



**29. SIMPOZIJUM DRUŠTVA ZA ZAŠTITU OD ZRAČENJA
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STUDIJA SLUČAJA SEZONSKE VARIJACIJE KONCENTRACIJE RADONA U PORODIČNOJ KUĆI U SRBIJI

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MOTIVATION

The indoor radon behavior has complex dynamics due to the influence of the large number of different parameters: the state of the indoor atmosphere (temperature, pressure and relative humidity), aerosol concentration, the exchange rate between indoor and outdoor air, construction materials and living habits. As a result, the indoor radon concentration shows a variation, with the usually periodicity of one day and one year. It is also well-known that the seasonal variation of the radon concentration exists. Besides, it is particularly interesting to investigate indoor radon variation at the same measuring location and time period, year after year. In that sense, we performed long-term indoor radon measurements in a typical family house in Serbia. Measurements were taken during the 2014, 2015 and 2016, in February and July, every year. We used the following measuring techniques: active and charcoal canisters methods.

Short-Term Radon Measurements

Continuous Radon Monitor Device Sun Nuclear - model 1029:

The short-term radon measurements are performed with SN1029 radon monitor (manufactured by the Sun Nuclear Corporation, NRSB approval-code 31822). The characteristics of the SN1029 radon monitor declared by the manufacturer are: the measurement range from 1 Bqm^{-3} to 99.99 kBqm^{-3} , accuracy equal to $\pm 25\%$, sensitivity of $0.16 \text{ counts/hour per Bq/m}^3$. With these characteristics, SN1029 radon monitor is defined as a high-sensitivity passive instruments for the short-term radon measurements and it is optimal solution for the radon monitoring in the our laboratory.



METHOD: EERF Standard Operating Procedures for Radon-222 Measurement Using Charcoal Canisters, (EPA 520/5-87-005, *Gray D.J, Windham S.T*, 1987., United States Environmental Protection Agency, Montgomery, 1987)

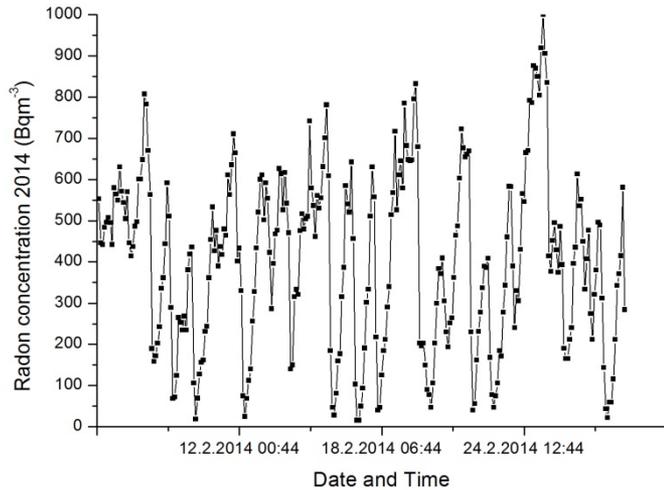


TESTED HOUSE

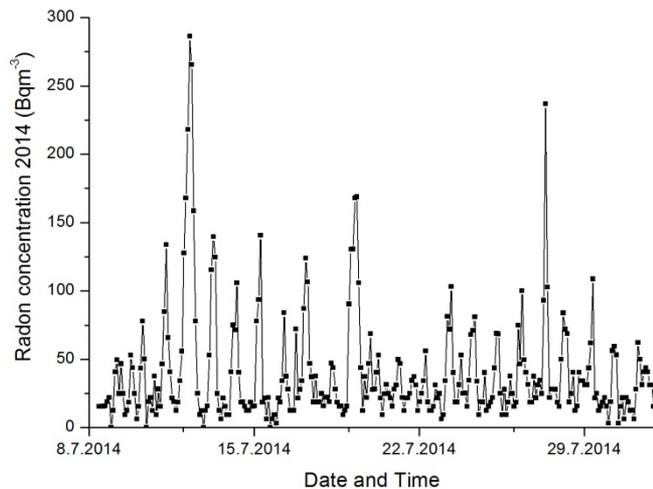


The selected house to measure the temporal variations of radon concentration is a typical one-family detached dwelling house built with standard construction materials such as brick, concrete, and mortar. The house is thermally insulated with Styrofoam. During the period of measurements, the house was naturally ventilated and air conditioning was used in heating and cooling mode. The heating of the house during winter period is based on the electricity.

2014

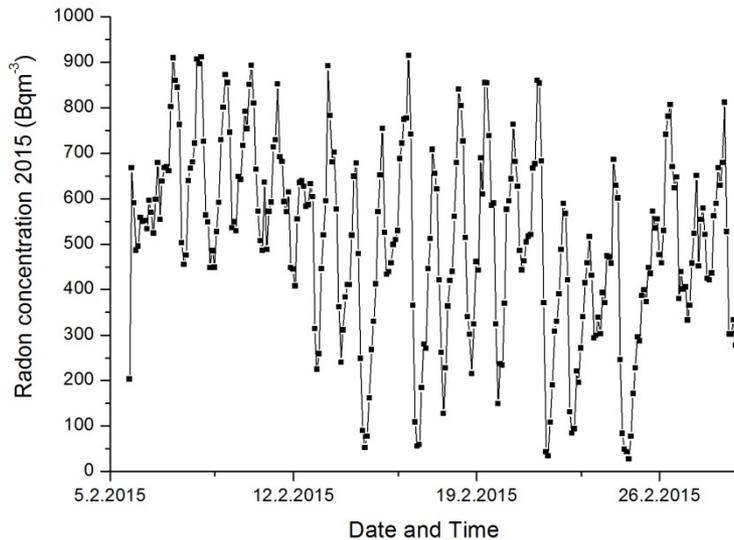


Minimum: 15 Bq m⁻³
Maximum: 1000 Bq m⁻³
Median: 418 Bq m⁻³
AM(SD): 402(216) Bq m⁻³
Temperature: 20.4(0.8) °C
Relative humidity: 67.4(5.7) %
Rn (charcoal canister): 432 ± 10 Bq m⁻³

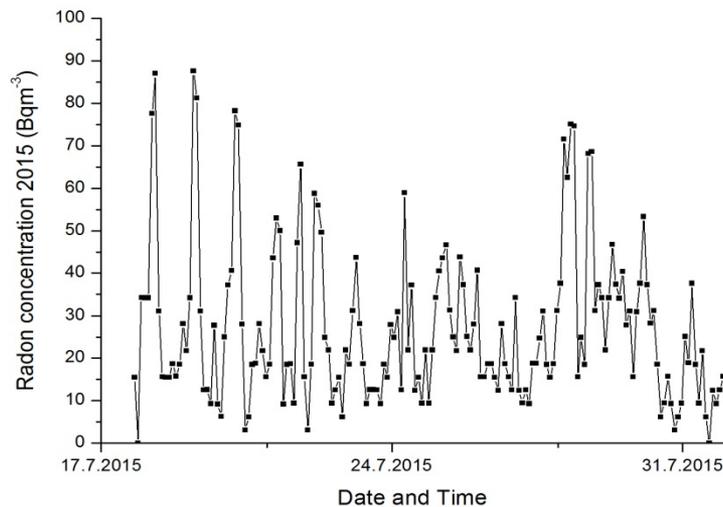


Minimum: 0 Bq m⁻³
Maximum: 286 Bq m⁻³
Median: 25 Bq m⁻³
AM(SD): 40(41) Bq m⁻³
Temperature: 24.7(0.9) °C
Relative humidity: 67.8(4.8) %

2015

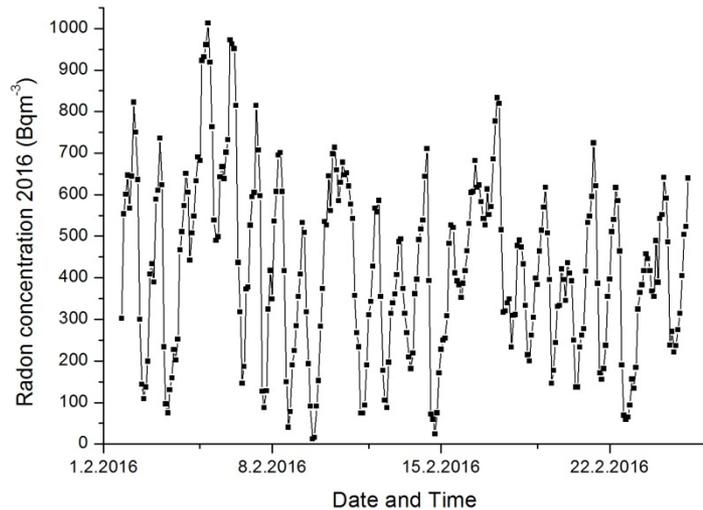


Minimum: 28 Bq m⁻³
Maximum: 915 Bq m⁻³
Median: 524 Bq m⁻³
AM(SD): 508(207) Bq m⁻³
Temperature: 21.2(0.6) oC
Relative humidity: 68.2(4.8) %
Rn (charcoal canister): 518 ± 6 Bq m⁻³



Minimum: 0 Bq m⁻³
Maximum: 88 Bq m⁻³
Median: 22 Bq m⁻³
AM(SD): 27(18) Bq m⁻³
Temperature: 24.9(0.8) oC
Relative humidity: 51.5(4.7) %

2016



Minimum: 12 Bq m⁻³

Maximum: 1013 Bq m⁻³

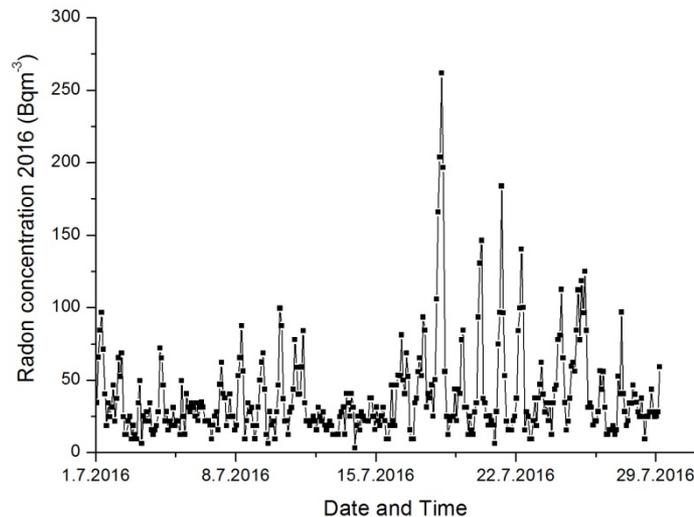
Median: 412 Bq m⁻³

AM(SD): 423(214) Bq m⁻³

Temperature: 22.3(0.6) °C

Relative humidity: 64.0(6.4) %

Rn (charcoal canister): 407 ± 5 Bq m⁻³



Minimum: 3 Bq m⁻³

Maximum: 262 Bq m⁻³

Median: 28 Bq m⁻³

AM(SD): 39(32) Bq m⁻³

Temperature: 24.6(0.8) °C

Relative humidity: 58.9(7.5) %

CONCLUSIONS

- **Long-term indoor radon measurements show intense seasonal variation**
- **The results obtained with different measuring methods are in good agreement**
- **The radon behaviour in the house is almost the same and show good reproducibility year by year**
- **The small variations in the year by year dynamics are originate from the variations in meteo parameters, which will be topics for further investigation. The detail analysis will be done using MultivariateAnalysis tools.**

THANK YOU FOR YOUR ATTENTION

