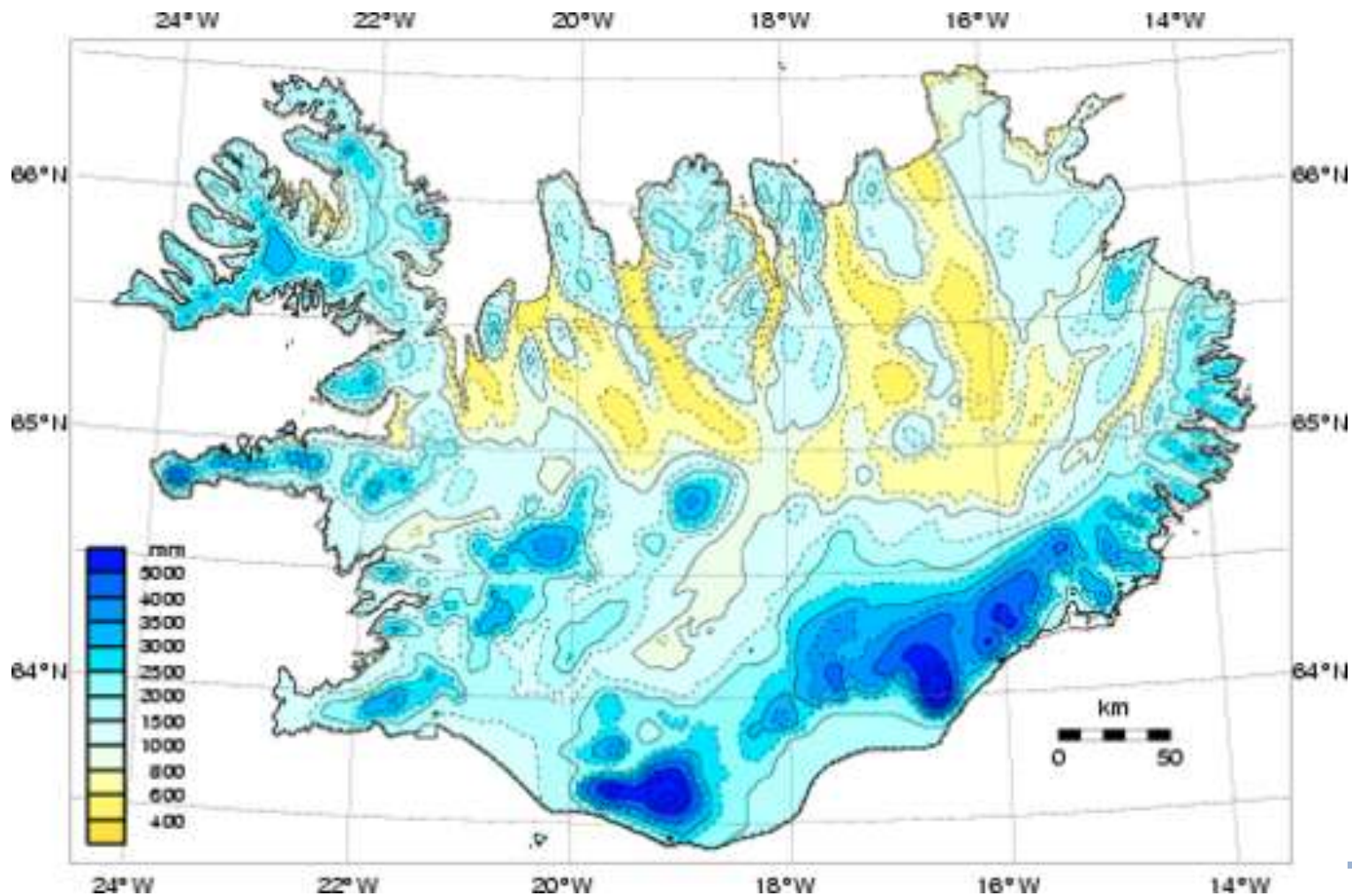
# Áhrif jöklabreytinga á farvegi jökulvatna og lónstæði við jökulrönd



Oddur Sigurðsson  
Veðurstofu Íslands

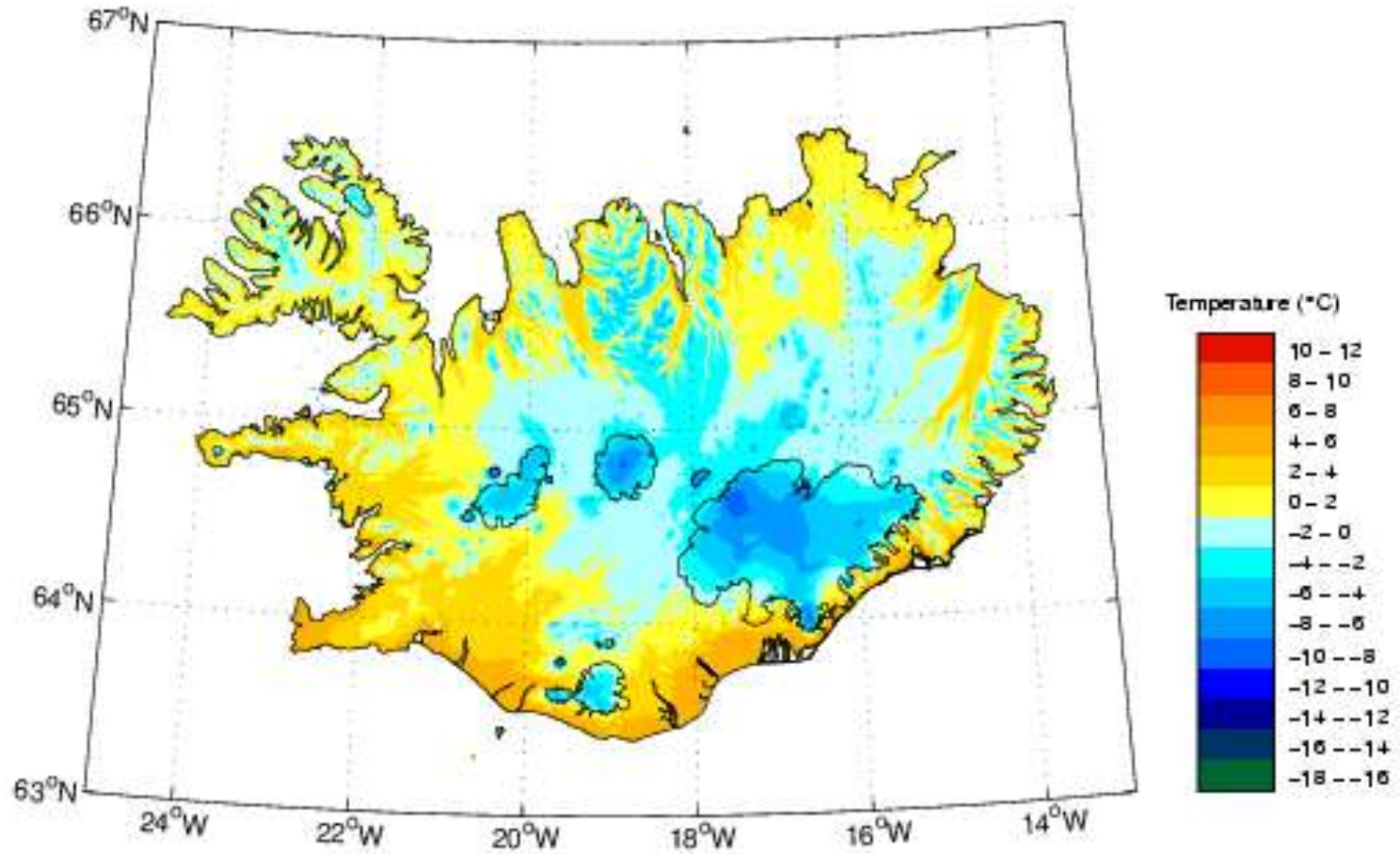


# Úrkomukort, 1961-1990





# Hitakort, 1961-1990

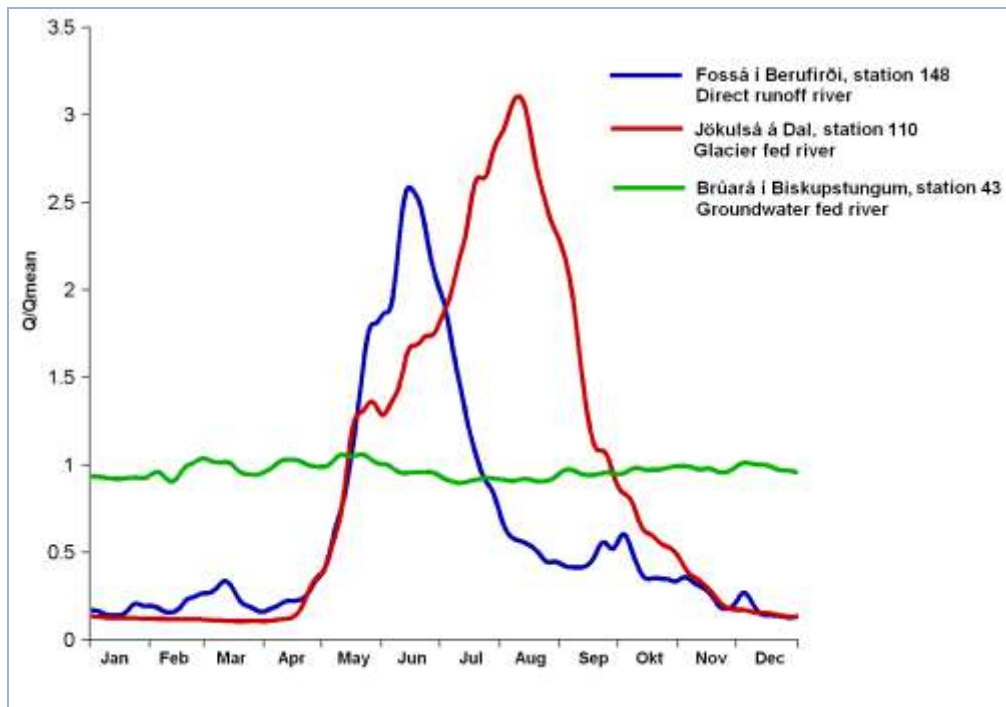


# Árstíðabreytingar rennslis og vatnsfallategundir

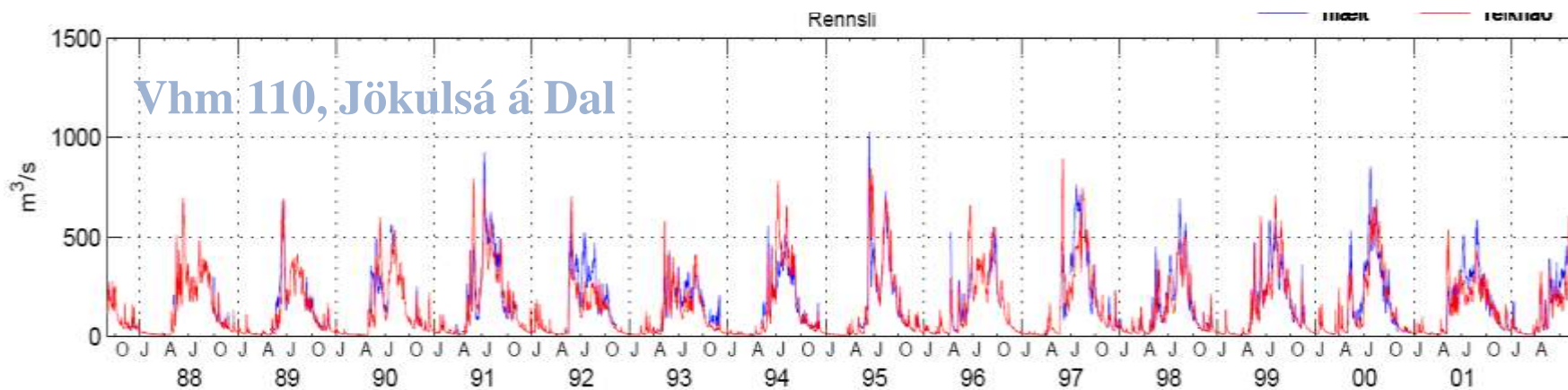
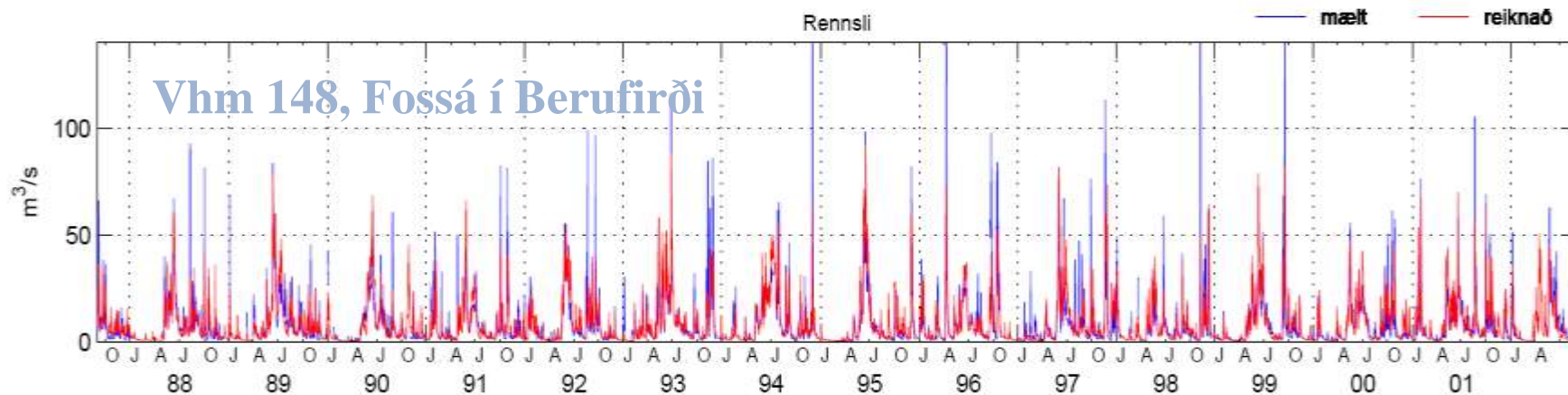
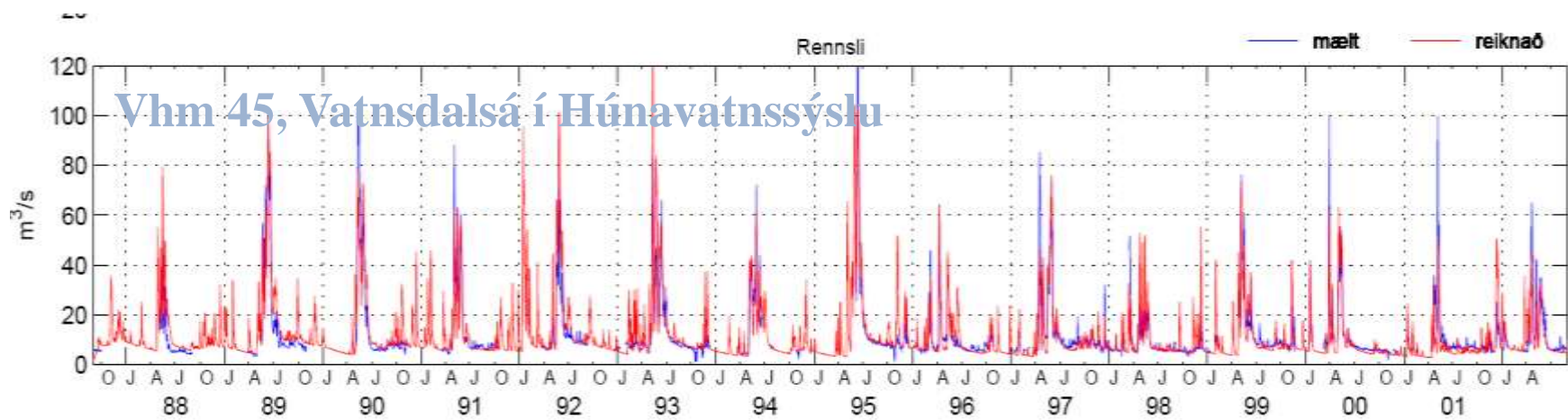
60% Dragár

20% Jökulár

20% Lindár



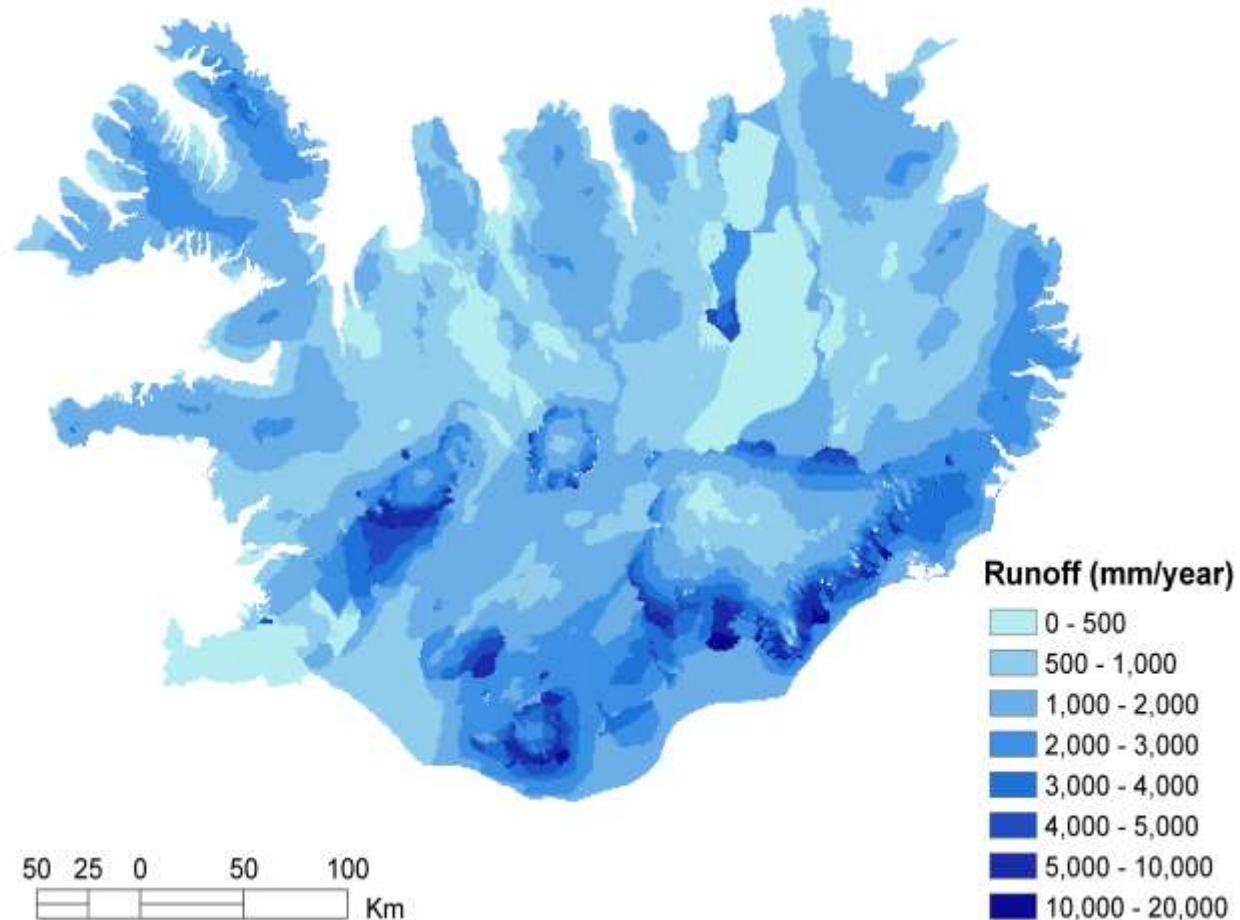




# Afrennsliskort 1961-1990

**Meðal afrennsli:  
1460mm/ári  
eða 4770m<sup>3</sup>/s**

- ▶ Sigurjón Rist:  
1690mm/ári eða  
5500m<sup>3</sup>/s
- ▶ Haukur  
Tómasson:  
1590mm/ári eða  
5150m<sup>3</sup>/s



# Vatnsauðlindin - nýting

## Til neyslu

- ▶ Neysluvatn
- ▶ Vatn til matvælaframleiðslu

## Í orkuiðnaði

- ▶ Vatnsaflsvirkjanir
- ▶ Jarðhitanýting - orkuberi
  - ▲ Húshitun
  - ▲ Rafmagnsframleiðsla
  - ▲ Ferskvatn hitað upp og nýtt eins og jarðhitavatn



# Vatnsauðlindin - nýting

## Í umhverfi

- ▶ Móttaki fyrir affall ýmss konar
- ▶ Veigamikill hluti vistkerfa
  - ▲ Ár, vötn, votlendi
  - ▲ Strandsjór
- ▶ Víða hluti af fallegustu náttúruperlum landsins

# Lindasvæði, vatnsból, þéttbýli

Fámént land: Stærstur hluti auðlindarinnar fjarri mannabyggð

Það þýðir þó ekki að unnt sé að umgangast hana af ábyrgðar- eða hirðuleysi

## Innlend áhrif

Leyfisbundinn iðnaður

Að langmestu leyti bundið við eldvirkni-  
beltið og nútímahraun

## Aðborin áhrif

Pb sem mælist í mosa



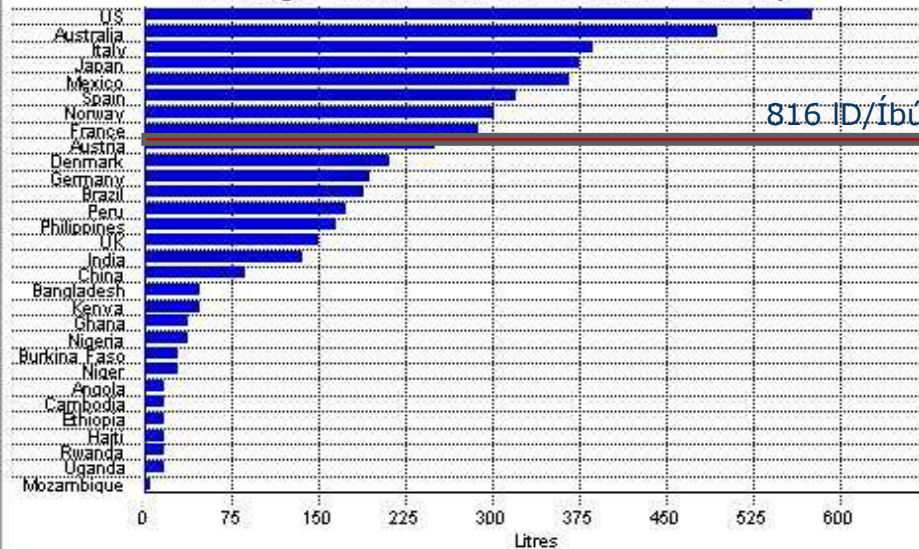
## Vatnsnám

Skráð Heildarvatstaka 5941,86 l/s

Sundurliðuð skipting

	Almenningsveita	Fiskeldi	Varmaskipti/ (Hitaveita)1	Stóriðja	Landbúnaður	Annað --
l/s	2.781	115	2.100	14	92	837
%	47%	2%	35%	0%	2%	14%

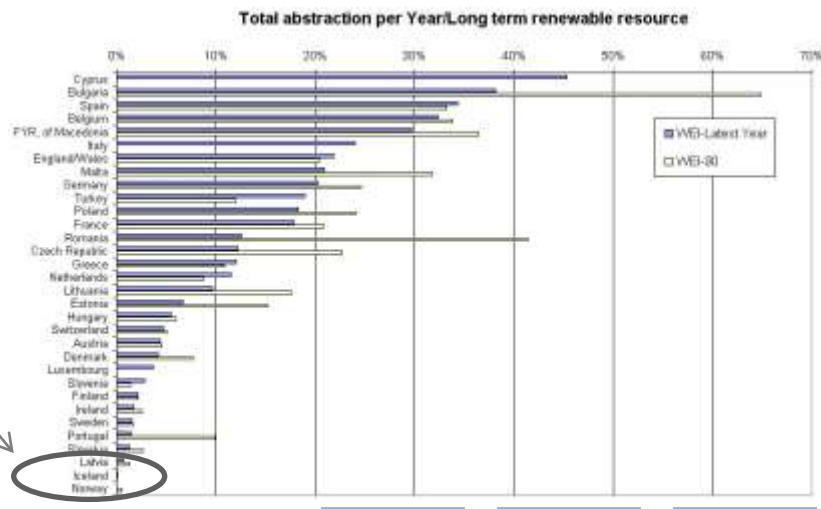
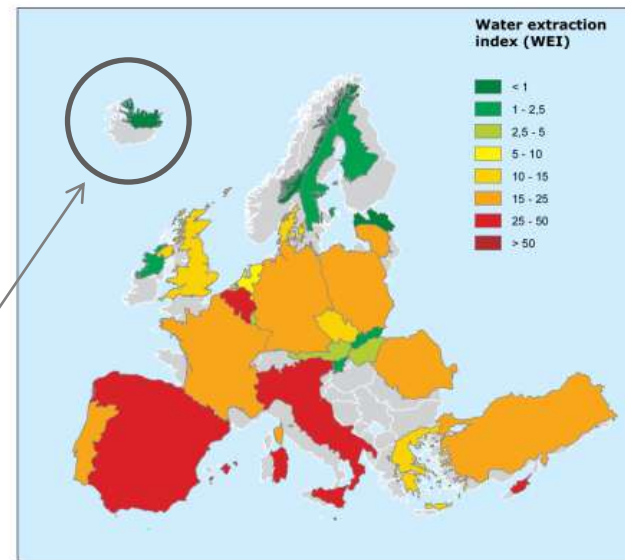
Average Water Use Per Person Per Day





# Vægi grunnvatns á Íslandi

- ▶ Um 20% afrennslis
- ▶ Um 20% vatnsorku
- ▶ Um 97% neysluvatns
- ▶ Orkuberi alls jarðhita
- ▶ Grunnvatnsmegin landsins >1000 m<sup>3</sup>/s, þ.a. um 400 m<sup>3</sup>/s á láglandi
- ▶ Fá lönd hlutfallslega auðugri af lindavatni en Ísland



## ORKUVEFSJÁ Iceland Energy Portal

English

Um vefsíðuna

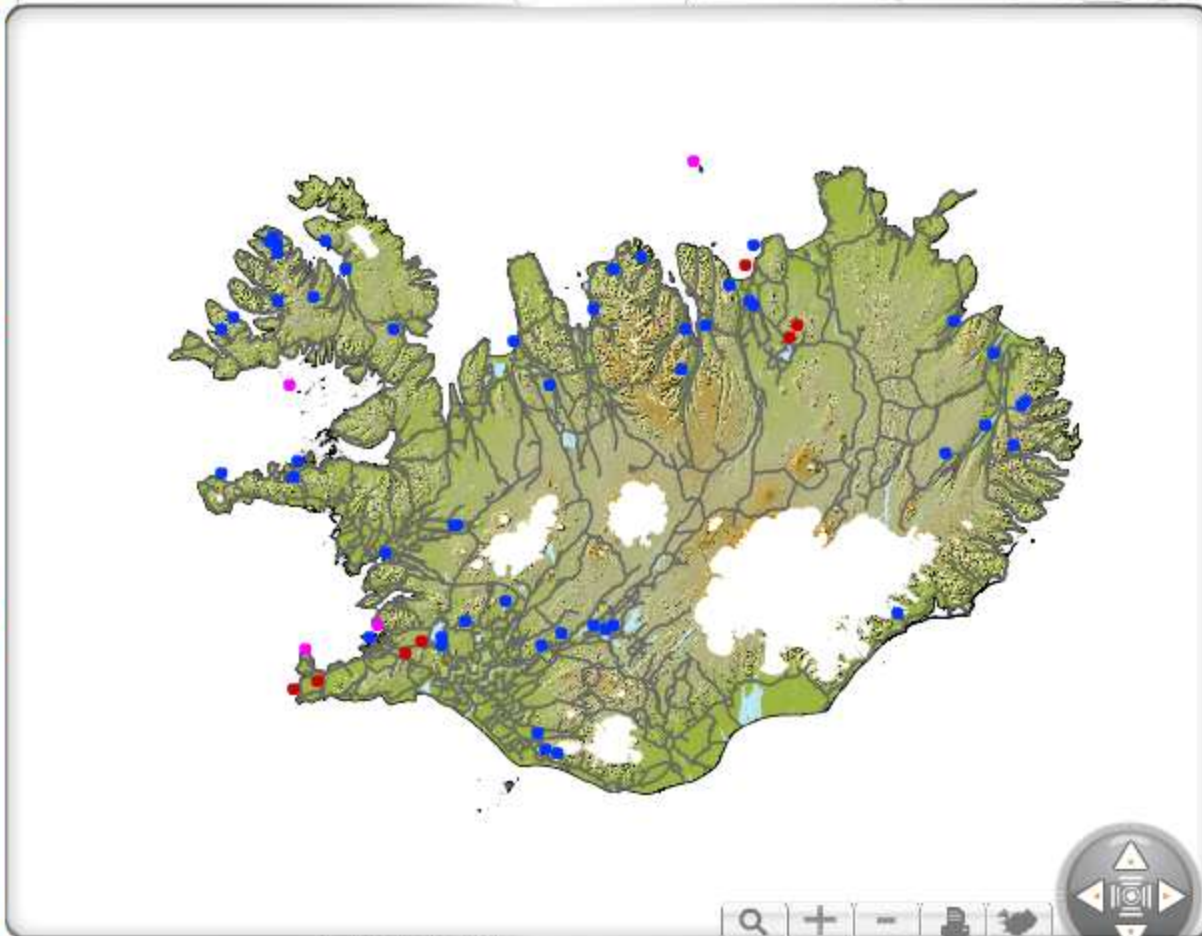
Hjálp



Fróðleikur

Um gögna

Ítarefni



### Skýringar þekju

- Hæðarmynd+
- Jarðvarmaorku
- Vatnsorkuver
- Eldsneytisstöð
- Hæðarmynd

### Virg lög

- 100% Hæðarmynd
- 100% Hæðarmynd

- ▼ Efnisflokkar
- ▼ Myndgrunnar
  - ▼ Fjarkönnunargögn
    - SPOT 5 - Íslandsmynd
  - ▼ Hæðargrunnar
    - Hæðarmynd+
    - Hæðarmynd
  - ▼ Raforkuvinnsla
    - Raforkuver
  - ▶ Jarðhitanoftkun
  - ▶ Kortasafn

# Raforkuframleiðsla undanfarin 10 ár

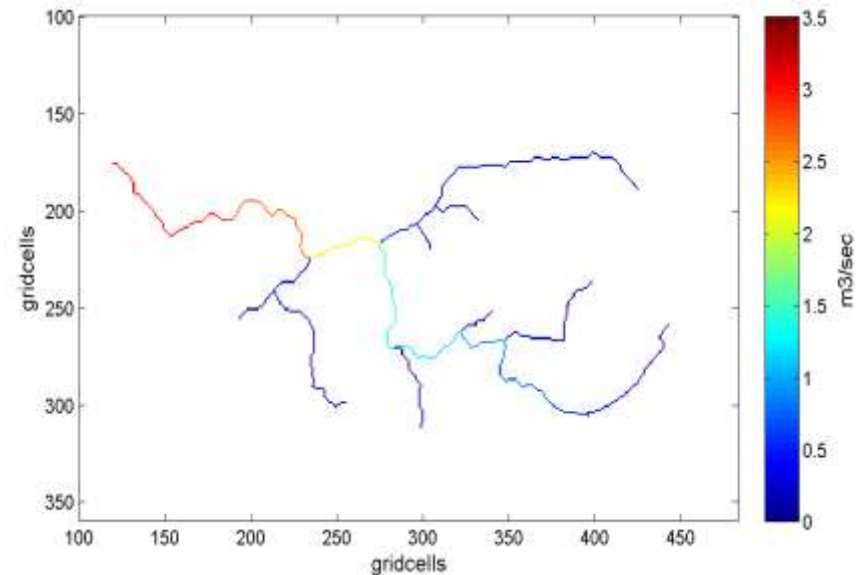
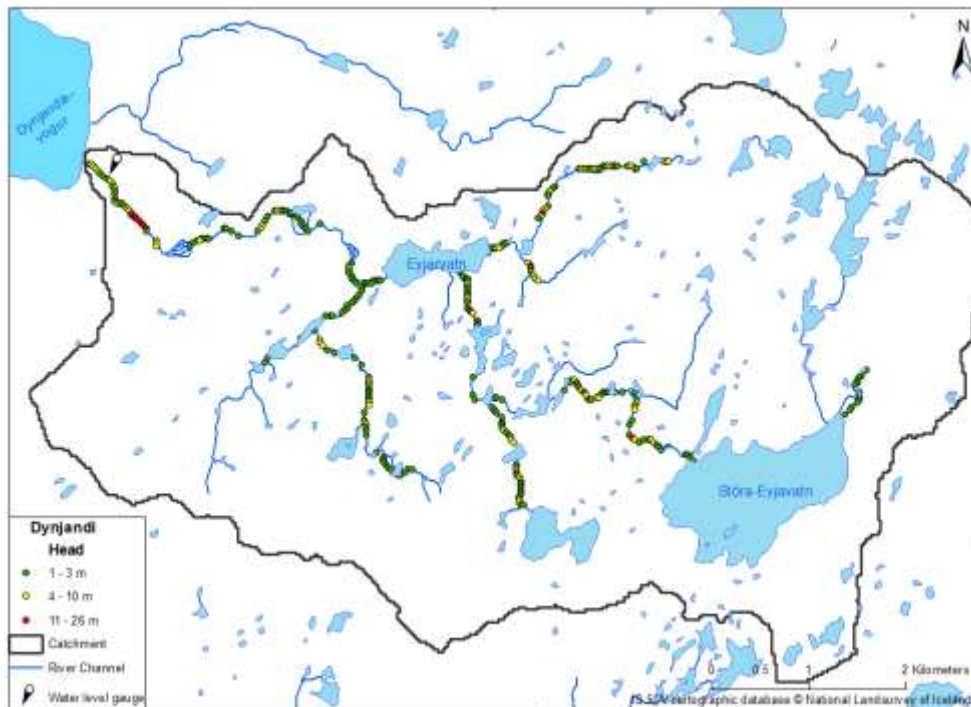
Ár	Vatnsorka [GWh]	Jarðhiti [GWh]	Eldsneyti [GWh]	Samtals [GWh]
2010	12592	4465	2	17059
2009	12279	4553	3	16835
2008	12427	4038	2,7	16467,8
2007	8394	3579	3,5	11975,7
2006	7289	2631	4,6	9924,8
2005	7015	1658	7,8	8681
2004	7131	1484	4,7	8618,8
2003	7082	1406	4,9	8493,3
2002	6972	1433	5,5	8411,1
2001	6574	1451	3,3	8028,7



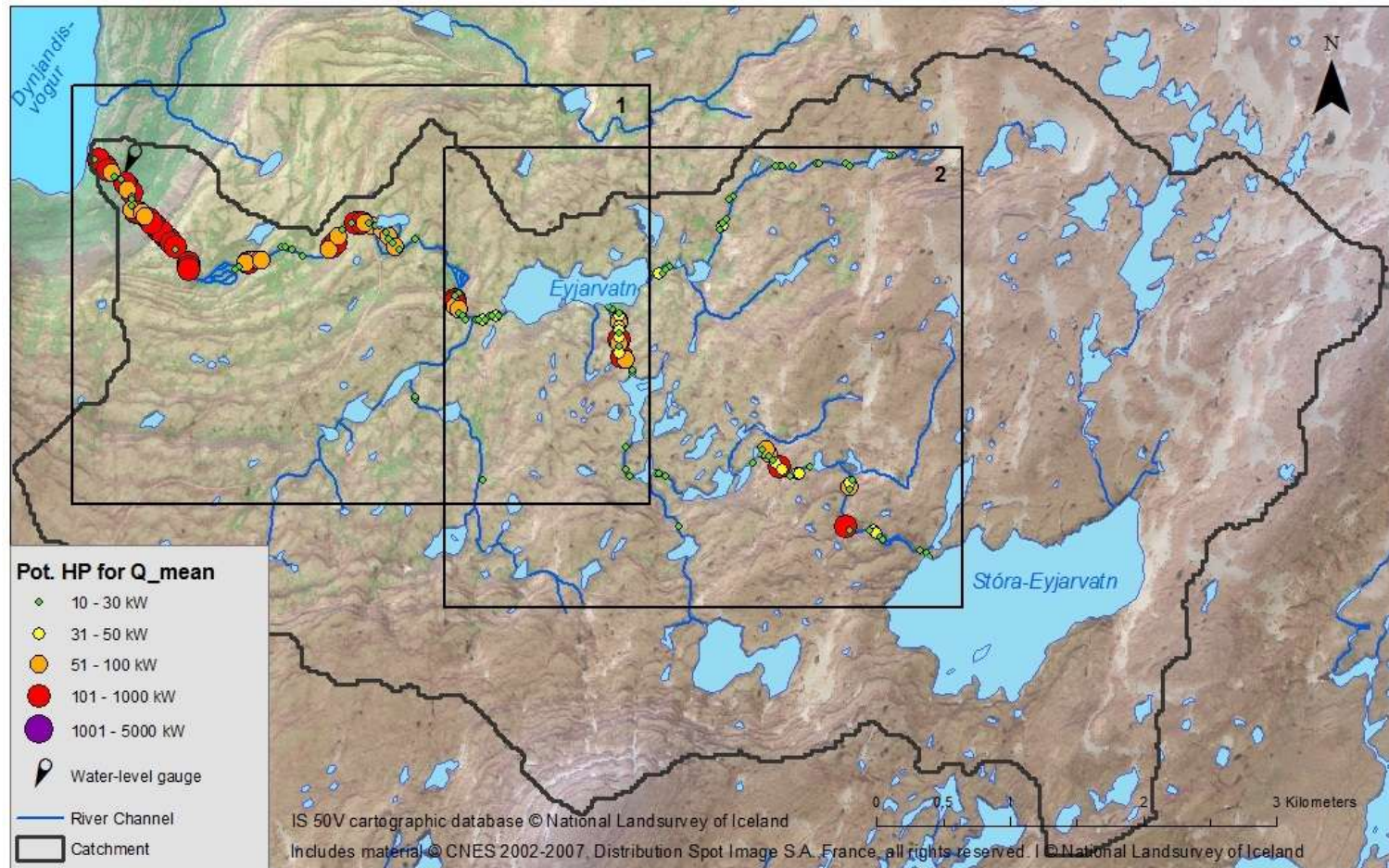
# Kortlagning vatnsafls út frá tiltækum gögnum á VÍ

- Fallhæð eftir öllum farvegum fæst með vatna- og kortagrunni VÍ

- Rennsli eftir öllum farvegum fæst með vatnafarslíkaninu WaSiM



# Tæknilega mögulegt vatnsafl Dynjanda gefið meðalrennsli

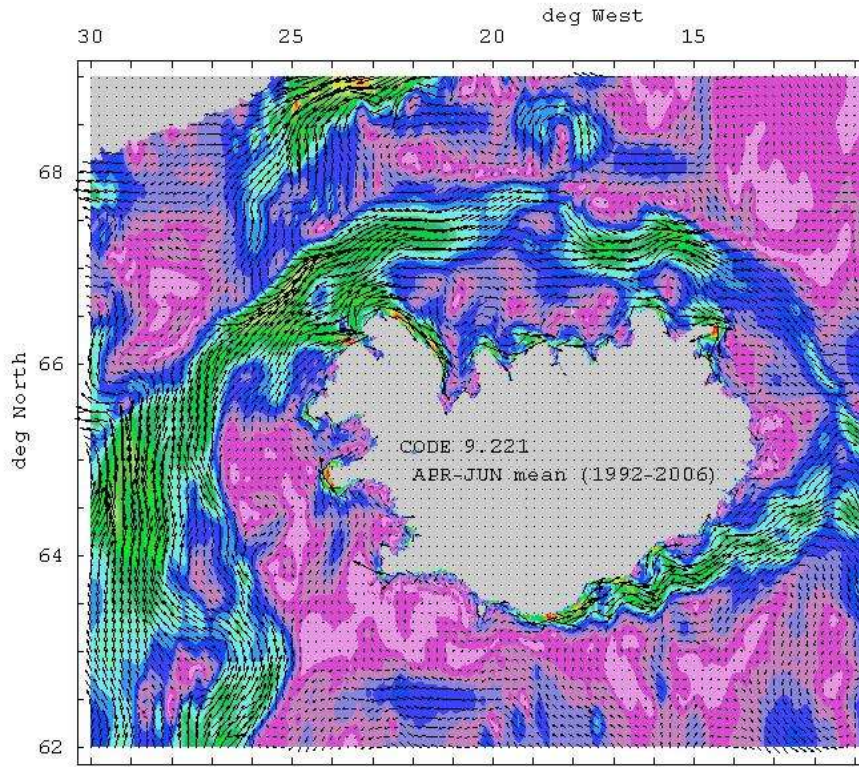




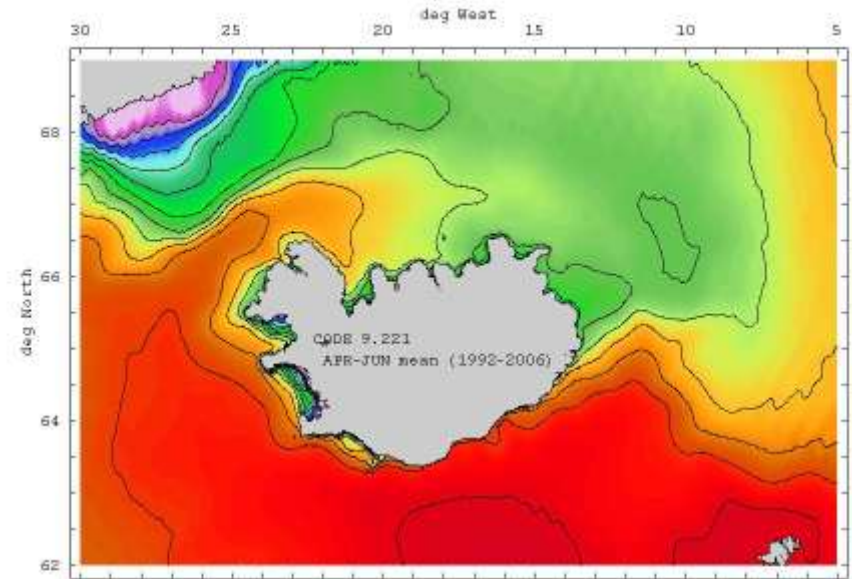
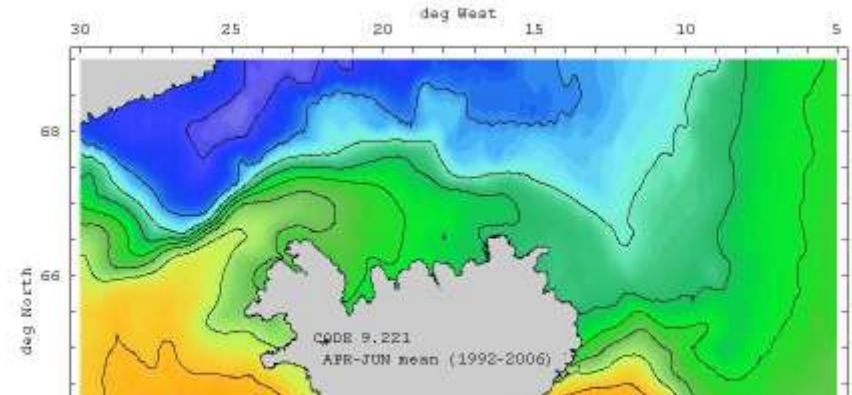
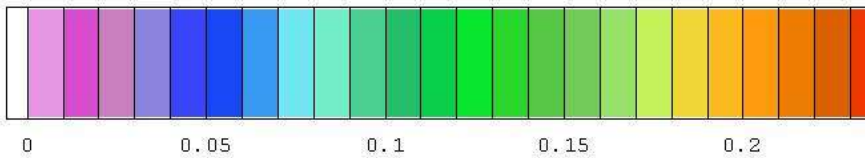




# spring mean (z=15 m) 1992-2006



flow velocity (z = 0015 m) [m/s]

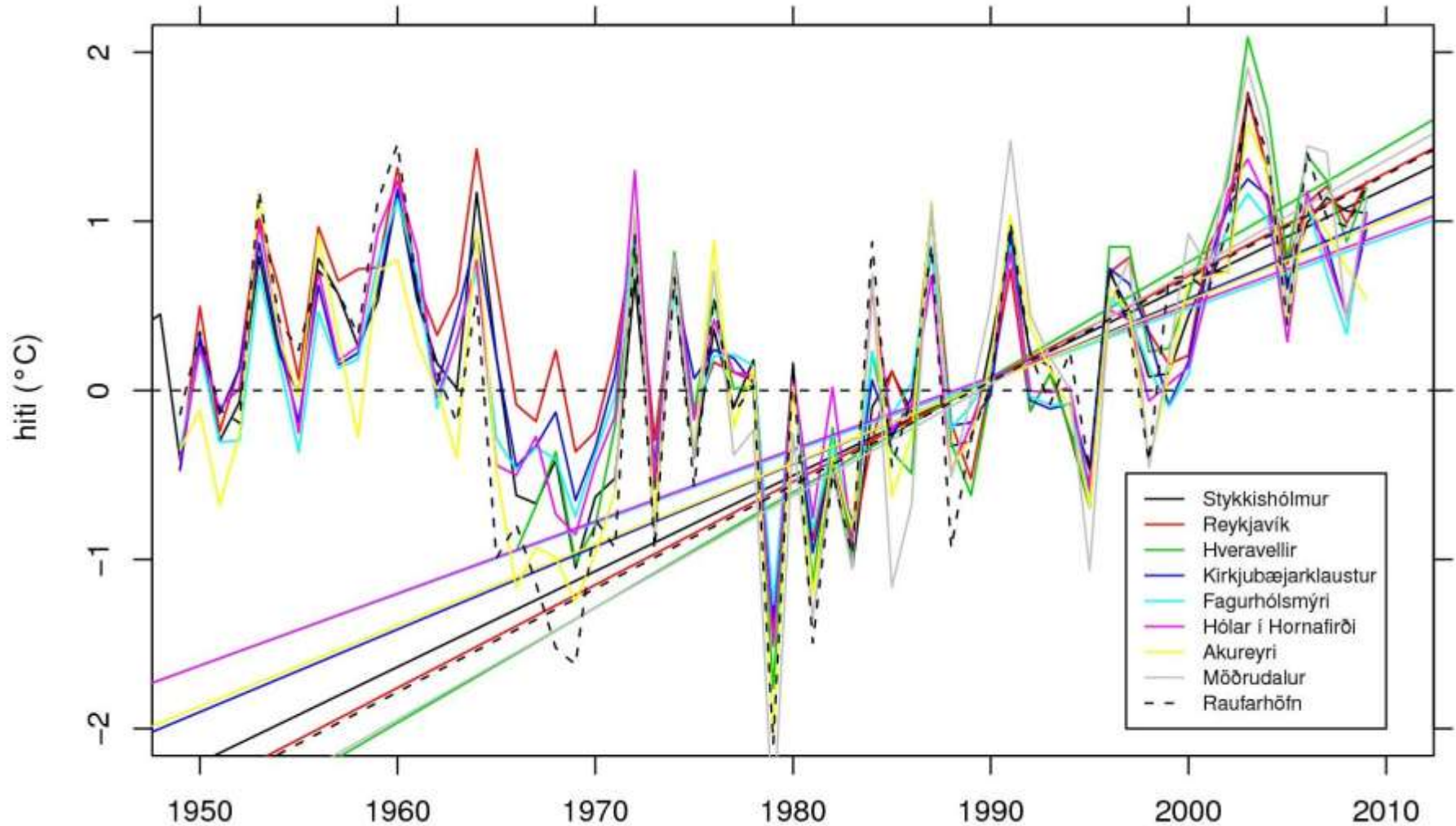


salinity (z = 0015 m) [°C]



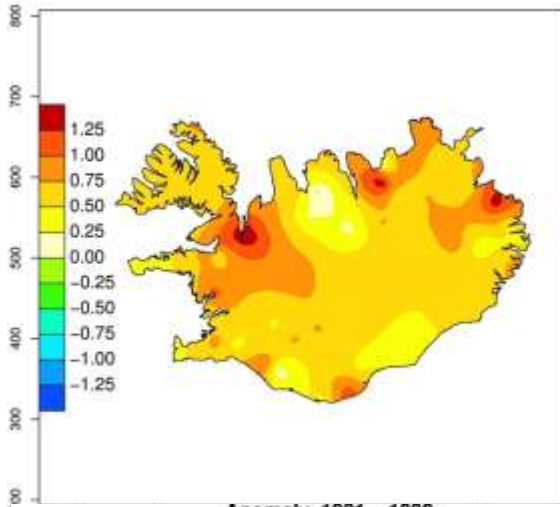


# Hitabreytingar á 8 veðurstöðvum

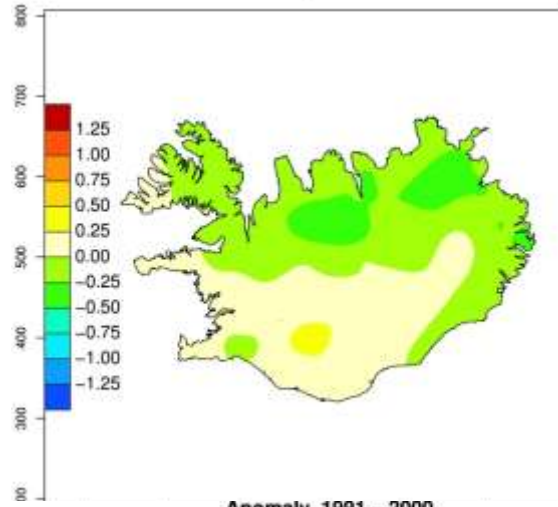


# Hitafrávikakort

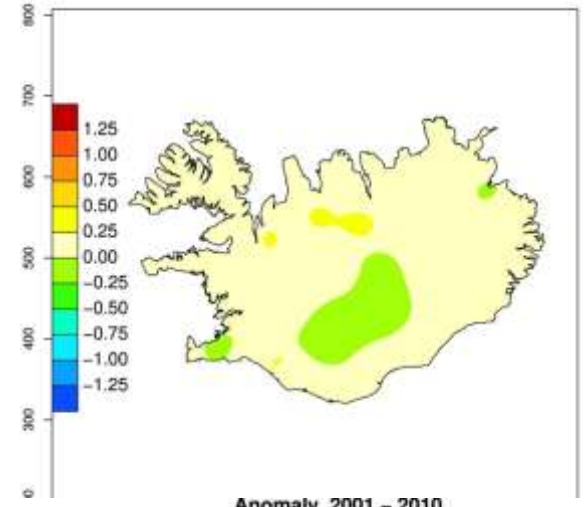
Anomaly 1951 – 1960



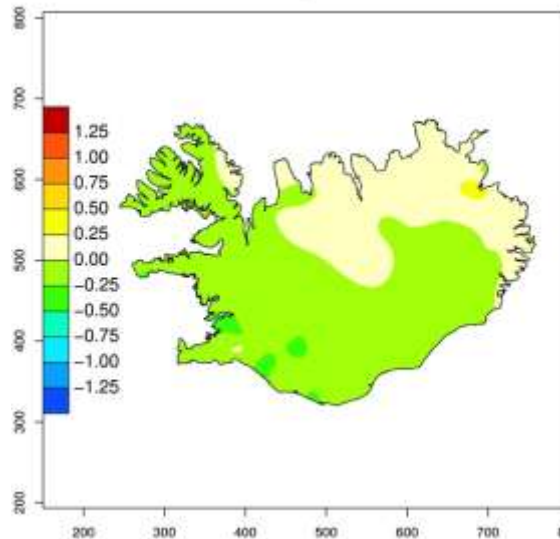
Anomaly 1961 – 1970



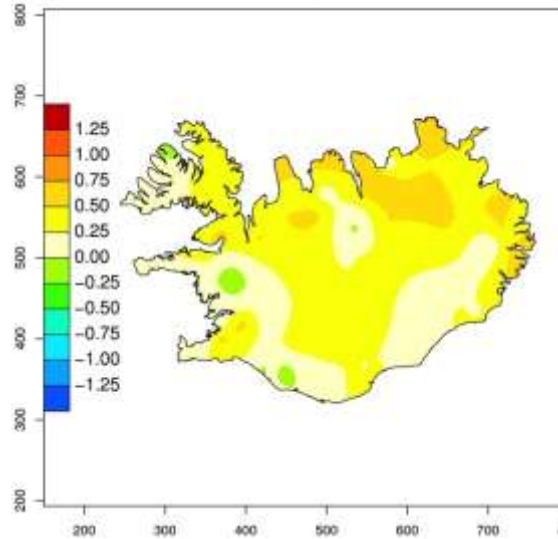
Anomaly 1971 – 1980



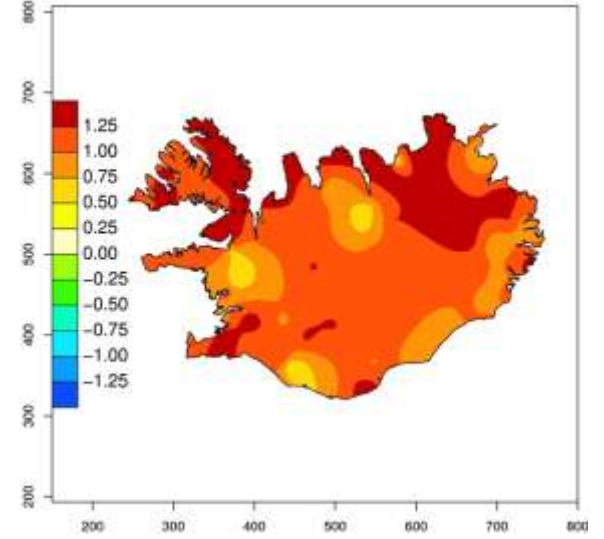
Anomaly 1981 – 1990



Anomaly 1991 – 2000

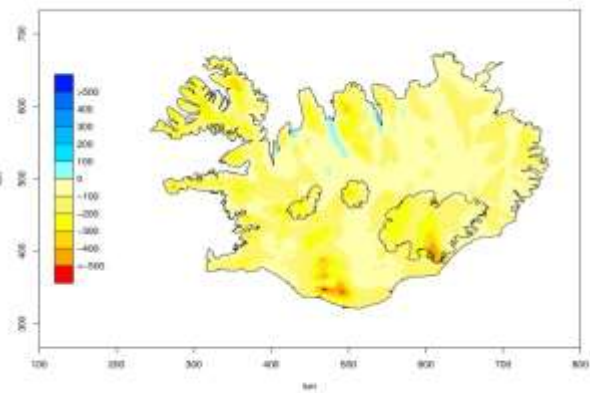


Anomaly 2001 – 2010

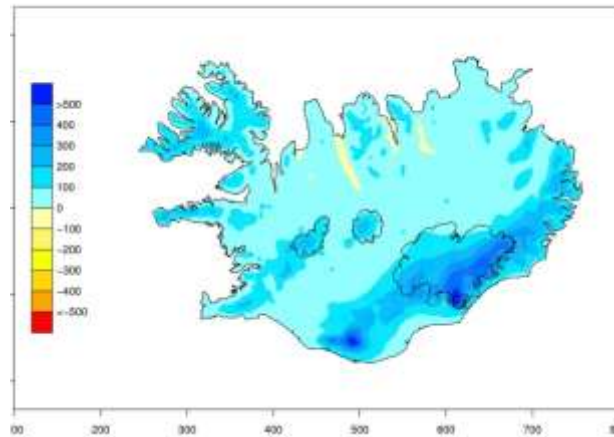


# Úrkomufrávíkakort, mm

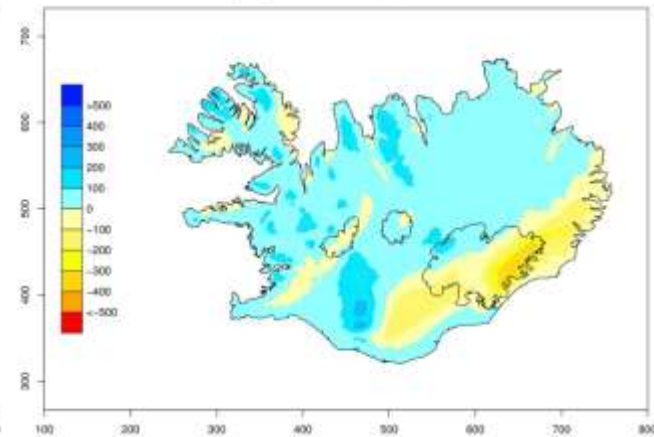
1961–1970 precipitation difference (mm) relative to 1961–1990



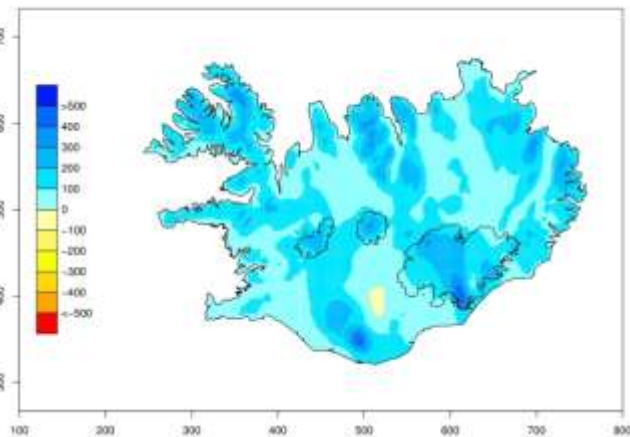
1971–1980 precipitation difference (mm) relative to 1961–1990



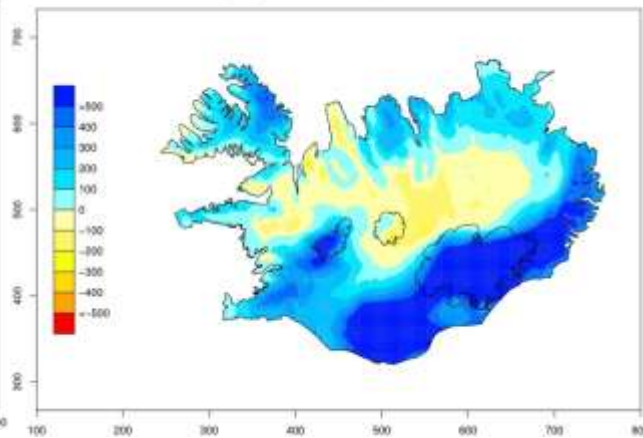
1981–1990 precipitation difference (mm) relative to 1961–1990



1961–2000 precipitation difference (mm) relative to 1961–1990



2001–2006 precipitation difference (mm) relative to 1961–1990





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# Loftslagsbreytingar – hopun jökla

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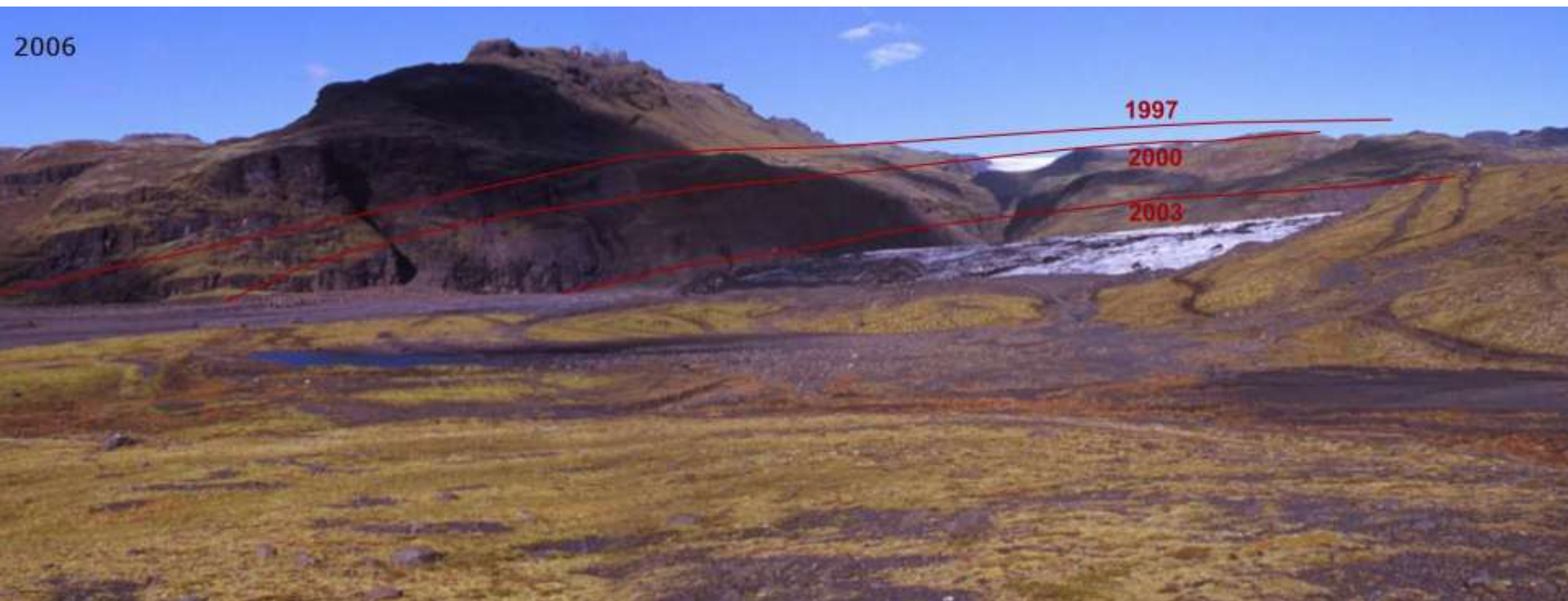
Sólheimajökull 1997





# Loftslagsbreytingar – hopun jökla

## Sólheimajökull 2006



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# Loftslagsbreytingar – hopun jökla

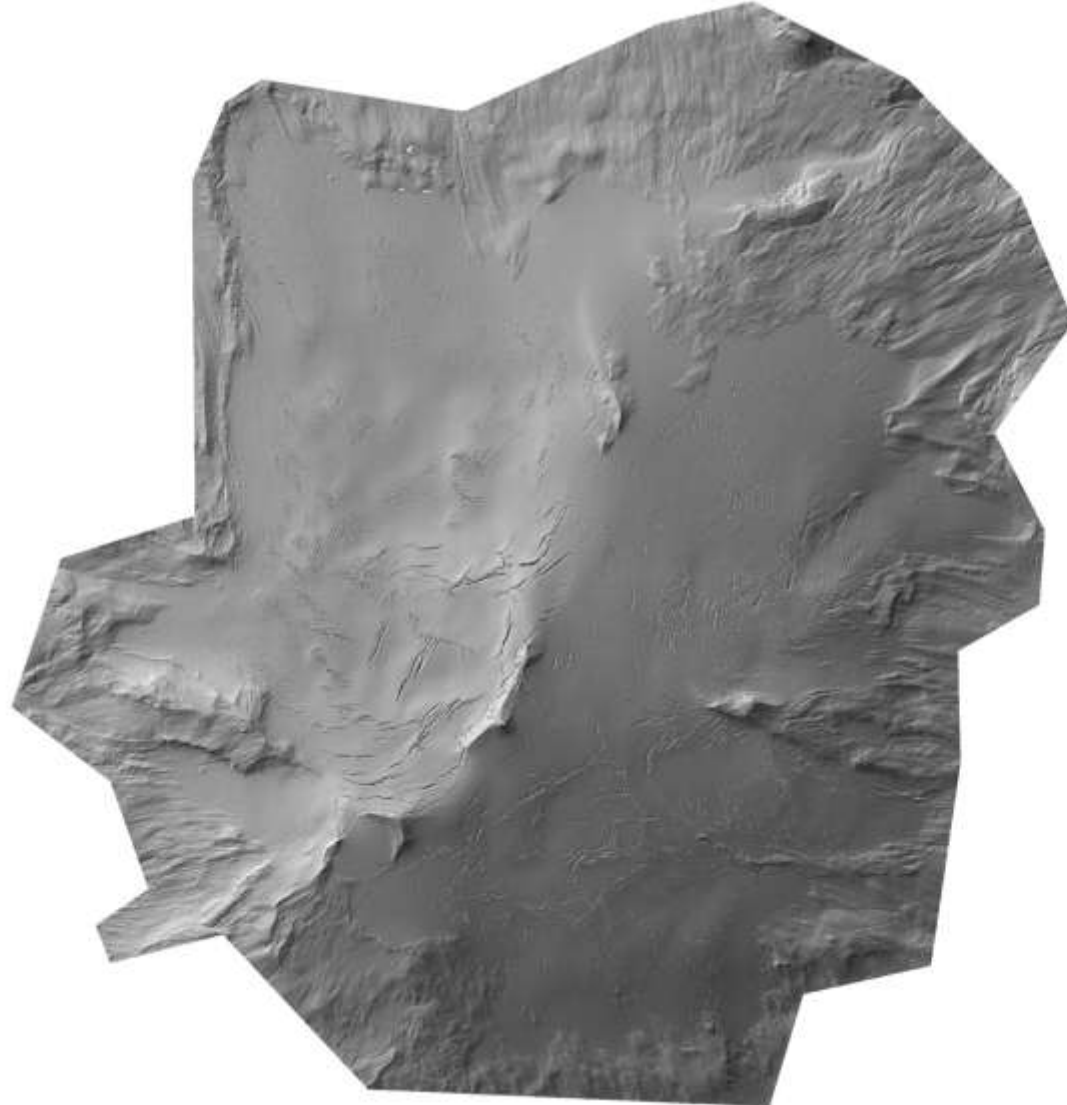
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Sólheimajökull 2010



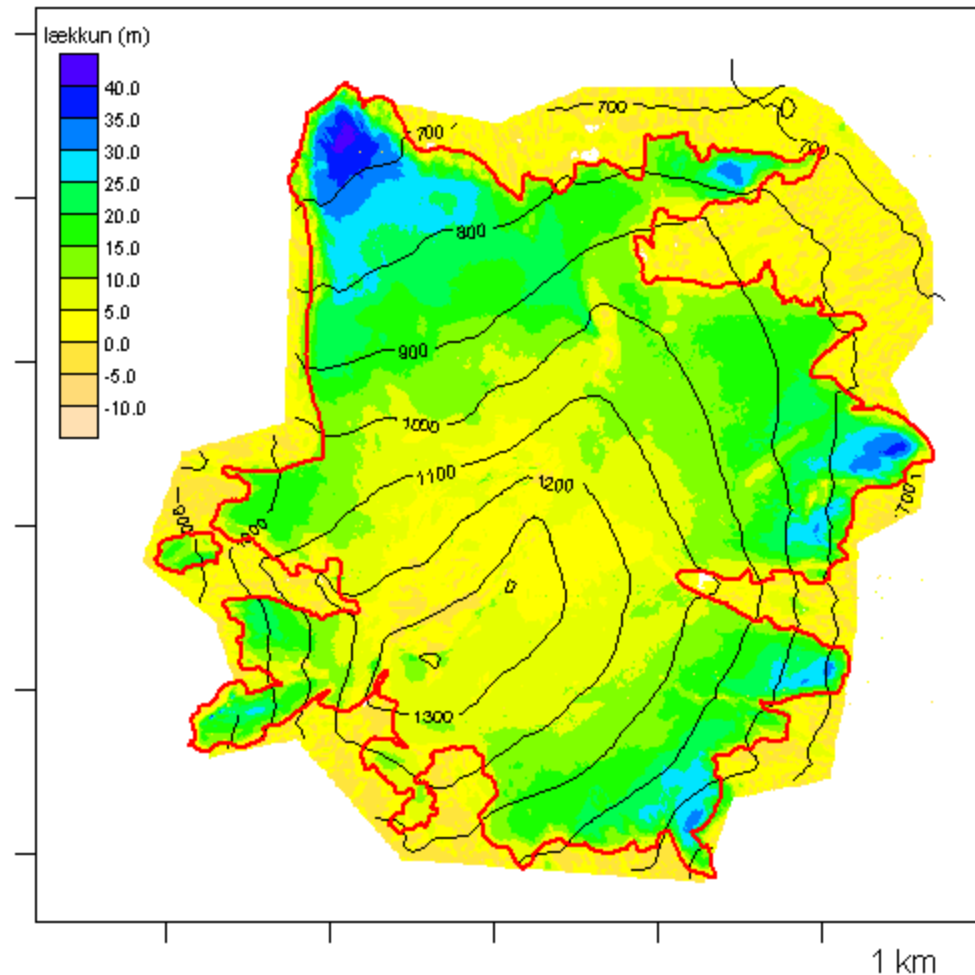


# Snæfellsjökull, lidar DTM



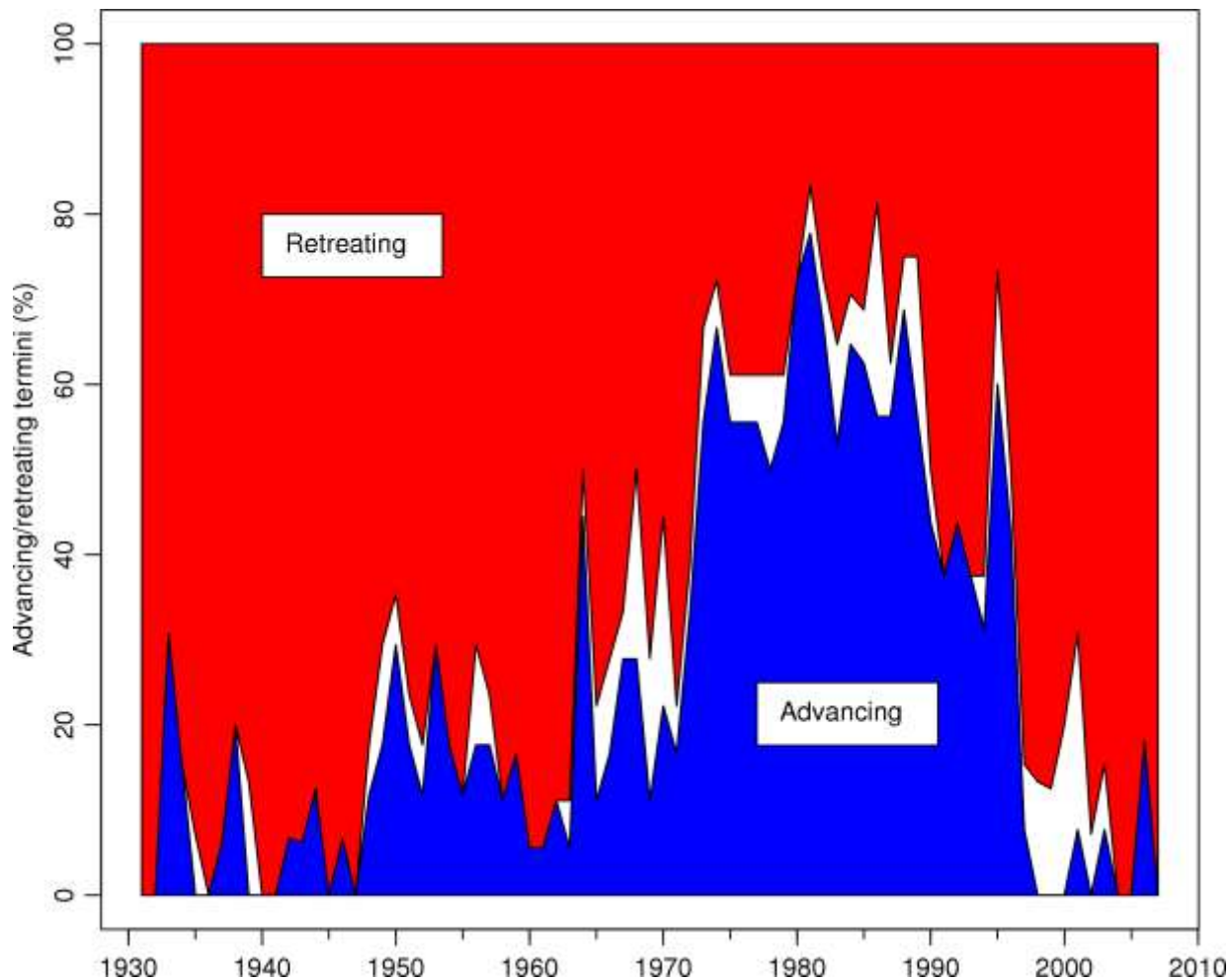
# Snæfellsjökull, lowering 1999 to 2008

Lækkun Snæfellsjökuls frá 1999 til 2008





# Glacier front variation and recent warming



**Most monitored glaciers are now retreating**

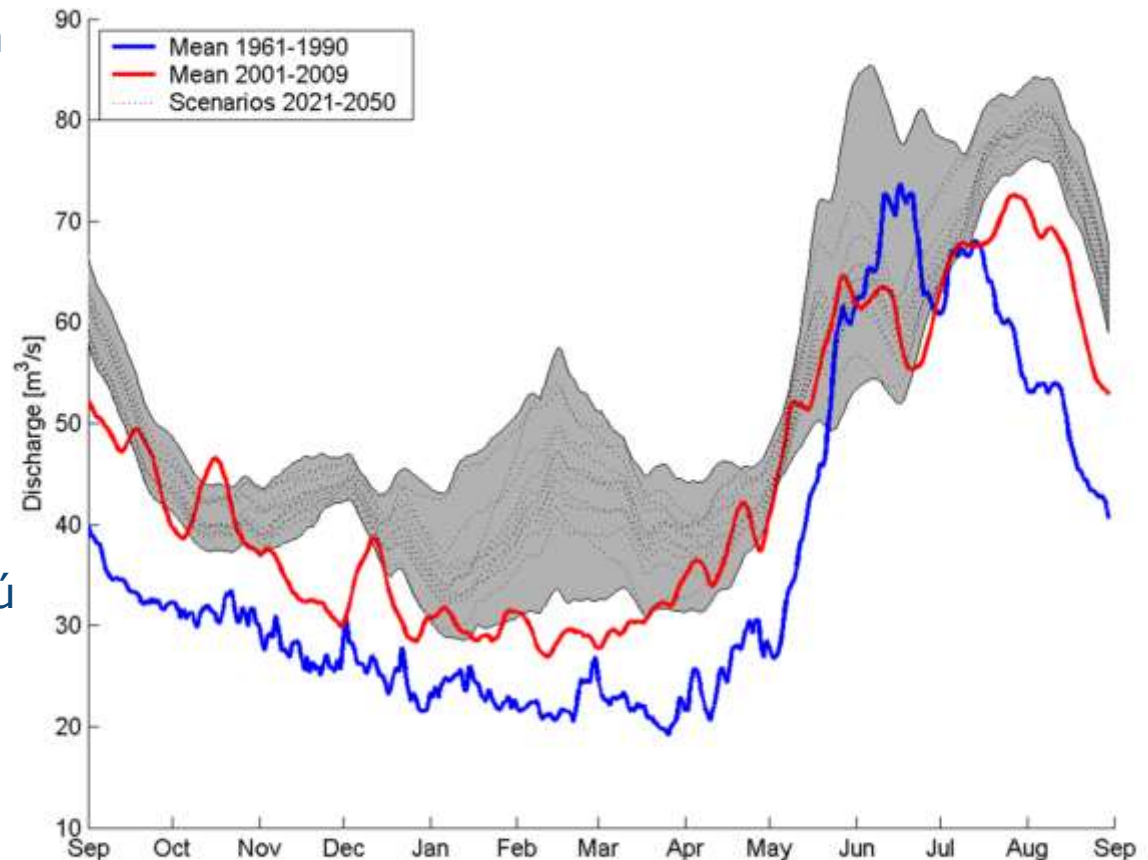
- ▶ Except surging glaciers

**Data based on volunteer work of members of the Iceland Glaciological Society**

# Áhrif loftslagsbreytinga á afrennsli á Íslandi

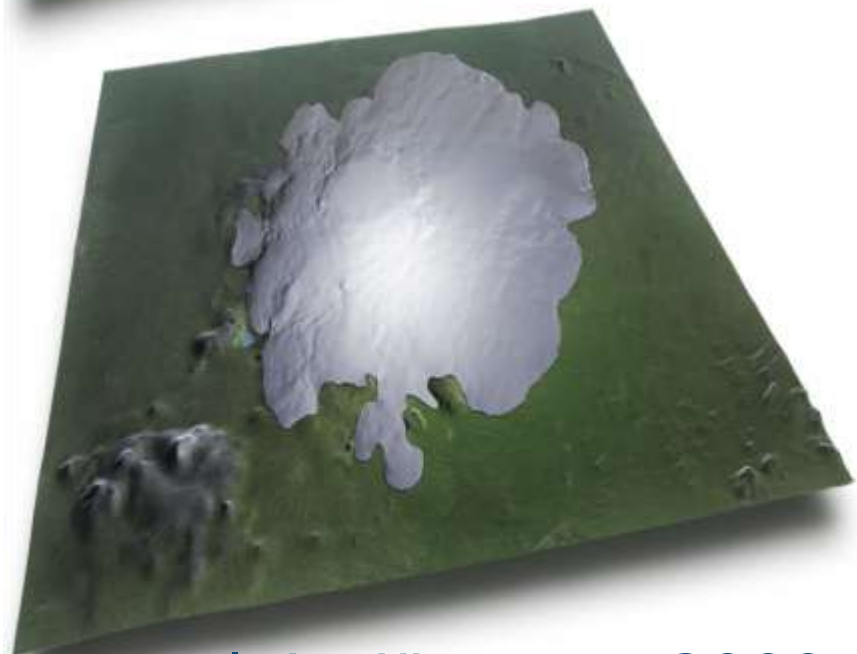
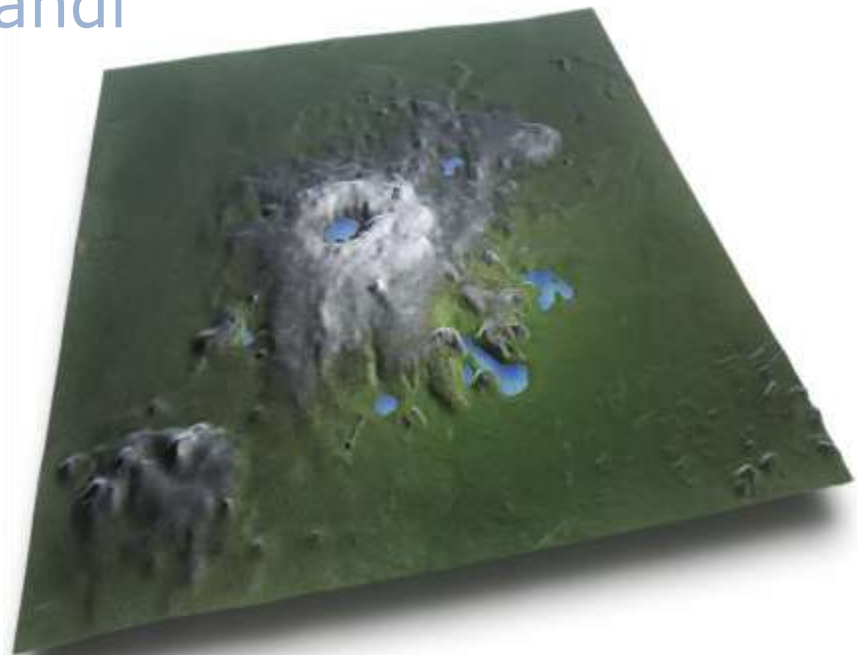
## Breytingar á árstíðabundnu rennsli í blandaðri jökulá, dragá og lindaá, Austari-Jökulsá

- ▶ 2021–2050 borið saman við 1961–1990
- ▶ 13 mismunandi framtíðarsviðsmyndir
- ▶ Hækkun hitastigs  $\sim 2^{\circ}\text{C}$ , háð sviðsmynd
- ▶ Aukning úrkomu  $\sim 16\%$ , háð sviðsmynd
- ▶ Töluverðar breytingar nú þegar árin 2001–2009 miðað við 1961–1990



# Framtíð- afrennsli frá breyttu landi

Langjökull



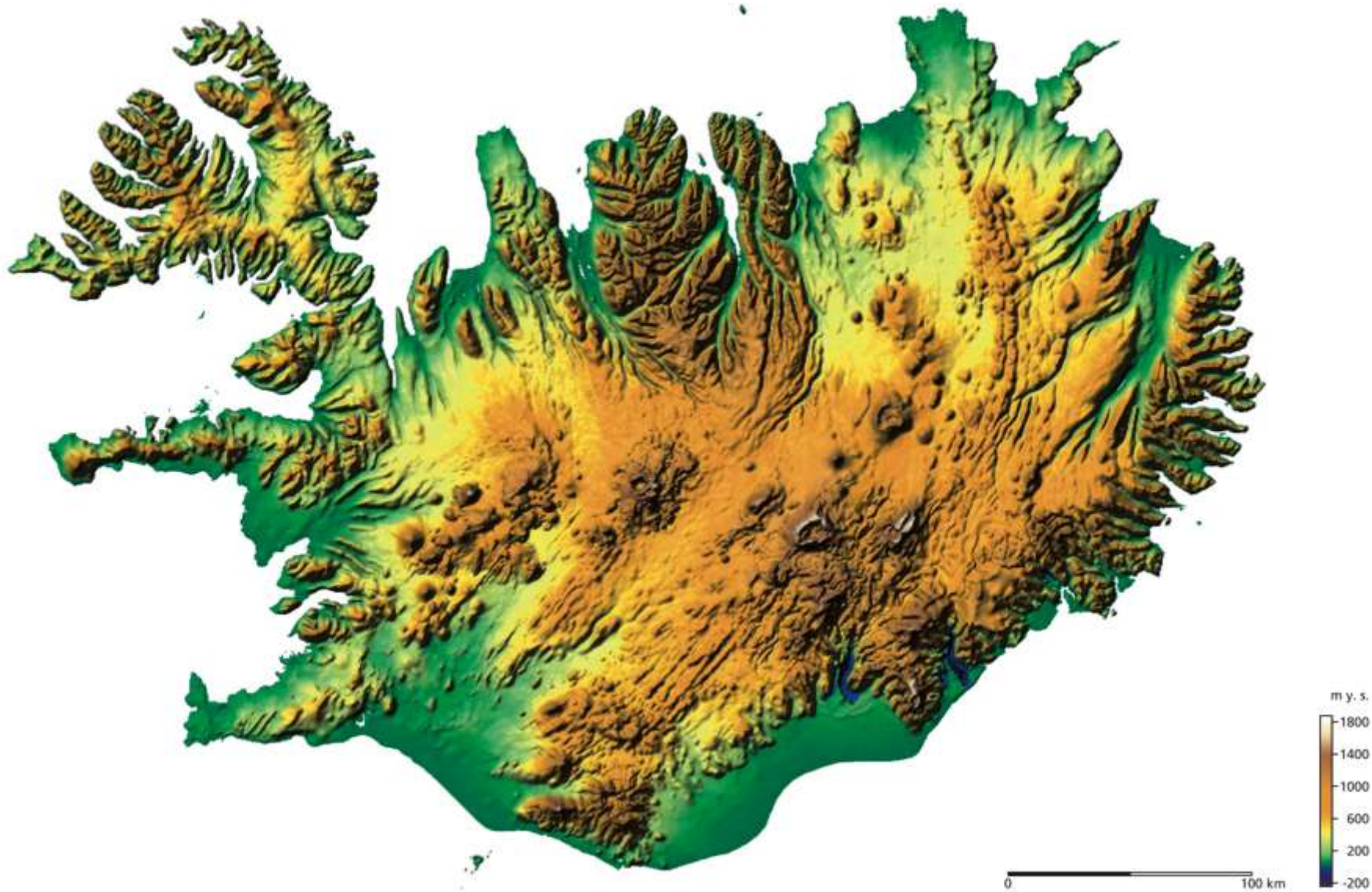
Helgi Björnsson 2009



Helgi Björnsson 2009



# Íslandskort árið 2200?



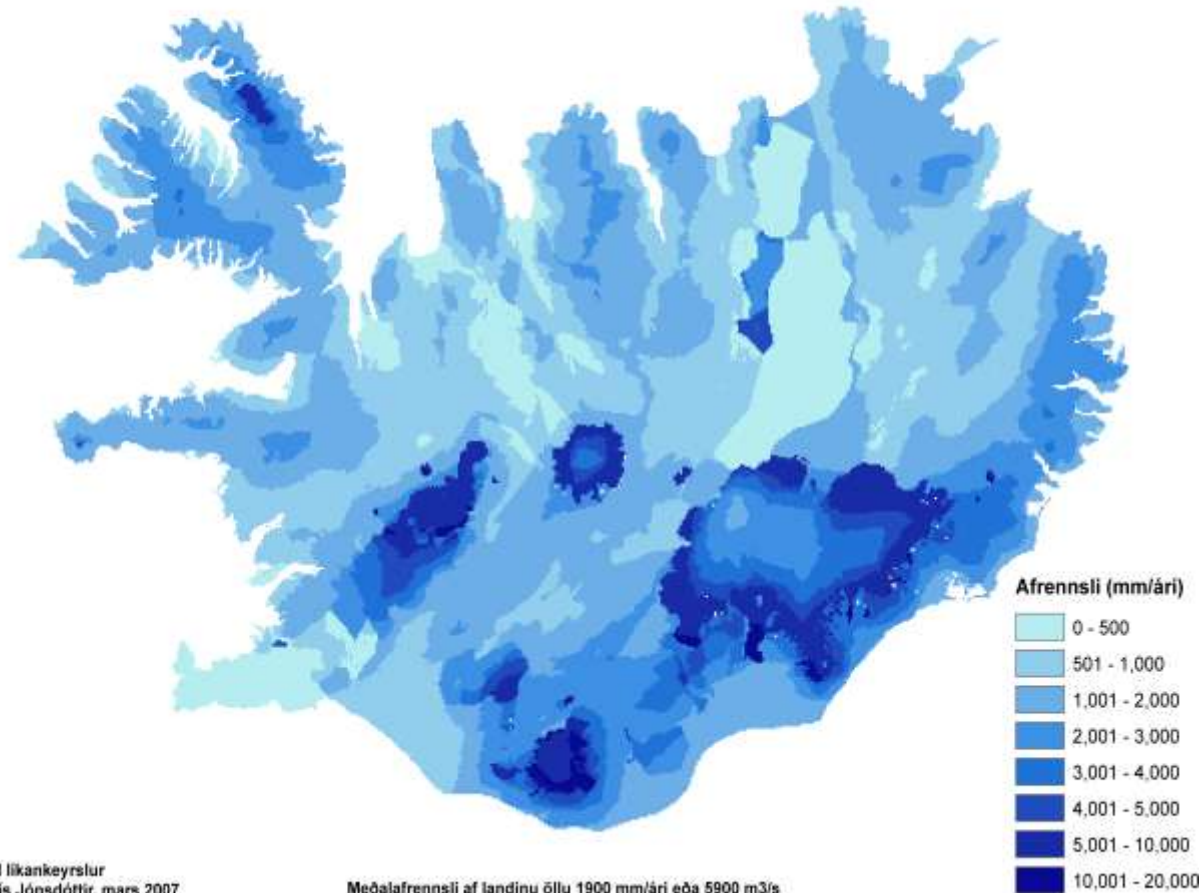
Helgi Björnsson 2009

# Afrennsliskort 2071-2100

Meðalársfrennsli vatnsáranna 2071-2100

**Meðal  
afrennsli:  
1900mm/ári  
eða  
5900m<sup>3</sup>/s**

- ▶ 25% aukning miðað við 1961-1990: 4770m<sup>3</sup>/s



WaSiM-ETH líkankeyrslur  
Jóna Finndís Jónsdóttir, mars 2007

Meðalafrennsli af landinu öllu 1900 mm/ári eða 5900 m<sup>3</sup>/s