Natural radioactivity of Slovenian soils

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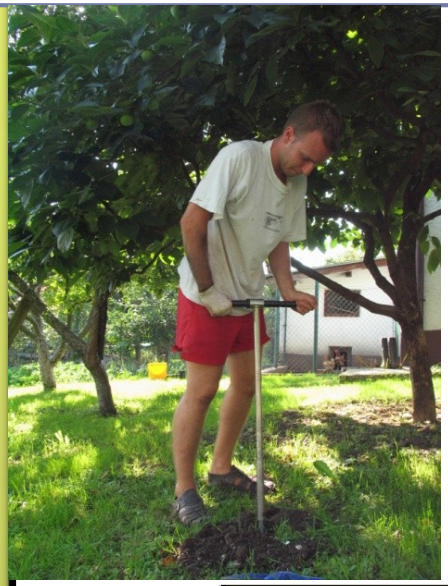
Introduction

- history of research of natural radioactivity in Slovenia
  - systematic radon survey in living and working environment
    Humar et al., 1992; Vaupotič et al., 2010
  - radium and uranium in ground, spring and surface waters
    Kobal et al., 1990; Popit et al., 2004; Vaupotič, 2002
  - equivalent uranium and equivalent thorium concentrations in soil samples from 30 cm of depth (60 points)
    Andjelov and Brajnik, 1996; Brajnik et al., 1992
  - ^{40}K, ^{232}Th, ^{238}U, ^{226}Ra, ^{228}Ra in terra rossa and eutric cambisol soil samples from 80 cm of depth within regular 25 m × 25 m grid
    Vaupotič et al., 2007
  - radon measurements in soil gas at 70 points
    Vaupotič et al., 2008
- **soil samples collected at 70 points**
  - **analysed for ^{40}K, ^{232}Th, ^{226}Ra**
  - **^{234}U and ^{238}U (29 points)**

Analysis of soil samples



sample collection and preparation:

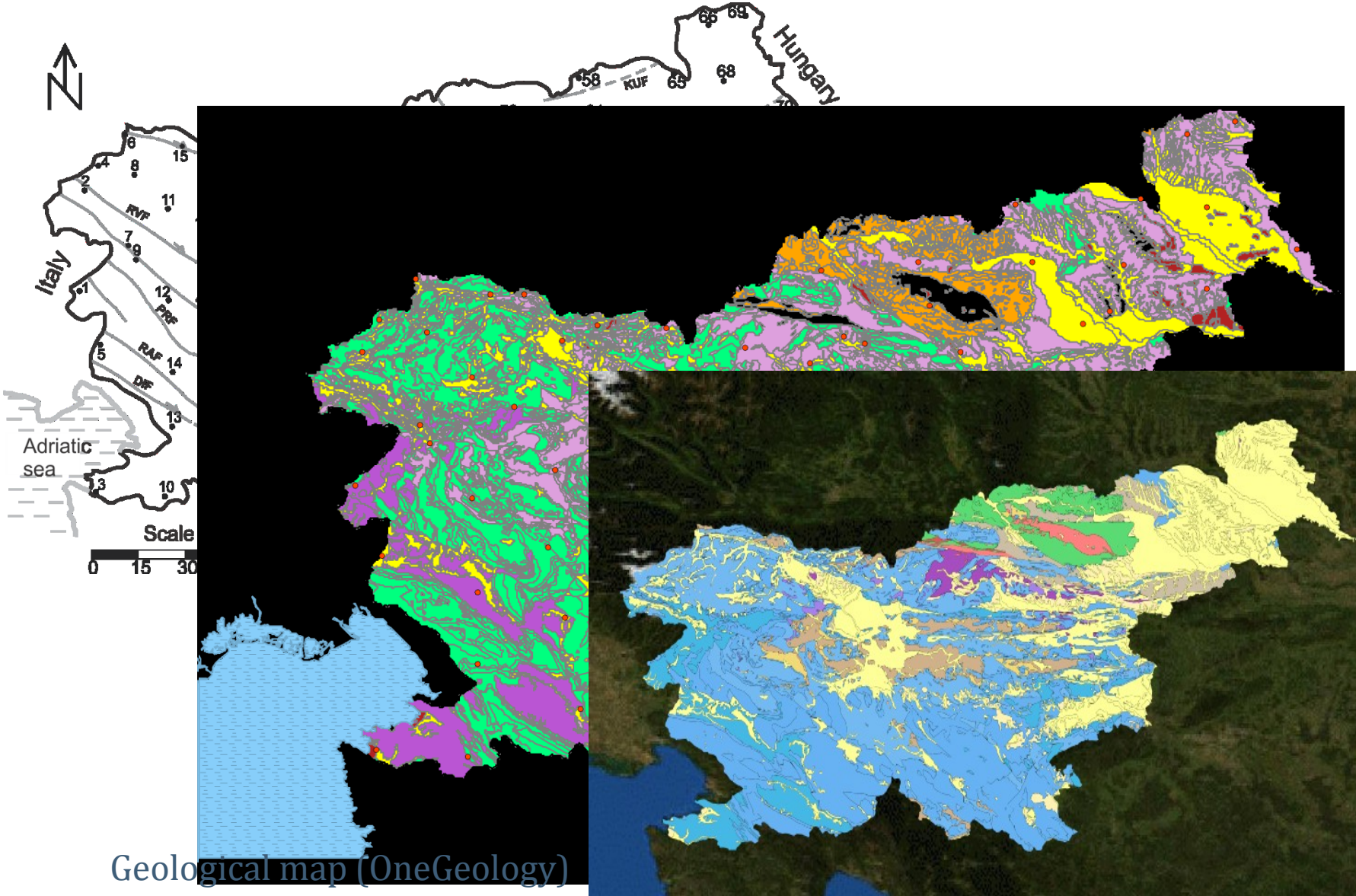
80 cm of depth, drying in air and then at 105 °C until the constant weight

high-resolution gamma spectrometry

radiochemical preparation → alpha spectrometry

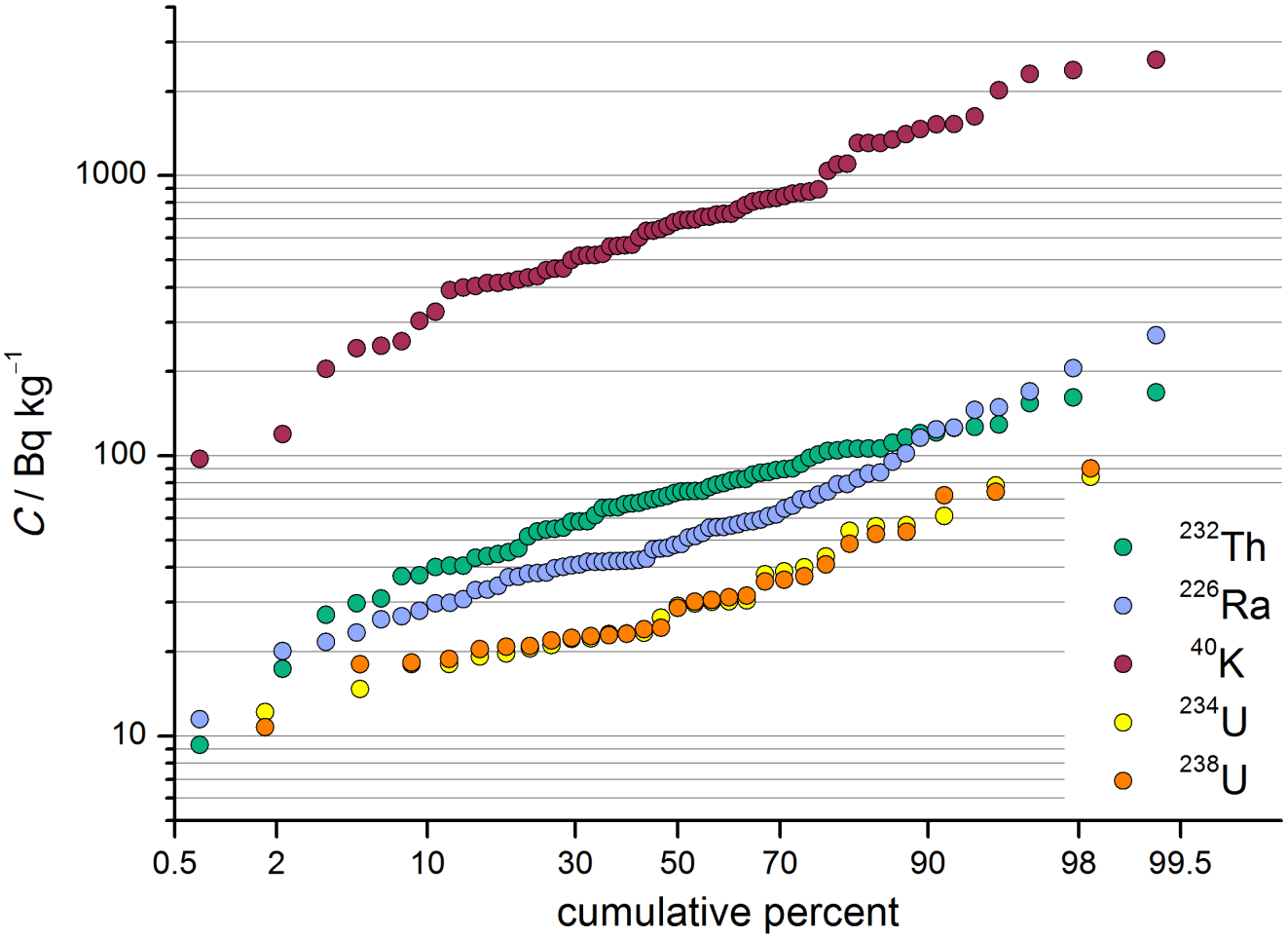
^{40}K ^{232}Th ^{226}Ra ^{234}U ^{238}U

Measurement locations

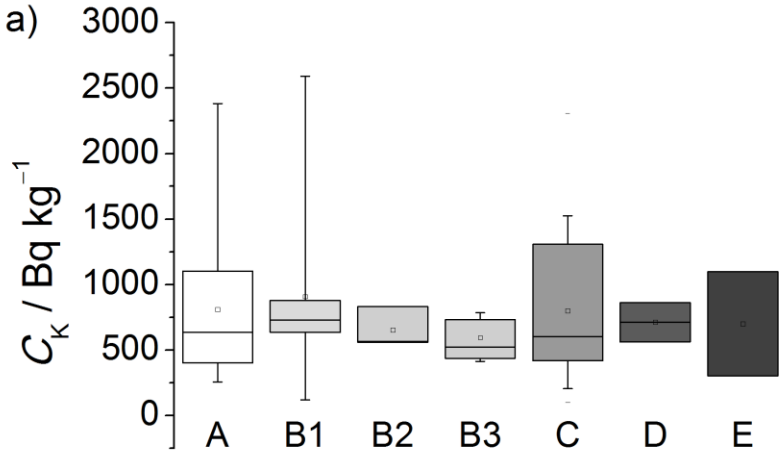


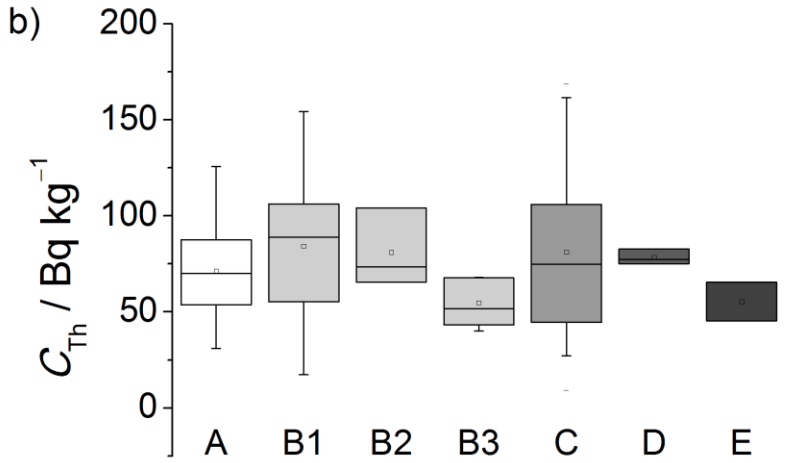
Geological map (OneGeology)

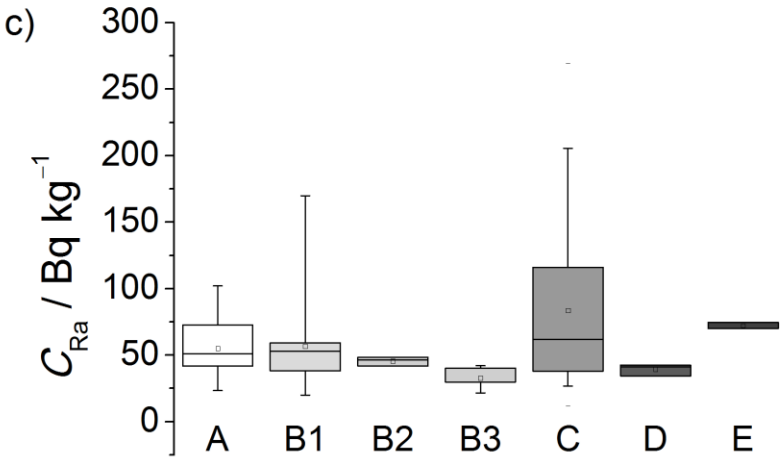
Log-normal distribution

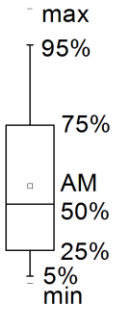


Radionuclides and lithological units



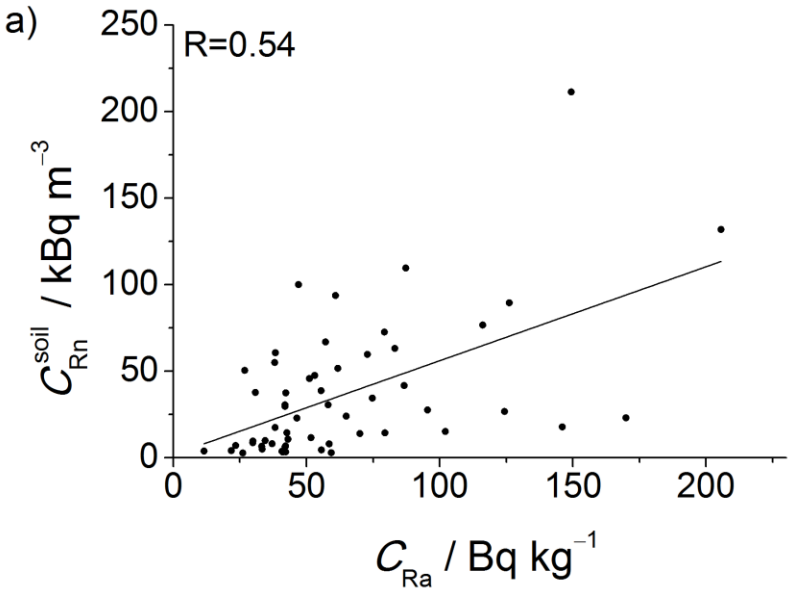


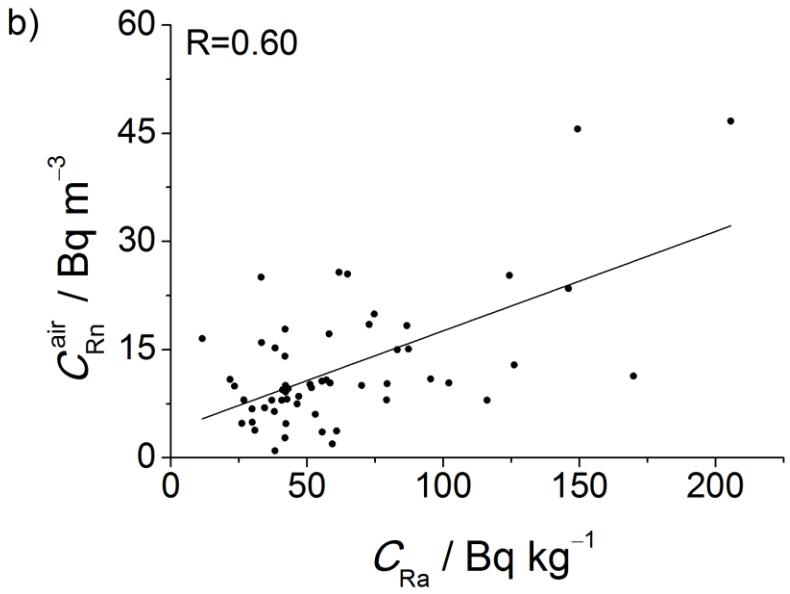




A – alluvial and glacial deposits
B1 – clastic sediments containing clay
B2 – coarse clastic sediments
B3 – flysch
C – carbonates
D – metamorphic rocks
E – sea and lake sediments

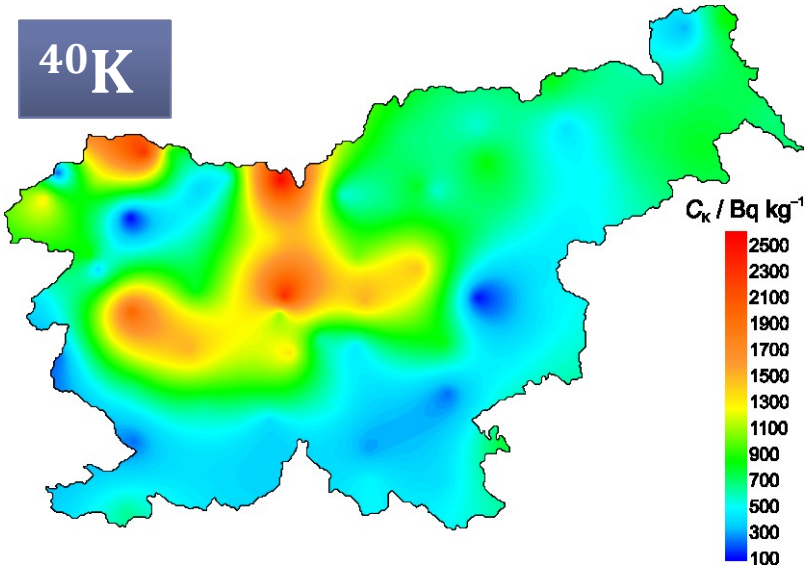
Correlation: ^{222}Rn – ^{226}Ra



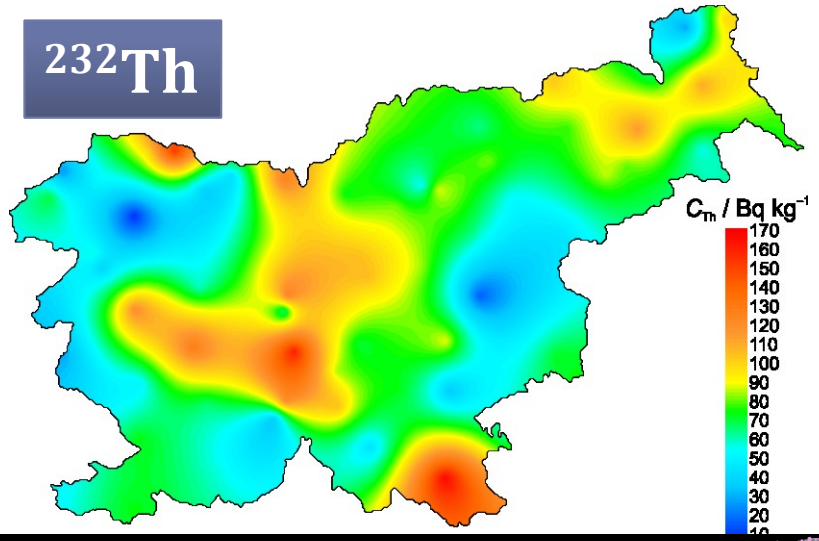


Spatial distribution of radionuclides

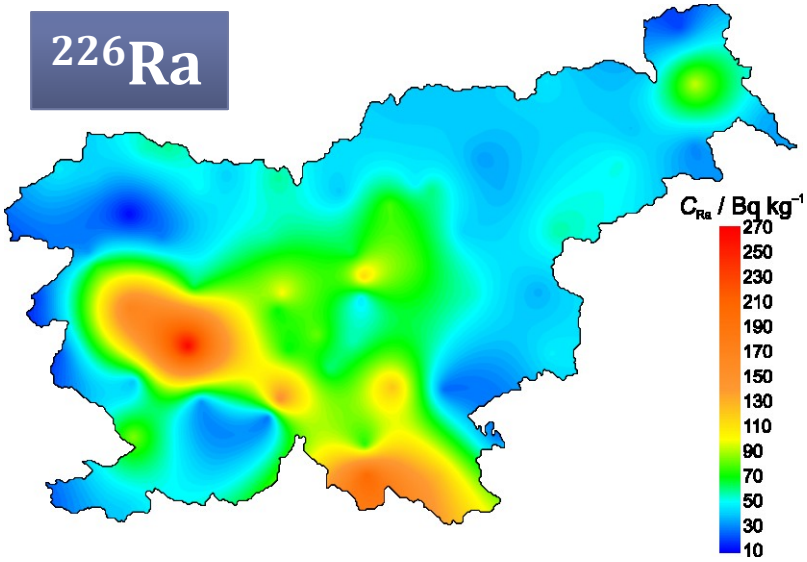
^{40}K

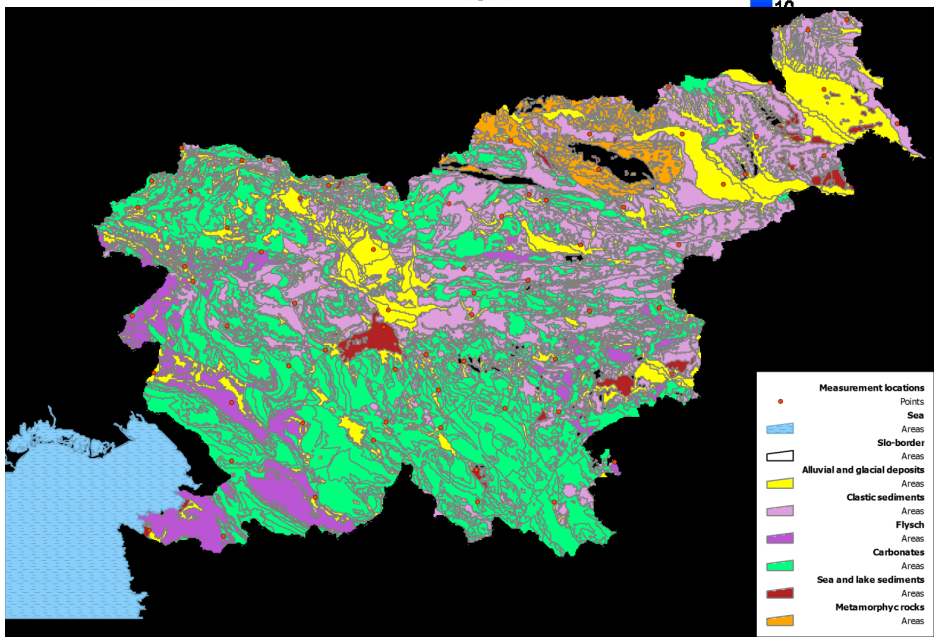


^{232}Th



^{226}Ra





Conclusion

- The highest average values for
  - ^{40}K, ^{232}Th: clastic sediments cotaining clay
  - ^{226}Ra : carbonate rocks
- The lowest concentrations of radionuclides on flysch sediments
- Comparing the results of radon measurements in soil gas and outdoor air with radium levels in soil, relatively good correlations were observed.

THANK YOU FOR ATTENTION!