# Permafrost and gas vapor diffusion

Alaska DNR SIRG PI, Paul Goodfellow

UAF Professor and Energy Specialist, Art Nash

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# Why is it a problem in Alaska?

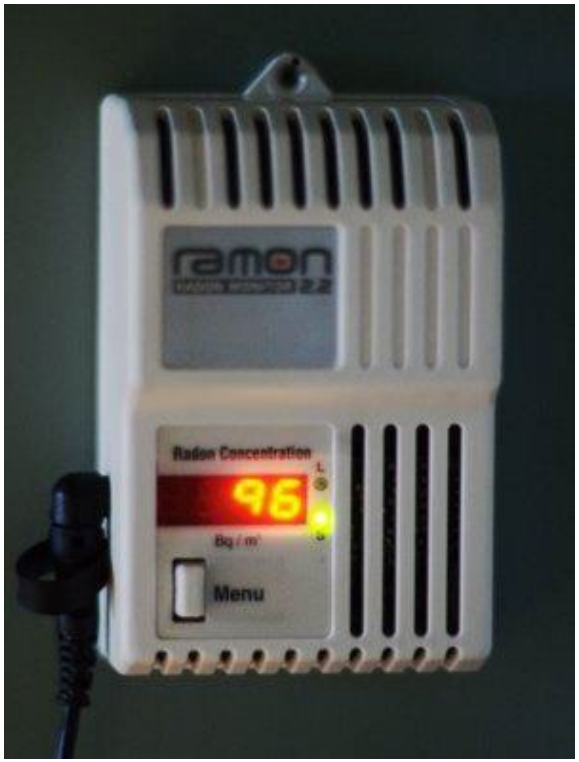
- Alaskan homes are now built tight to keep heat
- Subsurface uranium is scattered throughout AK
- Risk of having lung cancer increases with **any** level of radon (especially with tobacco smoke)

# Types of radon test kits used in AK











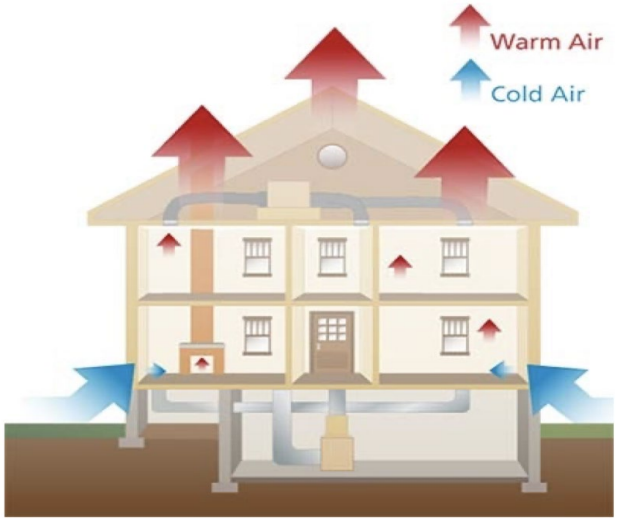

# Home factors leading to high radon levels

- Tightness of immediate soil or presence of ice/ permafrost (24m+ frozen soil) under the building
- Direct contact of the building onto the ground
- Occupants operation of the building

(The only way you will know if your home has radon infiltration is to test!)

(TEST, TEST, TEST!)

# Cool air warms up, rises with radon




https://www.nps.gov/tps/how-to-preserve/briefs/3-improve-energy-efficiency.htm

2022 modeling shows intact permafrost reduces radiation exposure to 10% of ambient levels

# Permafrost is thawing rapidly

There is a 42% expected loss of permafrost in the Arctic Circumpolar Permafrost Region by 2050

Blouin and Glover (2022) thawed samples from -18C to +5C, measuring gas release at each degree, and found that the most permeability change was from -5C to 1C

# Methane diffusion

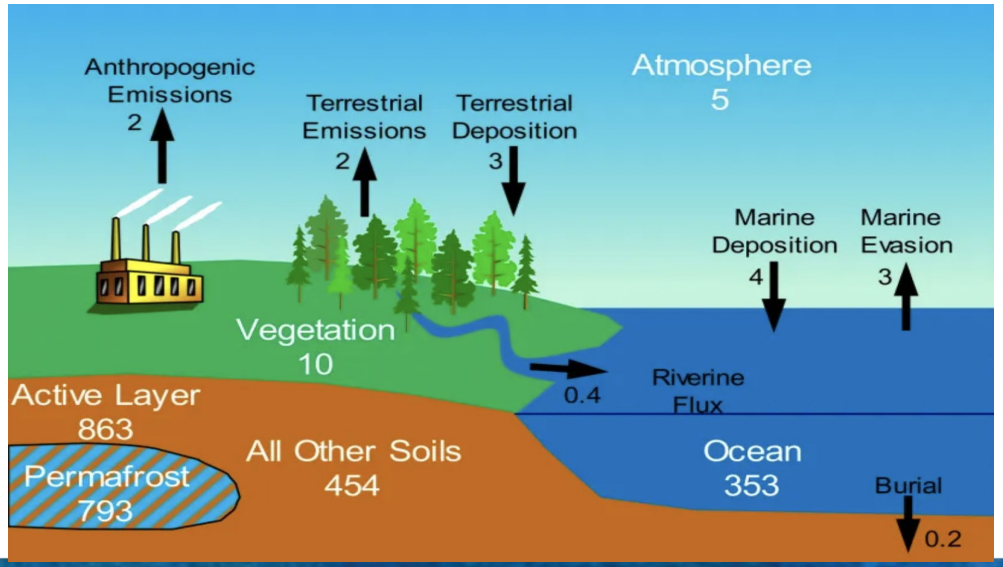
- Across arctic and boreal ecosystems, permafrost thaw is resulting in elevated methane efflux
- Thaw related surface subsidence and the resulting saturation of soils increases the activity of methanogenic microbes producing more methane
- Methane can serve as a carrier gas that increases the diffusion of radon from subsurface soils

# Mercury

- Atmospheric mercury binds with organic material in soil, is buried on sediment, and becomes frozen into permafrost

- Northern Hemisphere permafrost regions have the largest mercury reserves (2x the Hg as all other soils, air and ocean) and may

  rise with radon/methane



# Questions?

Paul Goodfellow (radon) paul.goodfellow@alaska.gov

ario Muscarella (methane) memuscarella@alaska.edu

Art Nash (radon) alnashjr@alaska.edu

Emily Seelen (mercury) eseelen@alaska.edu

Megan Andersen (soils) mandersen3@alaska.edu