

RIM 2018

Instructions for Comparison measurement of radon in soil gas at radon reference sites in the Czech Republic

1. General information – purpose of measurement

Radon comparison measurements at radon reference sites serve for verification of field radon (^{222}Rn) measurements performed by single organizations. Radon comparison measurement tests the calibration of the instrument, the technique of soil gas sampling, soil gas transfer into the detection chamber, radon-measuring procedure and stability of field measurements, elimination of thoron (^{220}Rn), and data processing. Tests are based on the comparison of numerically reported radon (^{222}Rn) activity concentration in soil gas (kBq/m^3) by specified organization with other participants of comparison measurement and with the database of two reference sites.

2. Term of radon comparison measurements RIM 2018

International Radon Comparison Measurement (RCM) at radon reference sites 2018 will be held on the 17 September 2018.

3. Place of radon comparison measurements RIM 2018

Radon comparison measurements RIM 2018 will be held at two radon reference sites Cetyne and Buk in the Czech Republic. Faculty of Science of the Charles University in Prague is the administrator of radon reference sites. Contact: matolin@natur.cuni.cz

The radon reference sites are 60 km SW of Prague (Praha) near the city Milín (Fig. 1) in the Czech Republic. The natural radon reference sites Cetyne and Buk, have been established in 2000, they are located on meadows, and are accessible for cars. Each reference site implies 10 stabilized stations marked by numbers. Single reference sites differ in radon activity concentration in soil gas, the radon distribution within the reference site is relatively homogeneous, and thickness and permeability of soils enable soil gas sampling at the reference depth of 0.8 m. Geological setting at radon reference sites was investigated by several geophysical methods. Temporal radon variations are recorded since the year 2000. There is no electrical power supply at radon reference sites, however a power supply generator can be provided on the request (See Questionnaire).

Table 1. Characteristic of radon reference sites

Reference site	c_A ^{222}Rn (kBq/m^3)	Permeab. of soil	Rock	Soil	U (ppm)	Terrain	Access for cars
Cetyne	32	L,(M),H	orthogneiss	SL	2.0	Meadow	+
Buk	146	H	granodiorite	LS	3.6	Meadow	+

L – Low, M – Medium, H – High
SL – sandy loam, LS – loamy sand.

4. Radon comparison measurement RIM 2018

Radon comparison measurement at reference sites is organized for a group of participants. Each organization measures radon (^{222}Rn) at 10 stabilized stations of each reference site by its own technique. Soil air is sampled from the reference depth of 0.8 m at a fixed position for each participant near to each stabilized station. Measurement at two radon reference sites Cetyne and Buk at RIM 2018 is planned for 1 day. Each organization reports data on the activity concentration of radon in soil gas (XX.X kBq/m^3 , three valid digits) at single stations of reference sites filled in a provided form. The form with results (Protocol) should be handed over to the Administrator in a short term after the measurement (during the workshop), or if necessary, mailed electronically by 1 October 2018 to the e-mail address: matolin@natur.cuni.cz.

5. Tests of radon comparison measurement

Tests are based on comparison of radon data reported by participating organization with radon data of the group, and with radon data of a database of the respective reference site. The computer programme TestMOAR evaluates the reported radon data. Three tests based on statistics were developed and programmed by the Institute of Applied Mathematics and Computer Technique, Faculty of Science, Charles University in Prague. Test No. 1 calculates differences between radon activity concentration at single stations ($N = 10$) of a reference site, reported by the participant, and a median of radon data reported by the group, which measured radon at identical stations in the same day of measurement. Test No. 2 determines the regression $y = a + bx$ between radon activity concentration at all measured stations of the two reference sites ($N = 2 \times 10 = 20$ stations) reported by tested participant (y), and median (x) of radon data for relevant identical stations reported by the administrator and all other participants measuring the same day. Test No. 3 is the comparison of the mean radon activity concentration in soil gas ($N = 10$) reported by the participant for a single reference site with the mean radon activity concentration in the database of the reference site. At present (2018), the database of each radon reference site comprises 259 data sets of successful measurements of organizations during the period 2000 – 2017. In order to eliminate temporal radon variation, Test No. 3 works with standardized radon data. The testing criterion (relation of normed mean radon activity concentration by participant/normed mean radon activity concentration by reference site database), which has the ideal value equal to one, accepts deviations of standardized radon data in the range 0.7 - 1.3 (30 % relative deviation). Test No. 3 is performed for each reference site separately. Computer programme TestMOAR accepts reduced number of entry radon data observed at a reference site. Results of tests will be anonymous; each organization will be denoted by a code.

6. Results of radon comparison measurement RIM 2018

Each participant of RIM 2018 will receive his assessment protocol introducing numerical results of Tests No. 1, 2 and 3, and a graph of the mean and radon data dispersion of the group (organizations marked in codes) at two reference sites. Assessment protocols and results of intercomparison measurement RCM 2018 will be available after all participants will pass over their data on measured radon activity concentration at reference sites. Assessment protocols will be mailed by the e-mail to reported e-mail addresses of each participating organization in October 2018.

7. Transport Prague – reference sites

Organizers of the workshop on request will provide transport Prague - reference sites (See Questionnaire).

8. Preliminary time schedule

Monday, 17 September 2018

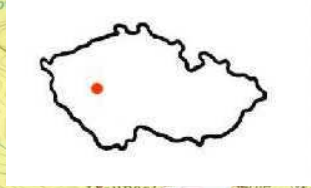
8.00	Departure from Prague
9.30 - 12.30	Measurement at reference site Cetyne
13.30 - 16.00	Measurement at reference site Buk
16.00	Departure to Prague

Note: Refreshment (tea, coffee, beer, sausages) will be available at reference site Buk during the whole radon comparison measurement.

Accommodation (If you prefer to start your visit to the Czech Republic near the reference sites, not in Prague): Suitable accommodation, just near to the area of radon reference sites, is available in “Hotel u Milina” (www.hotelumilina.cz).

Praha

Příbram



Buk
Loc: 49°38'44.851"N,
14°3'50.597"E

**Hotel
U Milína**
www.hotelumilina.cz

Cetyne
Loc: 49°36'24.412"N,
14°7'17.033"E

Location of radon reference sites Cetyne and Buk, Czech Republic

PROTOCOL

RIM 2018 - Radon comparison measurement at reference sites Czech Republic

Name of organization:

Address of organization:

E-mail:

Date of measurement:

Operator (name):

Sampling method

Type of sampling probe ("Neznal" probe, packer probe, or other):

Method of soil air sampling (hand pump, electrical pump, janette, other):

Measuring method (ionization chambers, Lucas cells, other):

Model of instrument and producer:

Serial No.:

Date and place of calibration:

Pause between the soil gas sampling and measurement (minutes):

Table Radon (^{222}Rn) activity concentration in soil gas determined at radon reference sites

Station No.	Cetyne		Buk	
	Depth m	c_A kBq/m ³	Depth m	c_A kBq/m ³
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Depth = depth of soil gas sampling