

Water resources - The Faroe Islands

The Management of Freshwater on Islands:

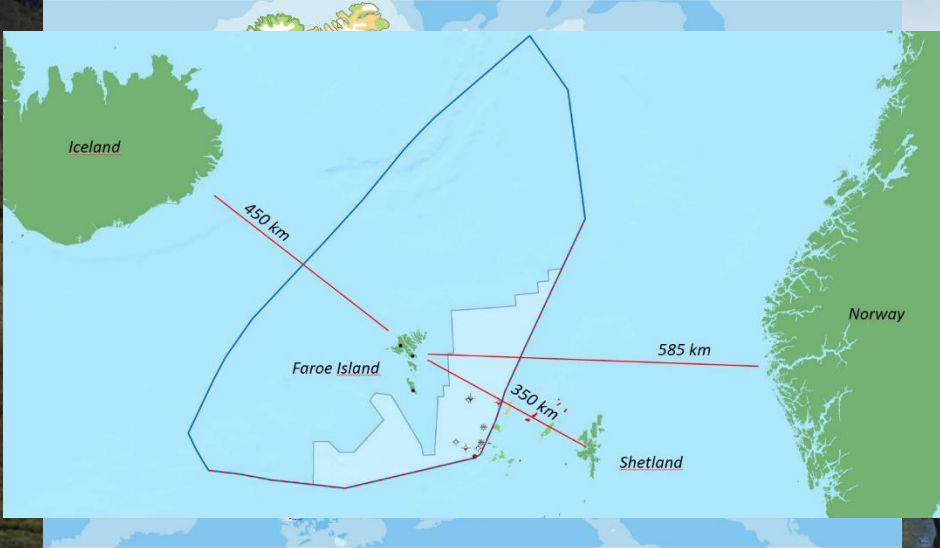
- Unique Challenges or Common Opportunities?

An Introductory Session presenting the 1st IWRA Islands Water Congress on Freshwater and Islands

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Location

- Onshore area c. 1,400 km²
- Offshore area c. 297,000 km²



Facts

- 18 islands
- 29 municipalities
- 300 metres above sea level in average
- Highest mountain: Slættaratindur, 882 m.
- Never more than 5 km from the ocean



Facts

- Self-governing within the Kingdom of Denmark
- Not a member of the EU
- Governed by the Løgting (33 members) and the Landstýri
- Headed by the løgmaður (Prime Minister)
- Approx. 54,000 people
- Capital Tórshavn: Approx. 20,000 people



Natural surface reservoirs

- Several natural surface reservoirs in the Faroe Islands for drinking water supply
- On the picture the Leitisvatn/Sørvágsvatn lake is seen. The lake is situated 40 m above sea-level

Constructed surface reservoirs



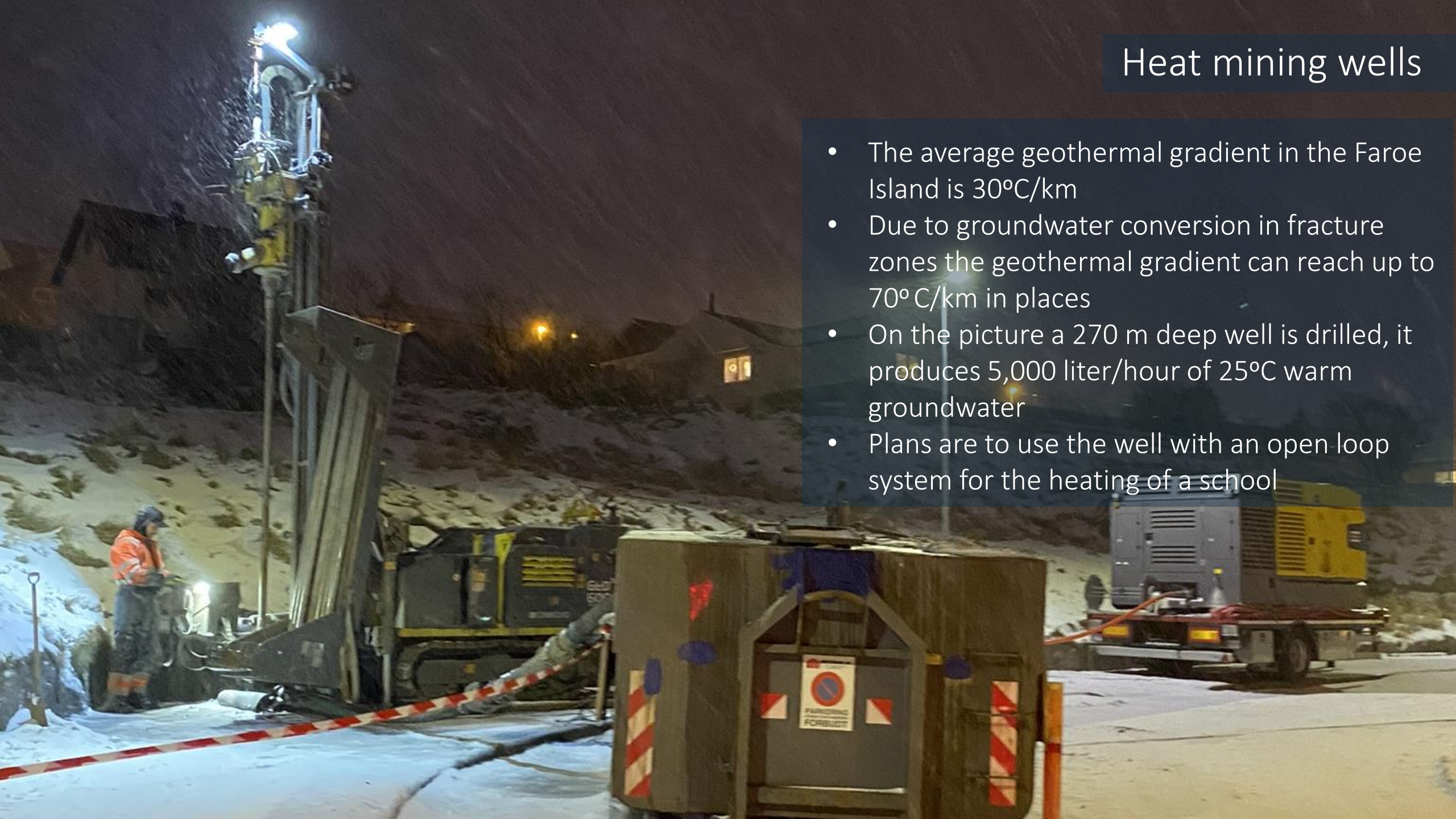
- For drinking water supply
- For hydropower supply
- Pumped storage – completed in 2027

Groundwater reservoirs

- Faroe Islands is a volcanic archipelago
- The last 15 years approx. 1700 shallow geothermal wells have been drilled for heating houses
- During this time, we have experience that large amounts of groundwater can be found in fractures and layer boundaries
- Reservoir quality is in general 10% and the permeability is very high in places
- Artesian wells are running with up to 17000 liters/hour

Heat mining wells

- The average geothermal gradient in the Faroe Island is 30°C/km
- Due to groundwater conversion in fracture zones the geothermal gradient can reach up to 70°C/km in places
- On the picture a 270 m deep well is drilled, it produces 5,000 liter/hour of 25°C warm groundwater
- Plans are to use the well with an open-loop system for the heating of a school



Heat mining

- Within a manmade cave in one of the sub-sea tunnels in the Faroes
- Was constructed during drilling to be used as a storage for al water deposited within the tunnel
- 40.000 liter/hour of 10.1 °C warm water are being pumped from the storage towards the nearest town and village on both sides
- Potential to use as heating source but is not utilized - yet

Springs and groundwater

- Springs are a common drinkingwater source in the Faroe Islands
- Groundwater percipitating into tunnels is also being used as a drinkingwater source in areas
- Groundwater has generally a high pH values of between 8.4 and 10.5
- This is due to circulation in basaltic rocks

DREKKIVATNSØKI
ØLL DÁLKING BANNAD
RESTRICTED
DRINKINGWATER AREA
ALL SORTS OF POLLUTION IS BANNED
Tórshavnar Býráð

Cleaning process



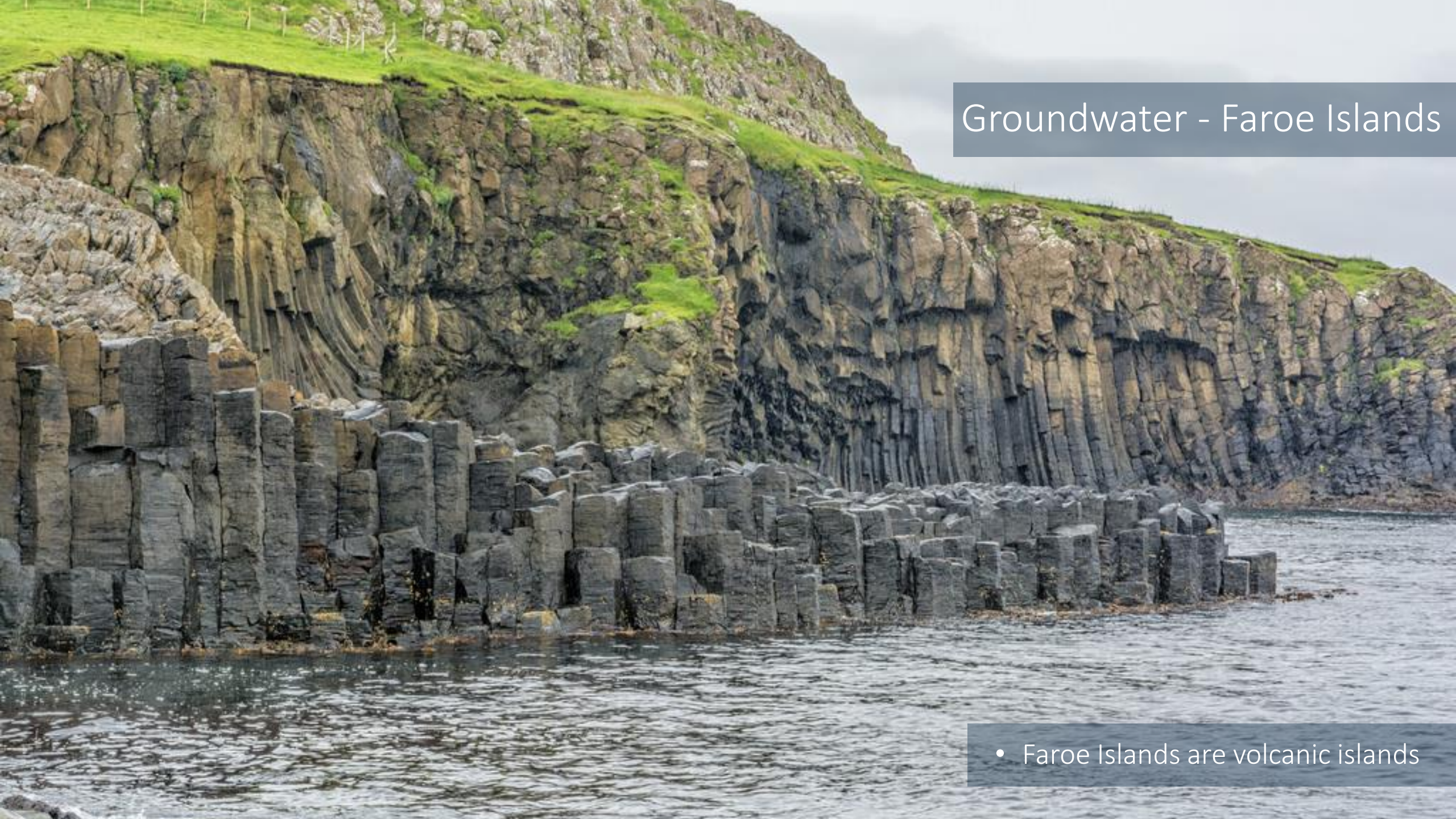
- All drinking water is cleaned by a UV filter even the groundwater before it is stored
- Surface water is also cleaned in sand filter



Water issues

- Annual precipitation is between 2000 - 4000 mm
- Yearly mean temperature is approximately 7°C
- Water scarcity during summertime
- Water supply – 90% surface water, 10% springs and groundwater
- Some villages have issues with access to clean water
- Growing industry – especially growing **smolts** for fish farming
- Shallow geothermal wells has lead to artesian wells
- Groundwater regulations

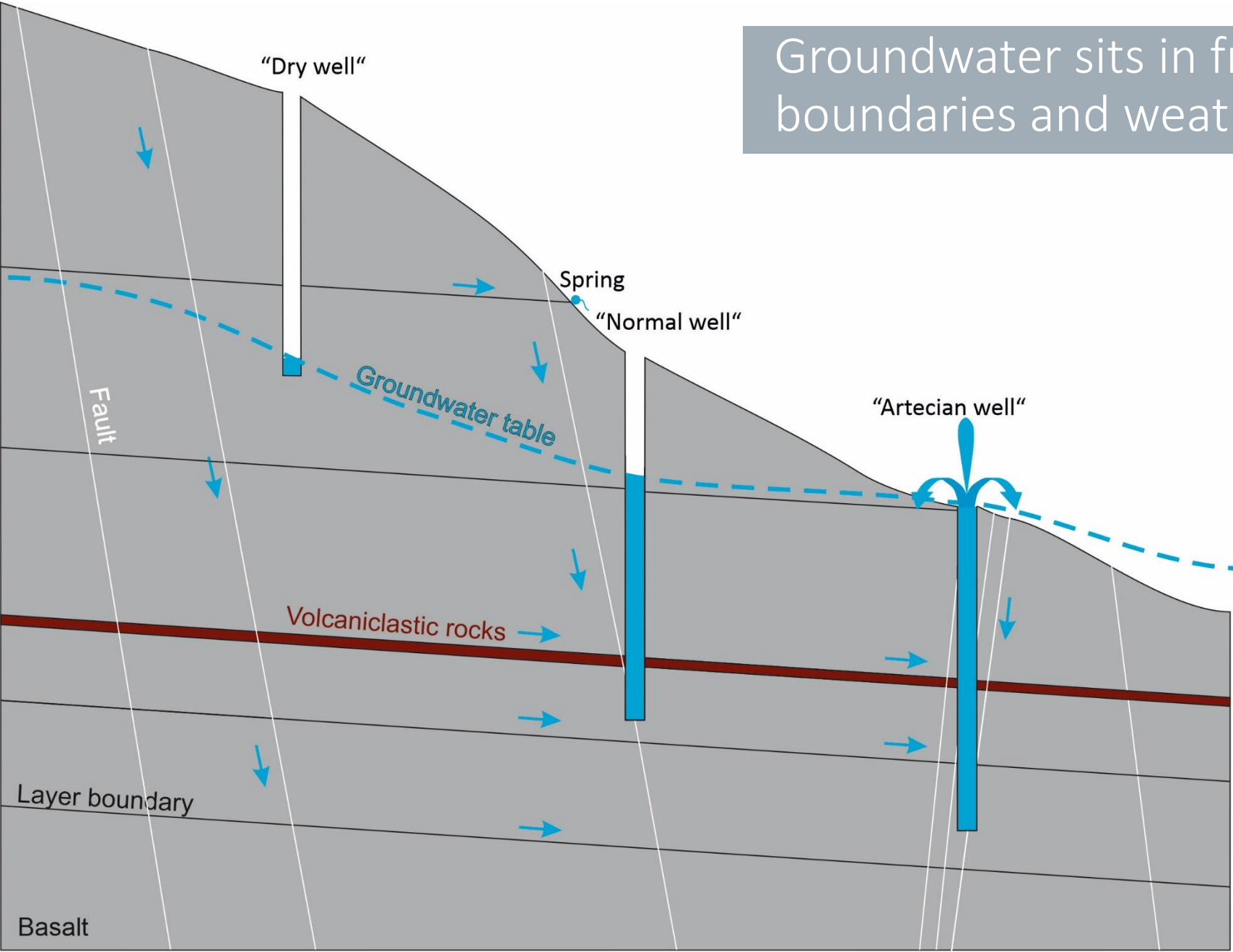




Groundwater - Faroe Islands

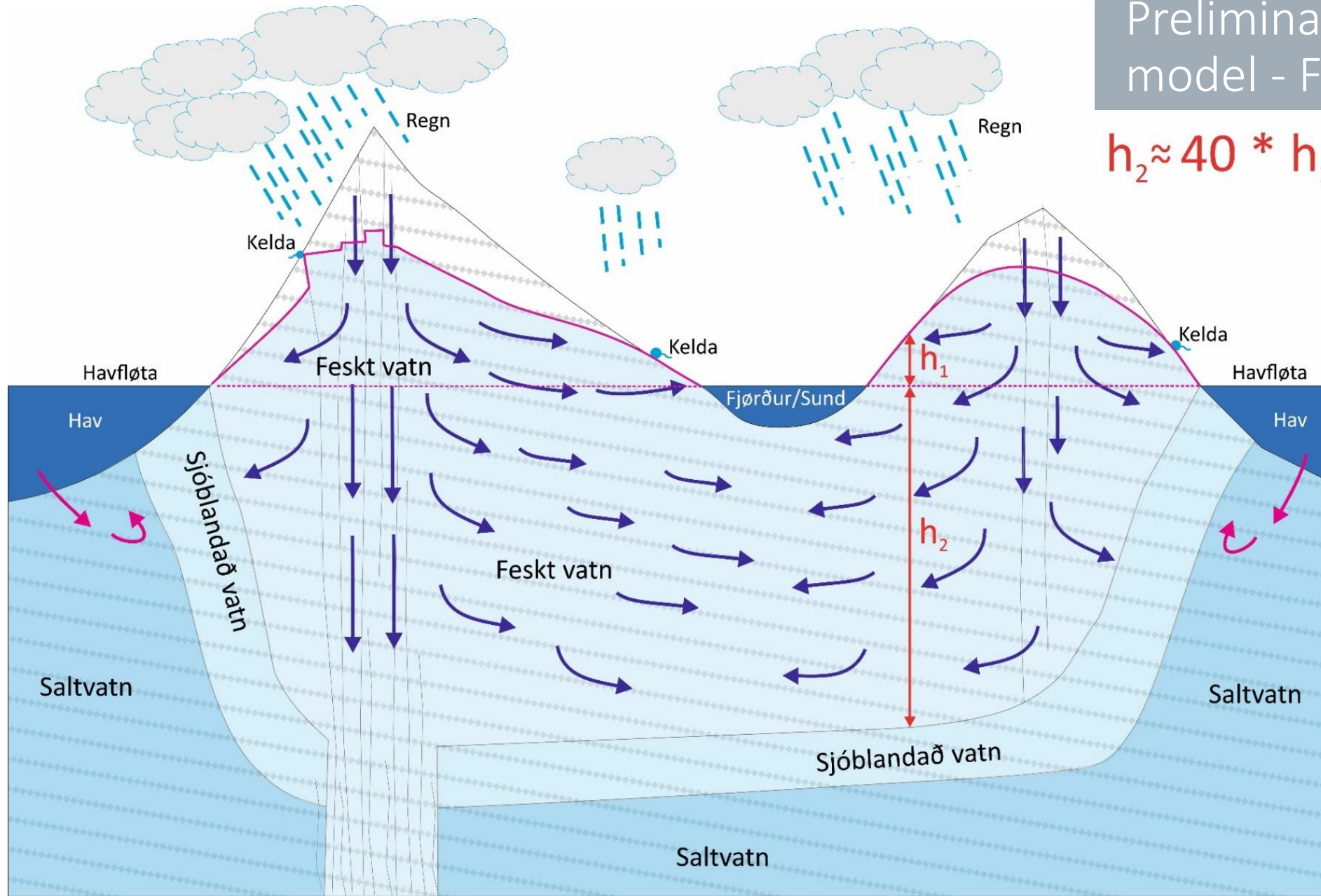
- Faroe Islands are volcanic islands

Groundwater sits in fractures, layer boundaries and weathered lavas



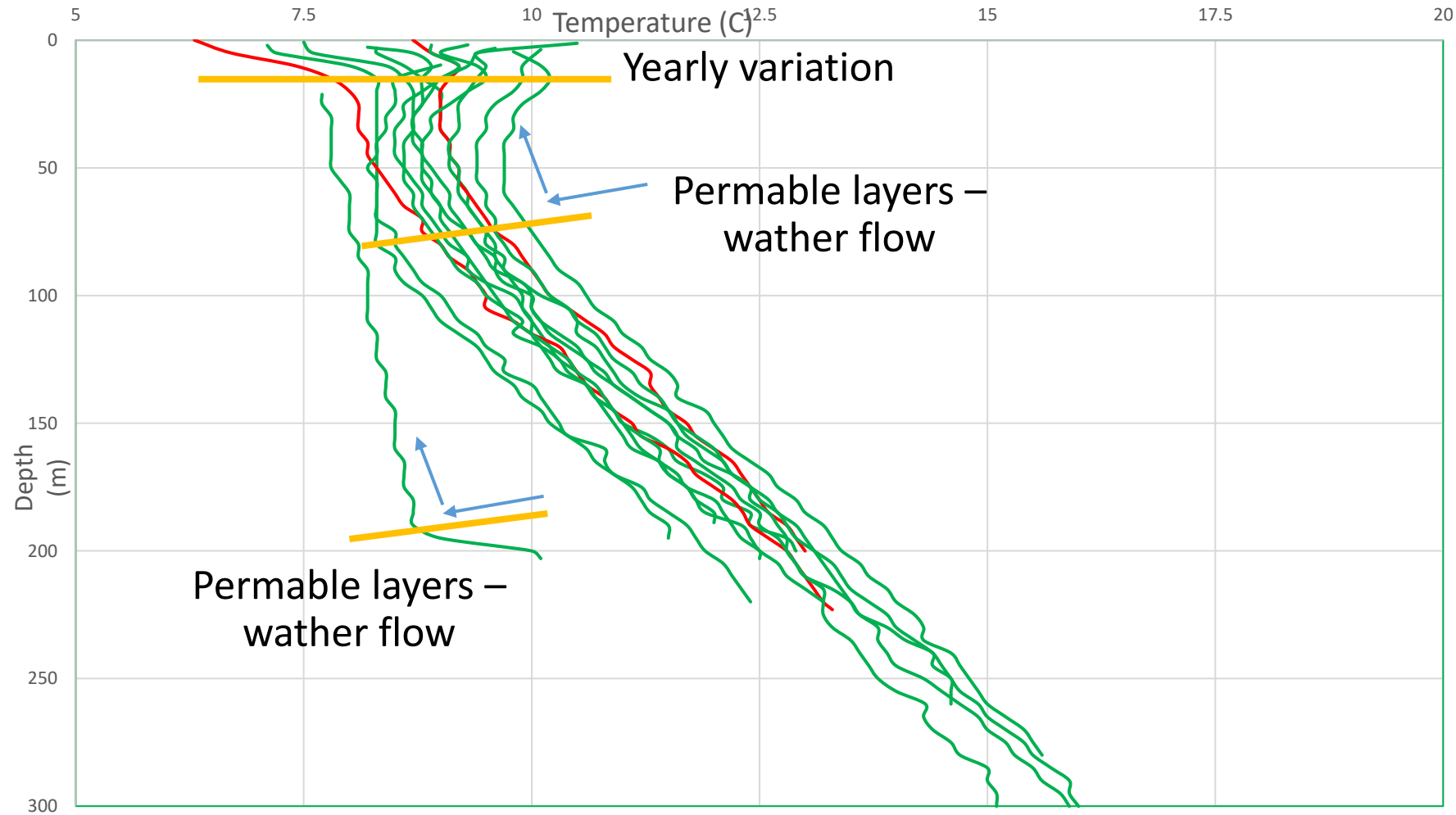
Preliminary groundwater model - Faroe Islands

$$h_2 \approx 40 * h_1$$



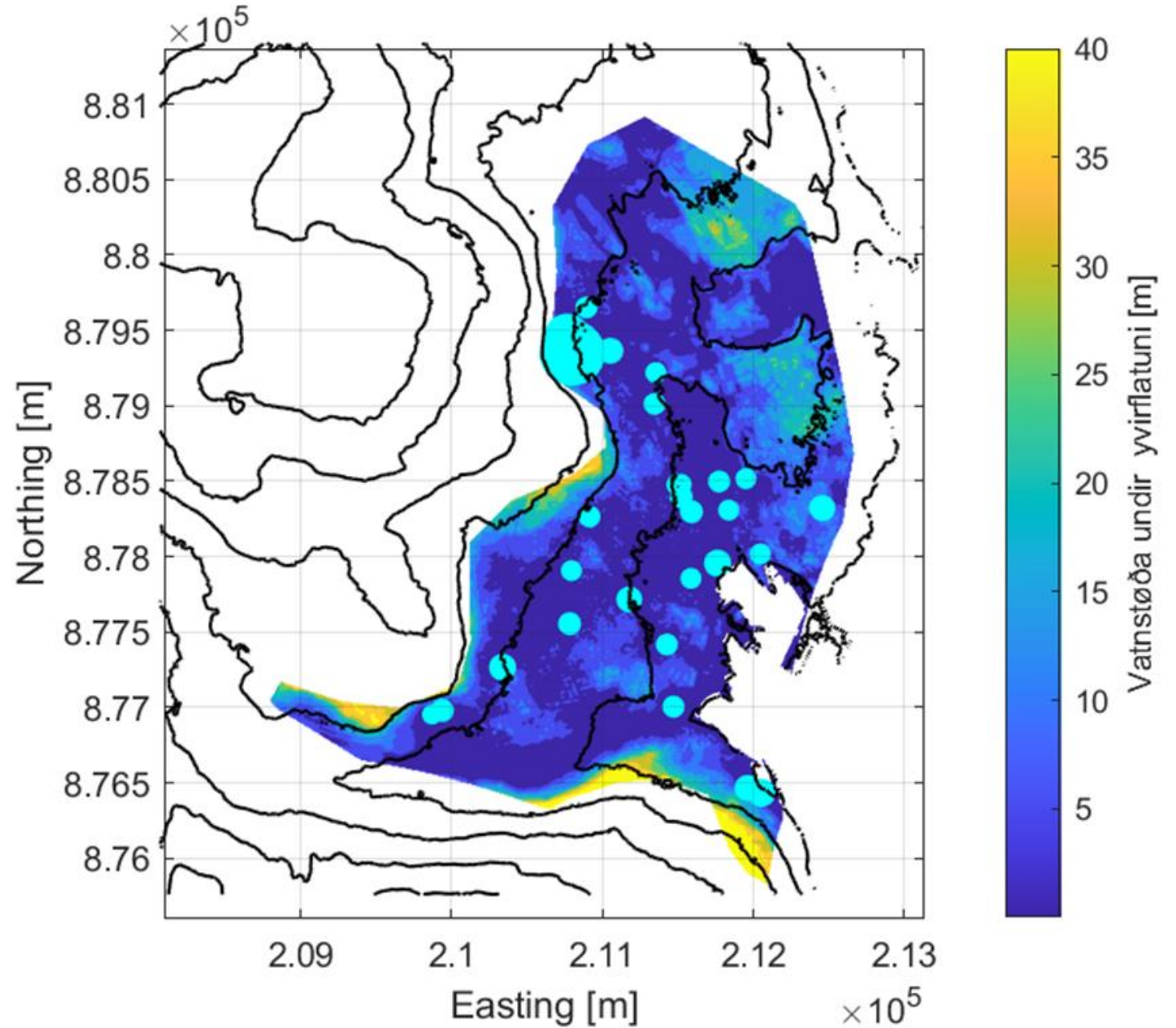
Measurements

1. Temperature measurement each 5 m down through the well
2. Groundwater flow
3. Groundwater table
4. Calculate geothermal gradient



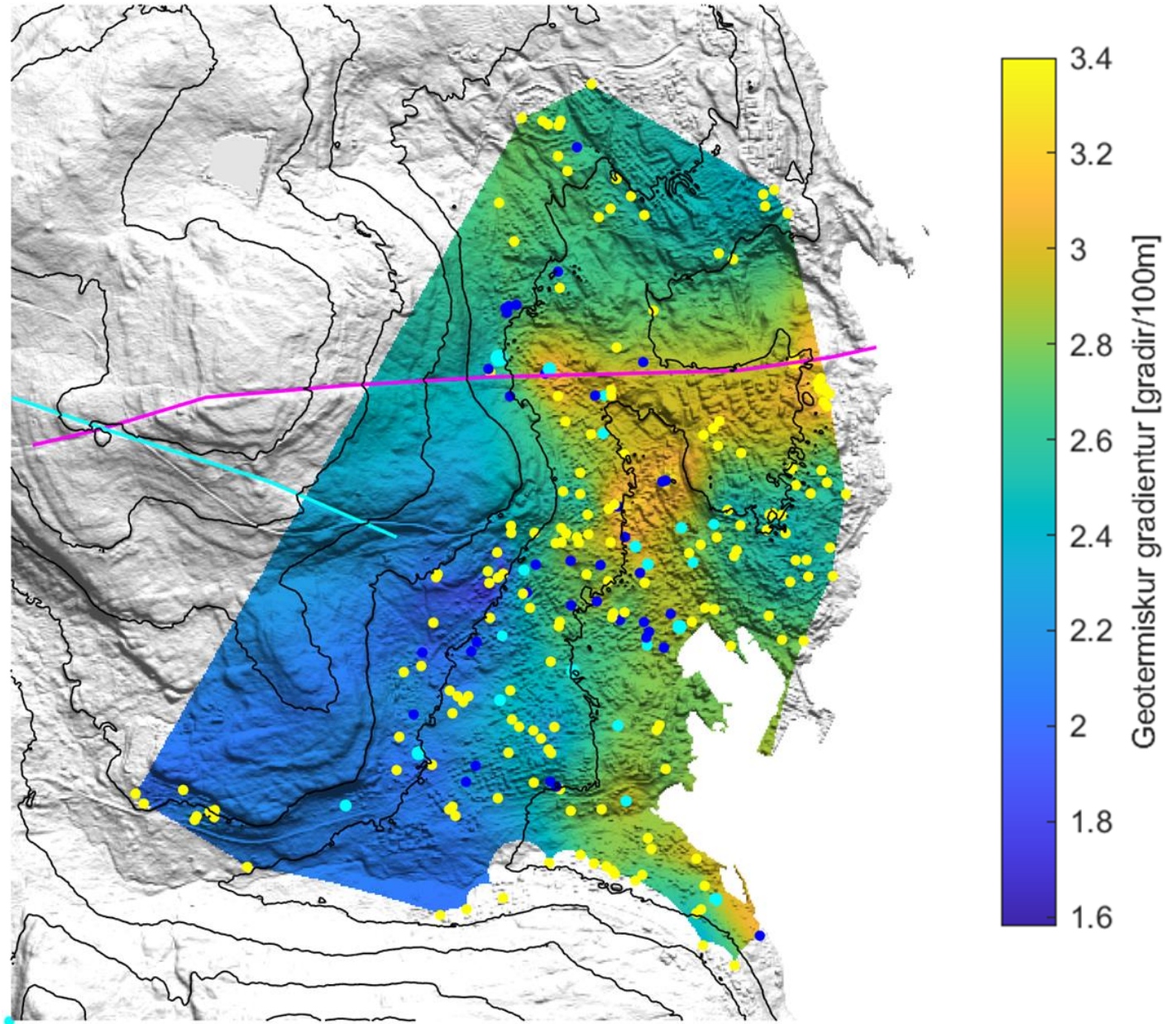
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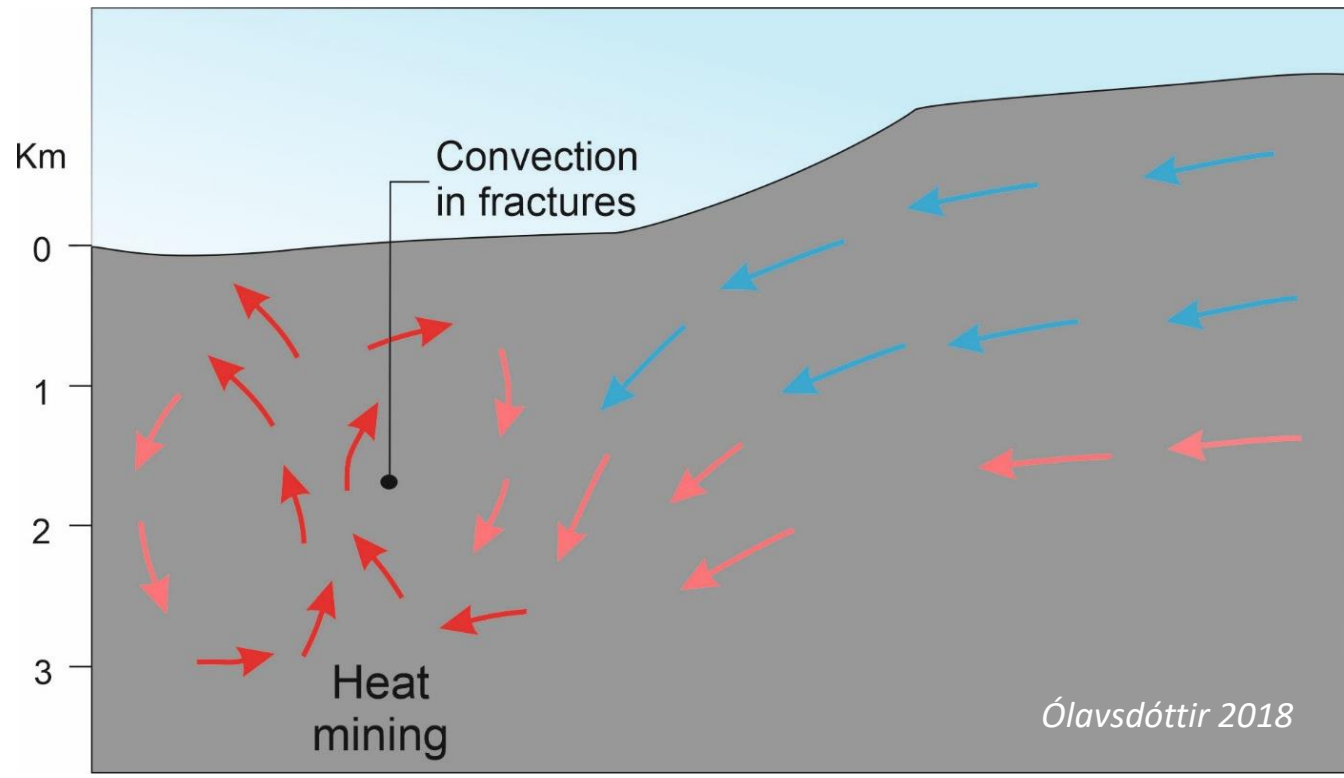
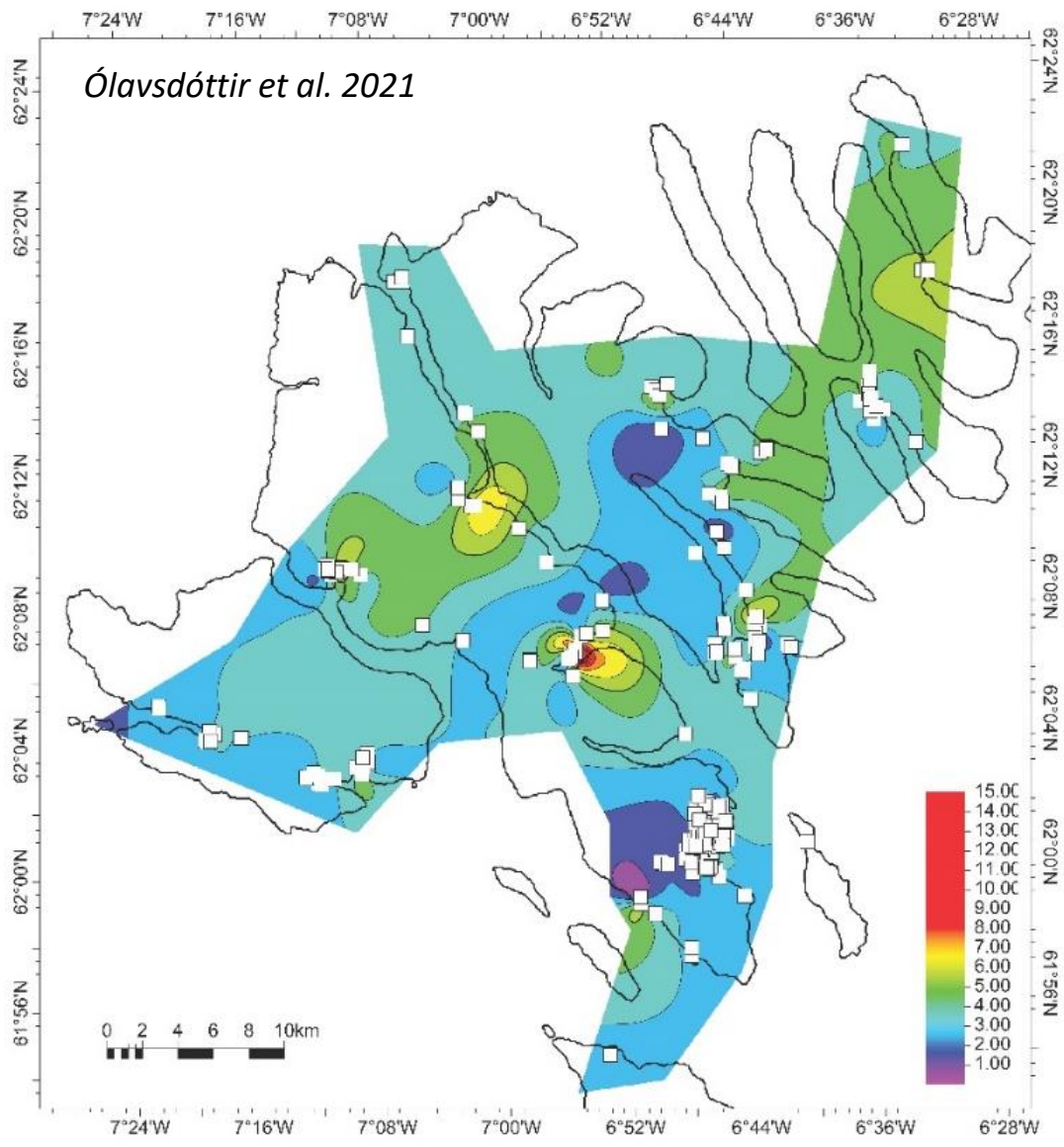


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- Geothermal gradient
- Heat mining



Geothermal map in the Faroe Island constructed from 500 wells. Calculated from the mean surface temperature and the bottom hole temperature

Further work to understand the un-answered questions

- 9 years - 27°C warm water - 16 m³/h
- Meteoric water
- Aluminum, boron, cyanide, fluorine and arsen a bit hit
- pH virðið to high
- Max. temperature of water = 38°C
- Age of water = 90% older than 1955 and 10% younger

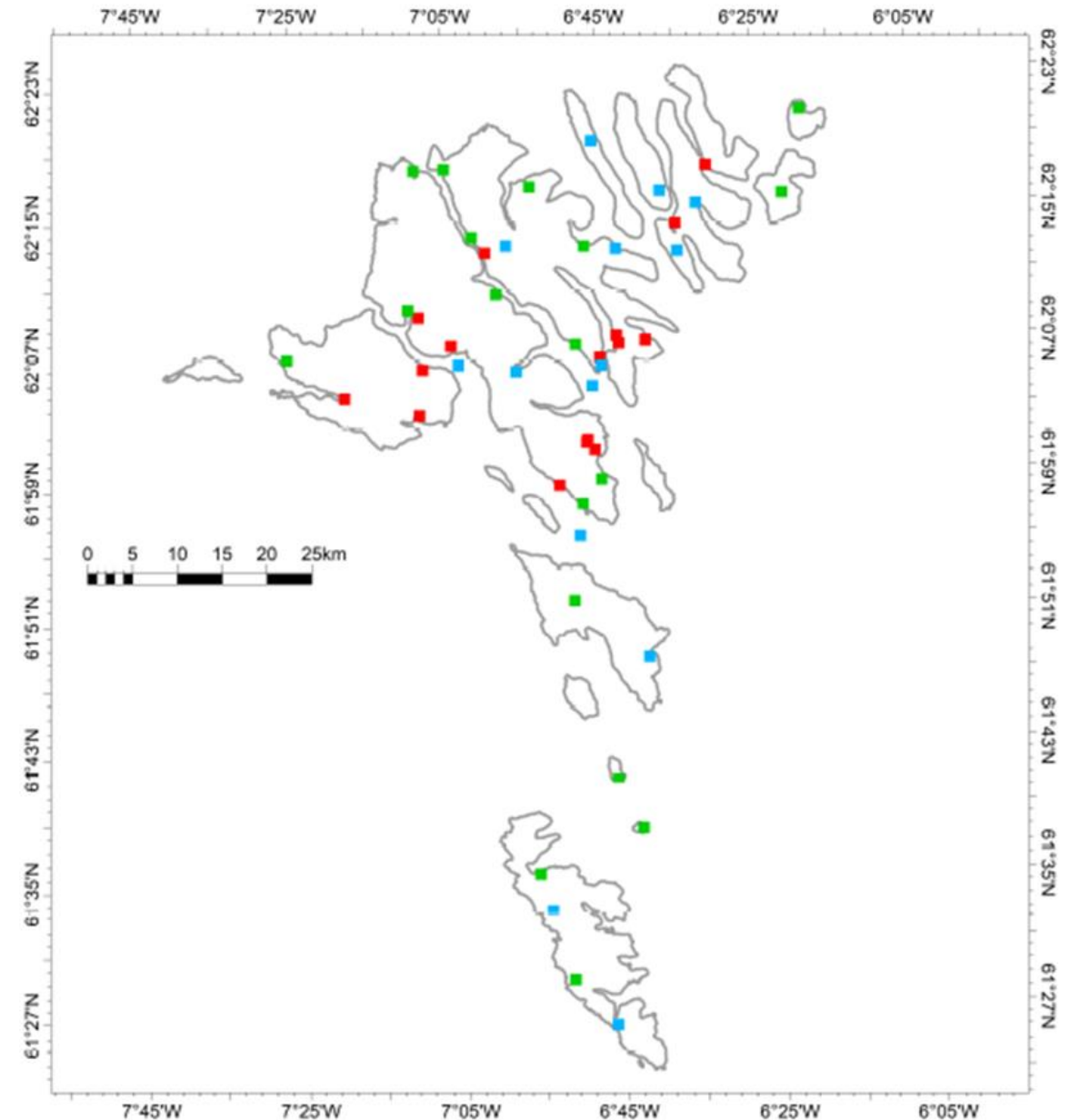


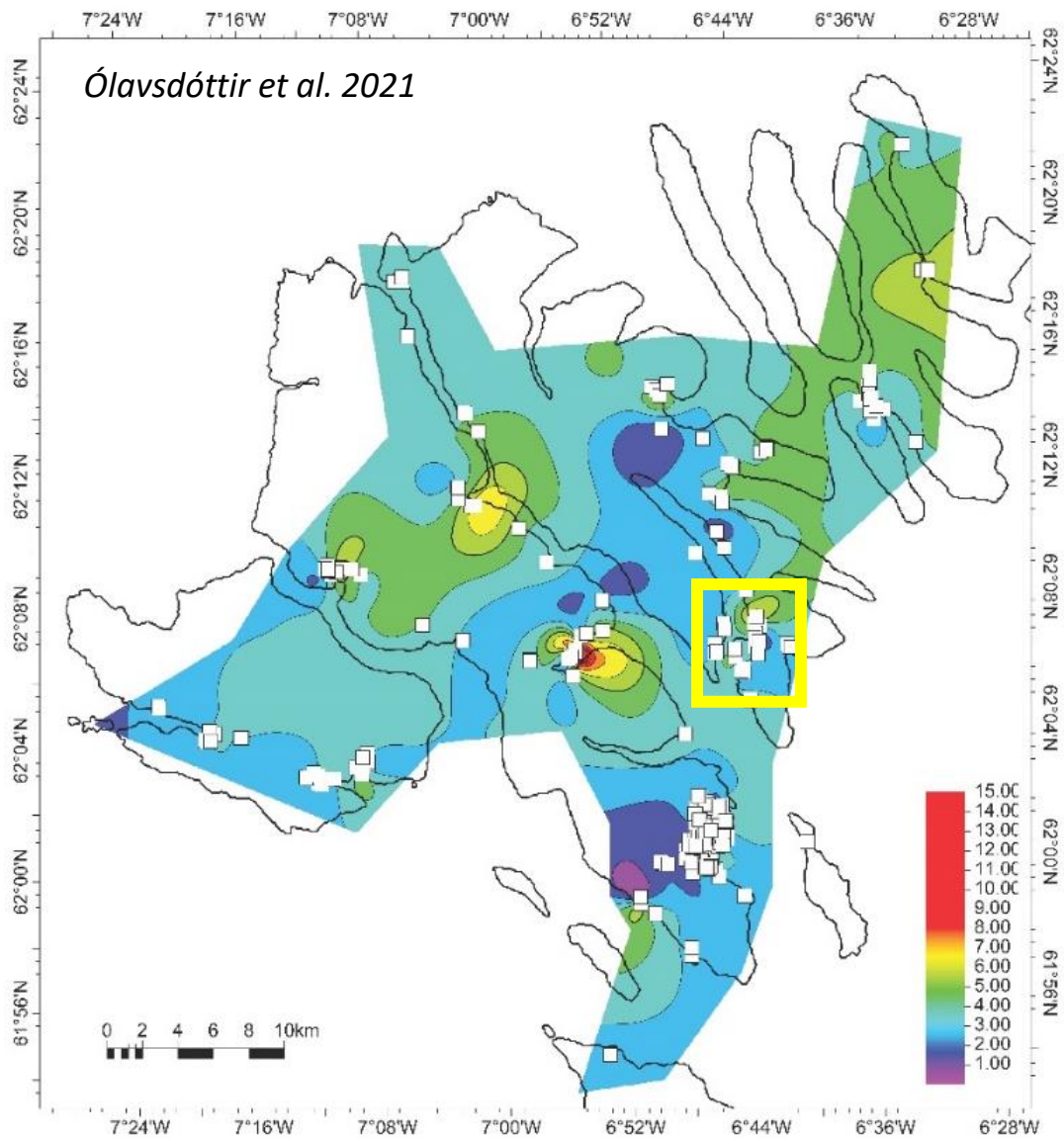
Ongoing Project

Mapping and interpretation of groundwater geochemistry within the Faroe Islands Basalt Group

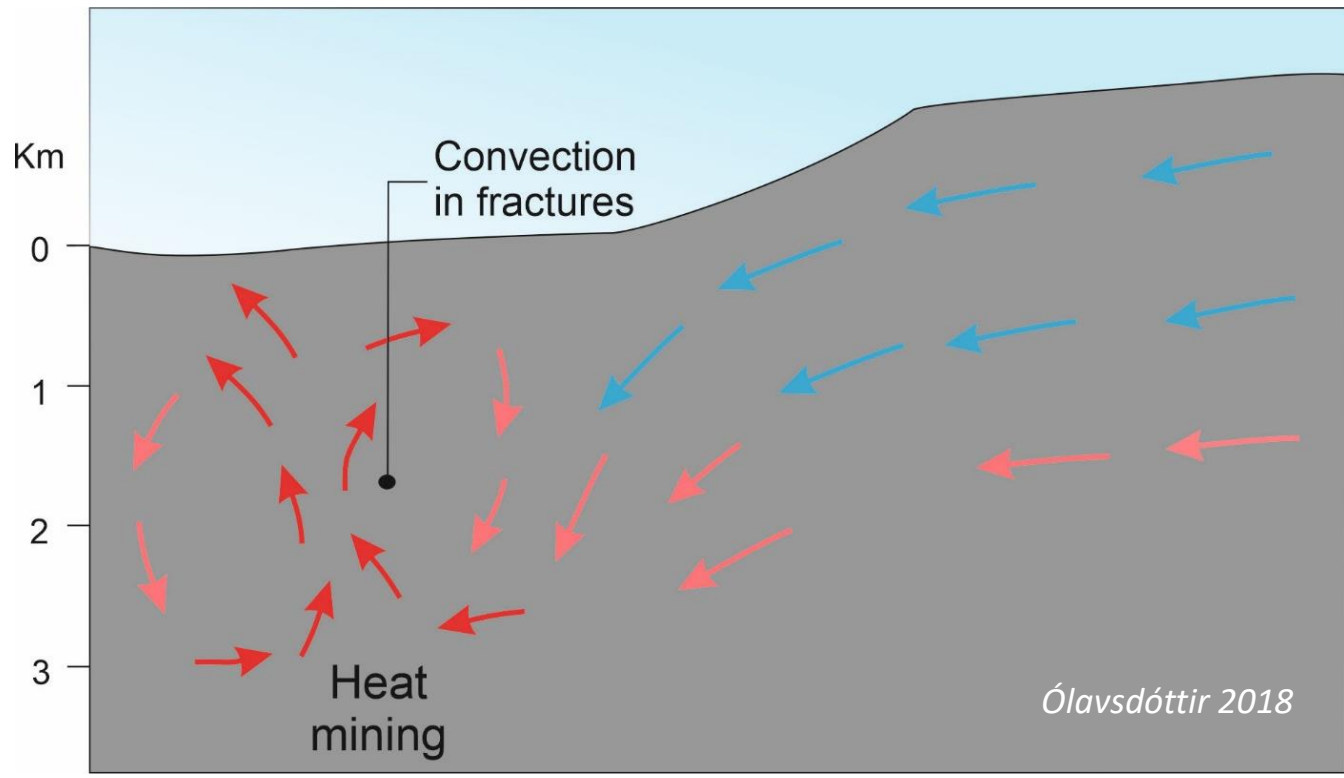
Aim of project:

1. To initiate a groundwater chemistry map of the groundwater aquifers for better understanding
2. For a chosen area - pumping tests, measure wells continuously and sample from surface water in the drainage area
3. Will become an online public database



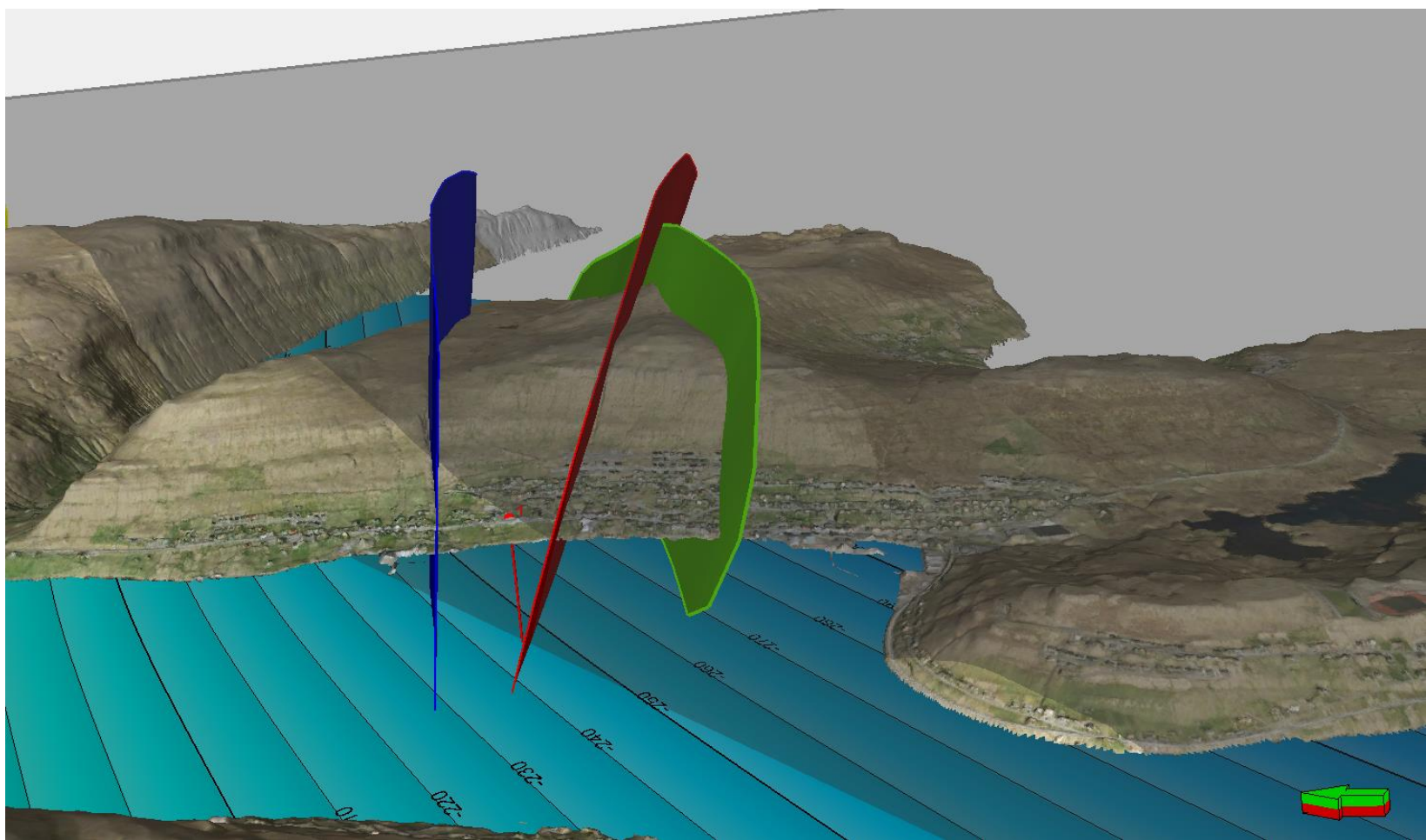
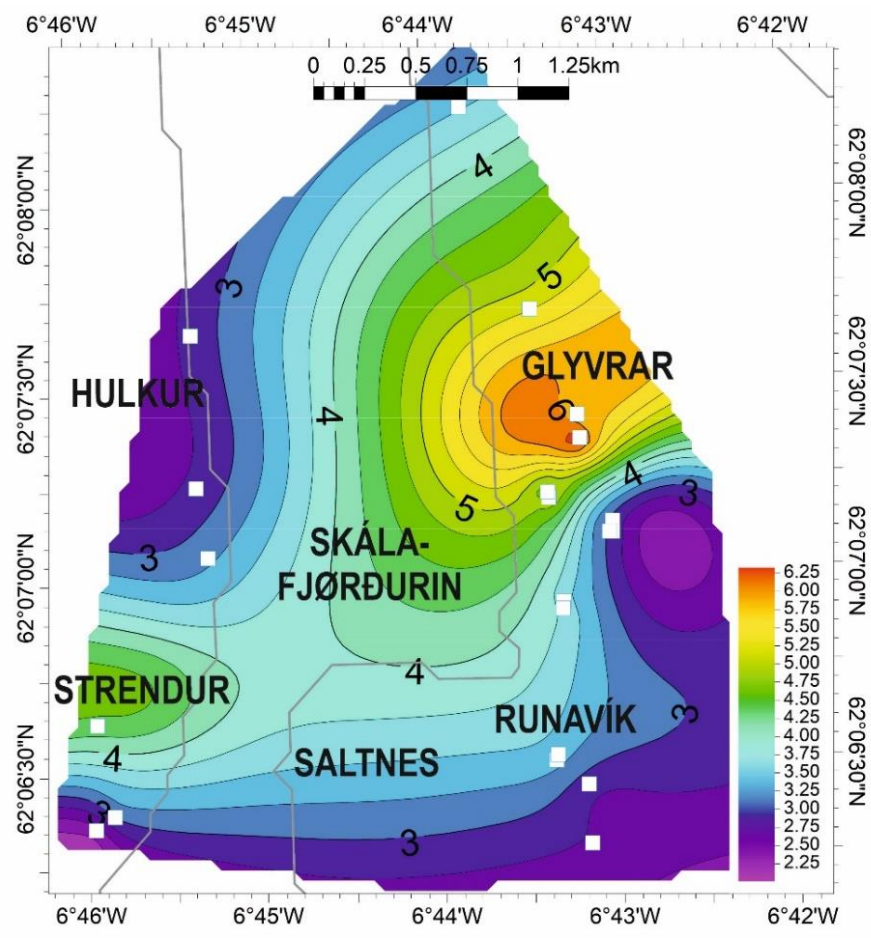


- Geothermal gradient
- Heat mining



Geothermal map in the Faroe Island constructed from 500 wells. Calculated from the mean temperature and the bottom hole temperature

Glyvrar heat mining project

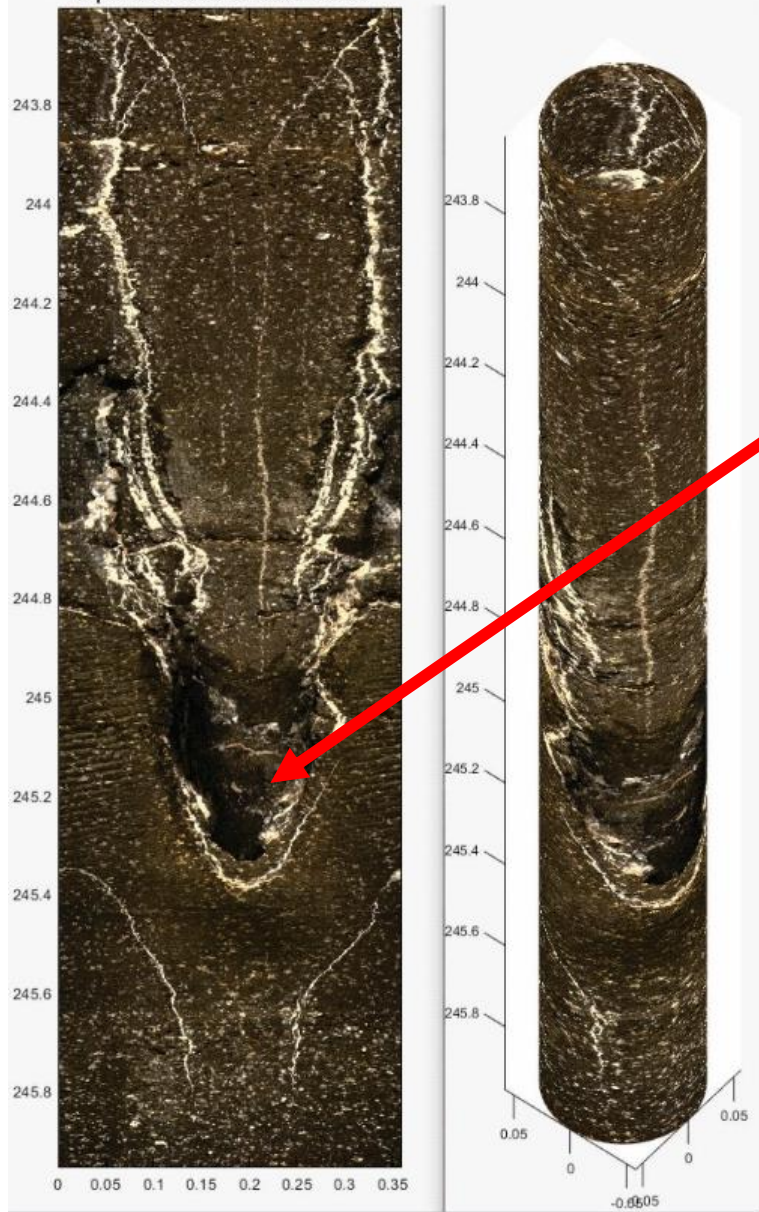


Glyvrar heat mining project

**Artecian well:
4.5 m³/h of 24°C**



N Optiskur televiwar 360° N



Legislation and data management

- First groundwater law came through the parliament in June 2023
 - Gives the government the rights over the groundwater
- First groundwater licence according to the groundwater law was given last week
- Administration of licence awards and the following supervision
- Management and systemizing data

A photograph of a subsea roundabout. In the foreground, a row of approximately 15 wooden figures, resembling stylized human forms, stands on a platform. The background shows the interior of a tunnel with curved walls, illuminated with vibrant blue and purple lights. A semi-transparent dark blue banner is overlaid in the center of the image, containing the text "Thank you for your attencion".

Thank you for your attencion

Draining groundwater

