

# Radon concentration in water in Iceland

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# Outline

- Little bit of history, geology and why we did the radon research
- Methodology of the two research
  - First research, 2003-2008
  - Second research, 2016-2019
- Results
- Conclusion



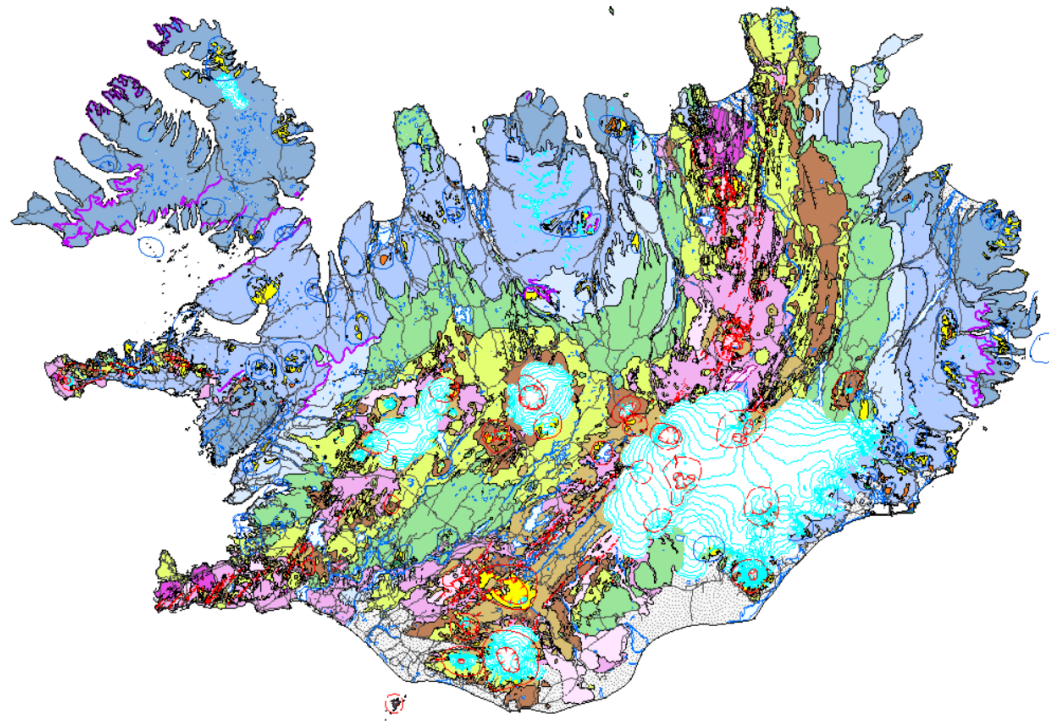
# Short history of radon measurements in Iceland

- First radon measurements were done in 1904-1906 in geothermal springs by Thorkell Thorkellson
  - concentration ranging from 21 to 8258 Bq/L
- Radon measurement in Iceland have mostly been done in geological research
- First measurement of radon in drinking water were done in 1982 in 18 houses
  - All results below detection limit 0.4 Bq/L
- Survey of radon in indoor air in 250 homes
  - Mean 13 Bq/m<sup>3</sup> and median 9 Bq/m<sup>3</sup>
- Survey of radon in hot and cold water 2014-2015 (Iceland GeoSurvey)



# Natural radiation in Iceland

- Basalt bedrock, low in natural radioactivity
- Typical gamma background,  $\sim 50$  nSv/hour
- Very little radon except in hot springs and geysers



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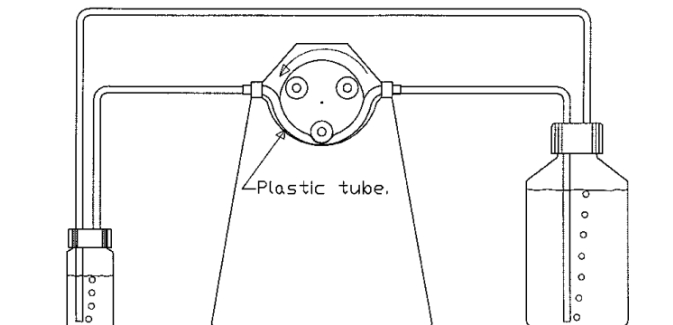
# Why?

- Need to be sure what you think you know
- The samples from 2003-2008 were measured by University of Iceland in cooperation with Hrefna Kristmansdóttir. It was a part of a larger study.
- The results had not been fully published before
- Data was missing from the southern part of Iceland so more samples were gathered, hence the sample series from 2016-2019



# Methods – LSC system 2003-2008

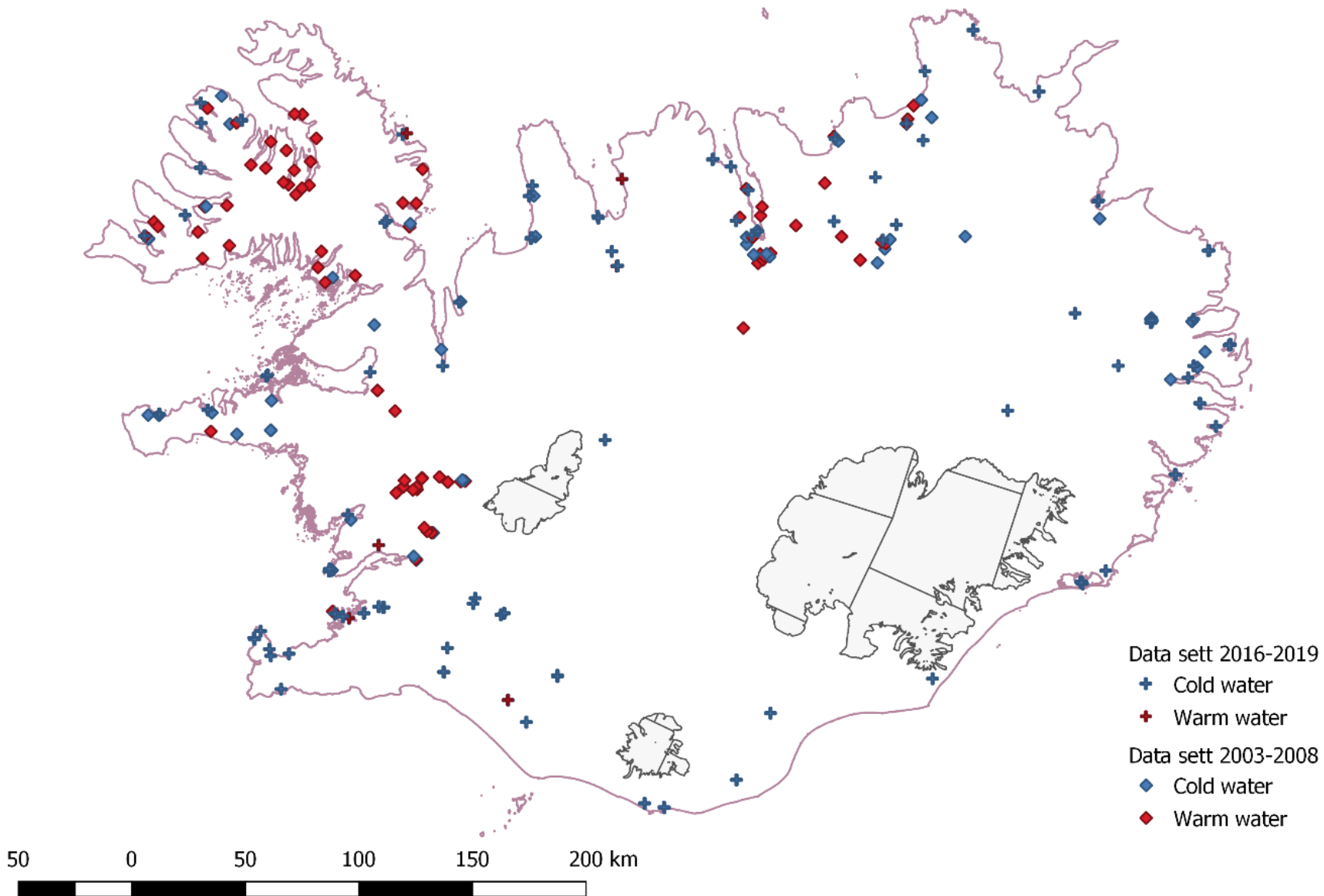
- Liquid scintillation system
  - 15 ml toluene
  - 200 ml water samples
  - Radon transferred with air bubbles in a closed system
- Specialized MCA to measure radon
  - Counts Bi-214 and Po-214 pulse pairs
- LLD: 8 mBq/L with a 3 hour counting time
- Samples taken with care to minimize radon losses
- Samples from hot and cold water, boreholes, springs
- Other substances measures (e. SiO<sub>2</sub>, Mg, Fe, Al, O<sub>2</sub>, H<sub>2</sub>S) and variables such as pH and conductivity



# Methods – RAD7 – 2016-2019

- RAD7, a solid state detector
- 250 ml samples in glass bottles
- Radon transferred with air bubbles in a closed system
- LLD: 0.37 Bq/L in 1 hour counting time
- Samples in glass bottles, taken with care to minimize radon losses
- Samples mostly cold water from the tap





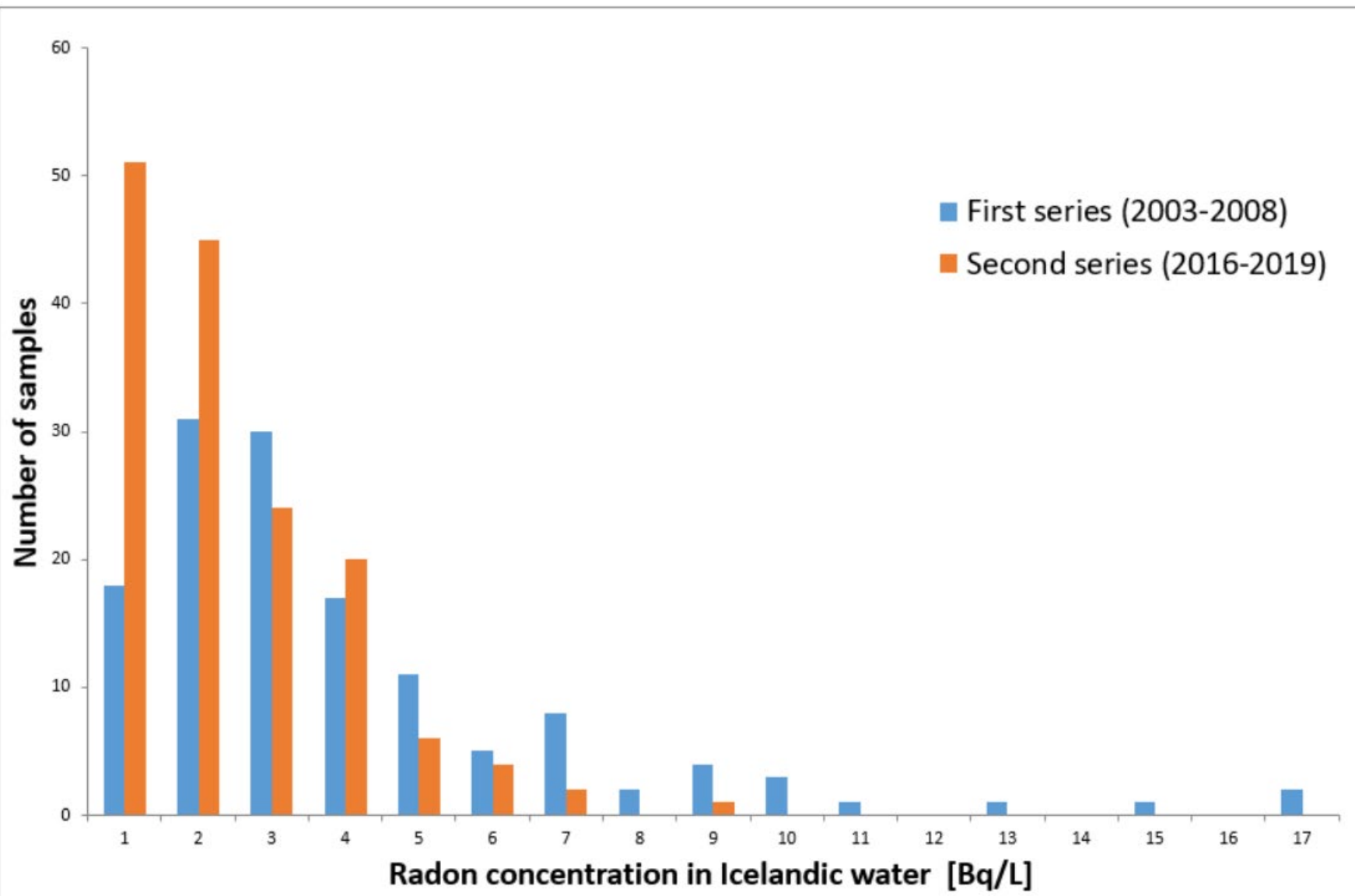
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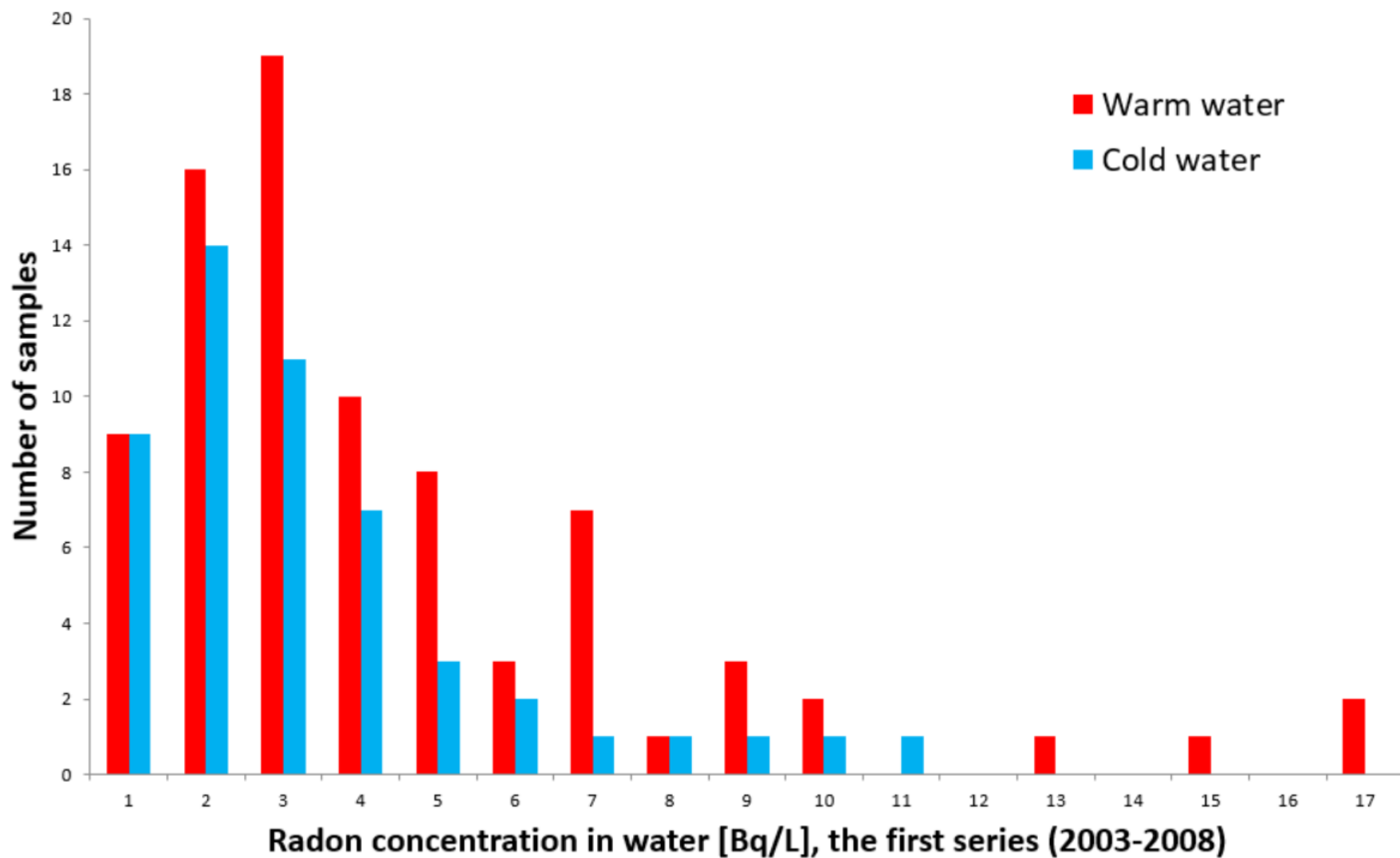
# Results

- Survey 2003-2008
  - 134 samples
  - Range: from 0.3 to 16.9 Bq/L
  - Median: 2.6 Bq/L
  - Average: 3.5 Bq/L
- Survey 2016-2019
  - 153 samples
  - Ranges: from 0.1 to 8.5 Bq/L
  - Median: 1.5 Bq/L
  - Average: 1.9 Bq/L
  - 18 sample below detection limit





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# Conclusion

- We have a very low radon concentration in both hot and cold water in Iceland
- Found no correlation with radon concentration and other substance or variables in the water
- Radon in water is not a health issue in Iceland





Thank you for your attention



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