The local aspects of indoor radon's temporal variability

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UNIUNEA EUROPEANĂ

Instrumente Structurale 2014-2020

LiRaCC

SmartRADON

Programul Operațional Competitivitate 2014-2020, Axa prioritară POC-A1-A1.1.4-E-2015
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Antreprenoriat pentru inovare prin cercetare doctorală și postdoctorală
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Context:

Council Directive 2013/59/Euratom

- Article 74

Indoor exposure to radon

1. Member States shall establish national reference levels for indoor radon concentrations. The reference levels for the ***annual average*** activity concentration in air shall not be higher than 300 Bqm^{-3}.

Setting:

- Romania
- 5 major cities
- Residential sector
- Energy efficient buildings

Materials and methods

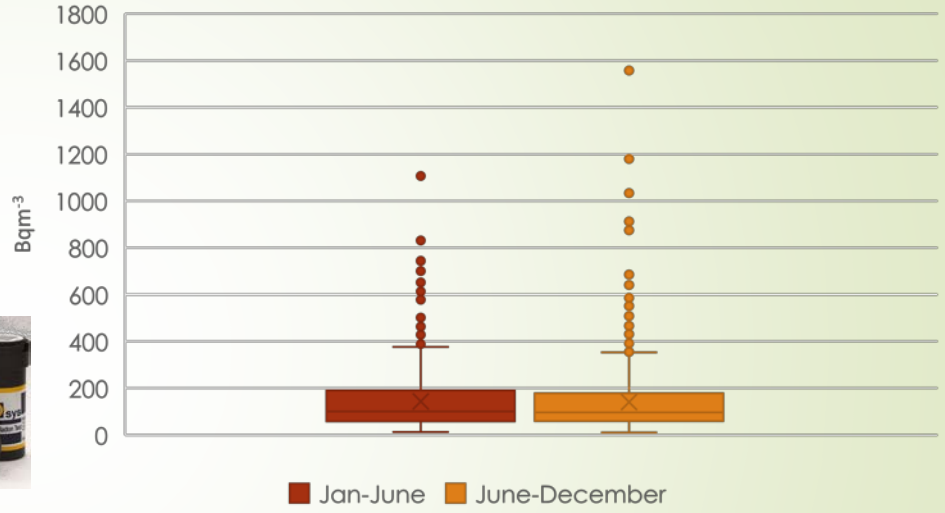
- Passive measurements: RSKS detectors
  - 1000 buildings – 2 campaignes
  - 100 buildings – 4 campaigns

- Active measurements: *ICA systems developed by LiRaCC*
  - *100 buildings – starting November 2018*

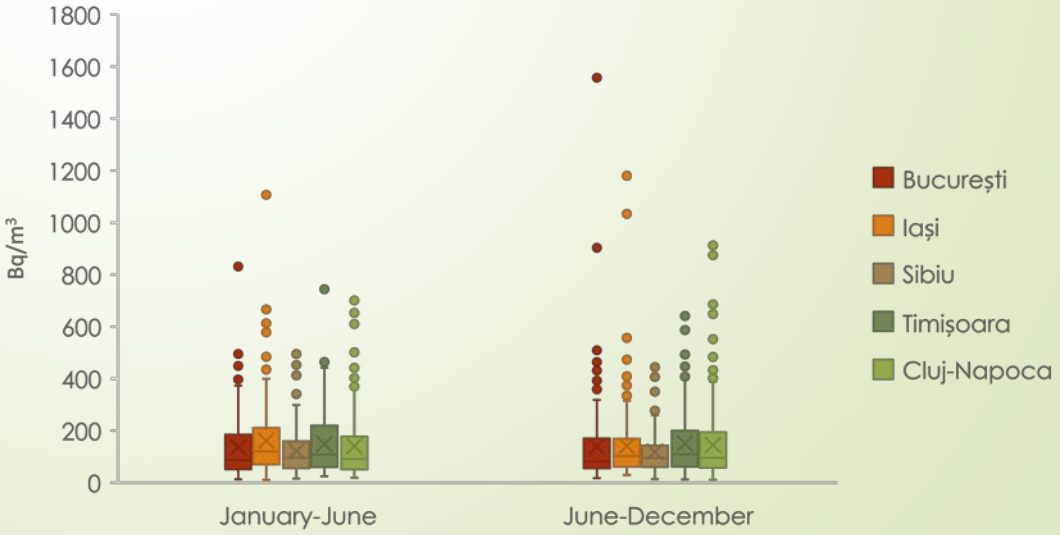
Results:

Temporal variability – biannual

- National



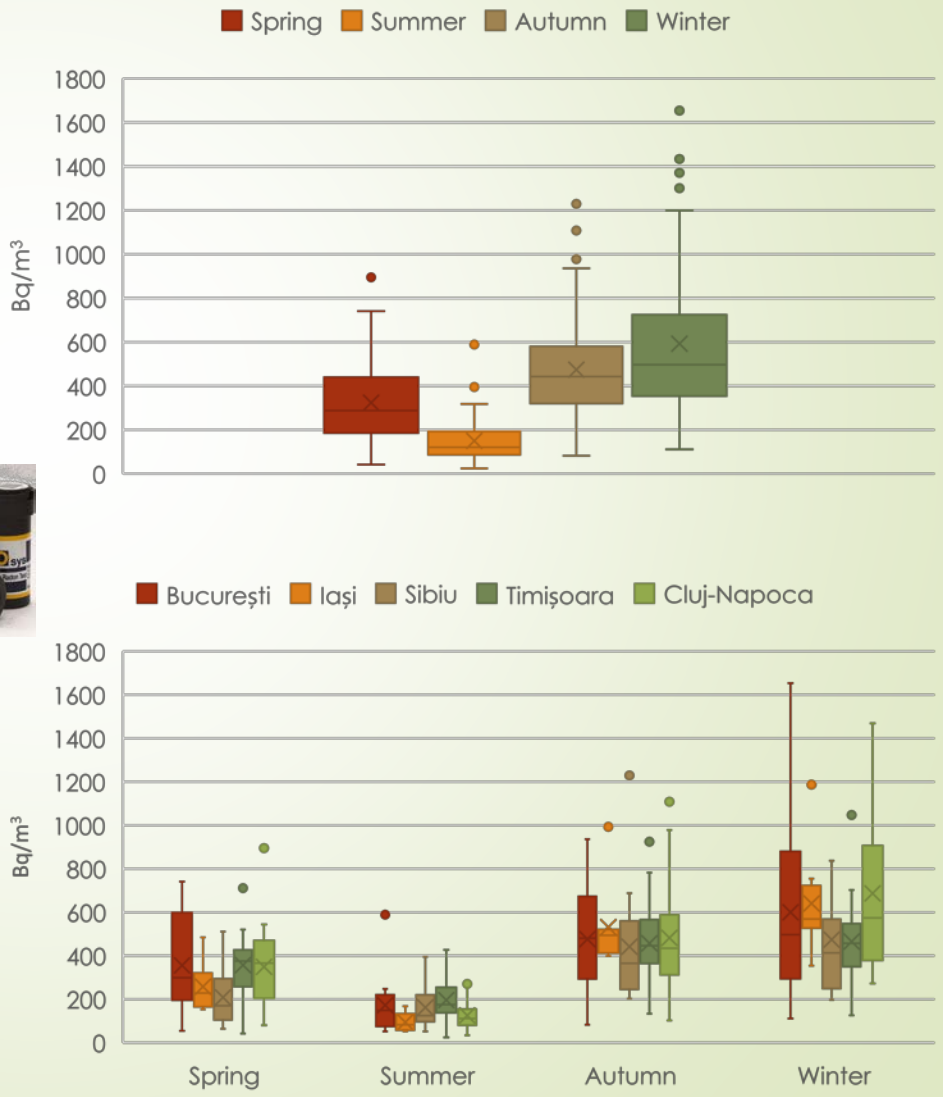
- Regional



Temporal variability – trimester

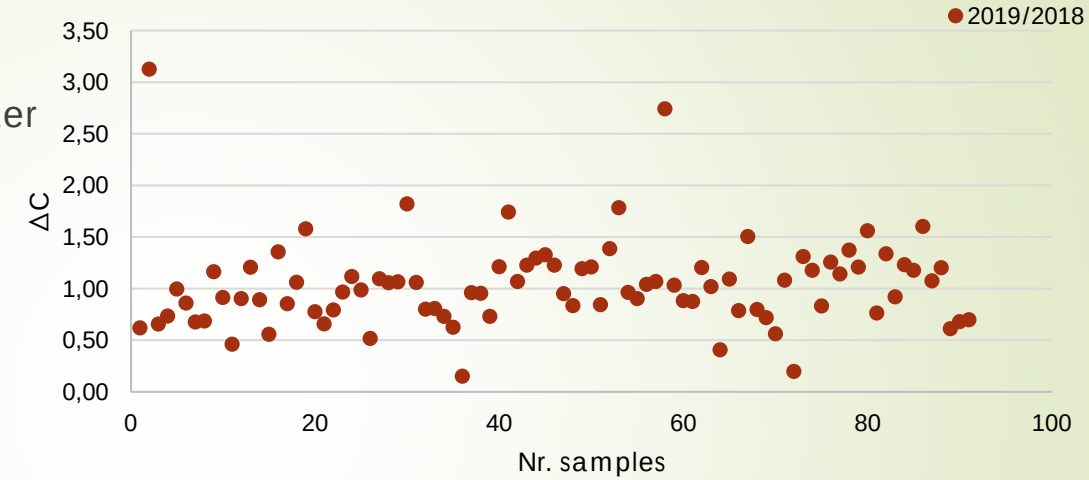
- National

- Regional

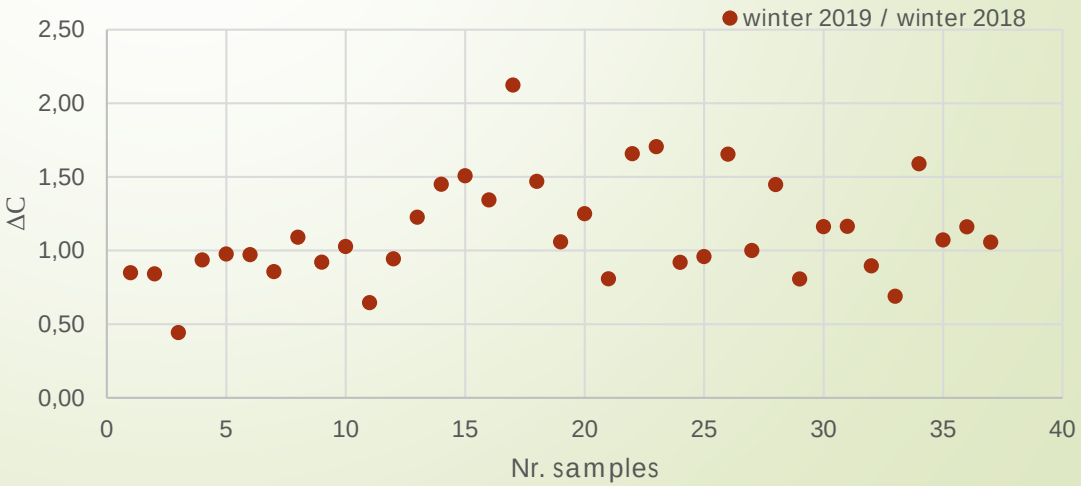


Temporal variability – annual

- **Passive**
  - Biannual vs. Trimester
  - Correlation: 0.57

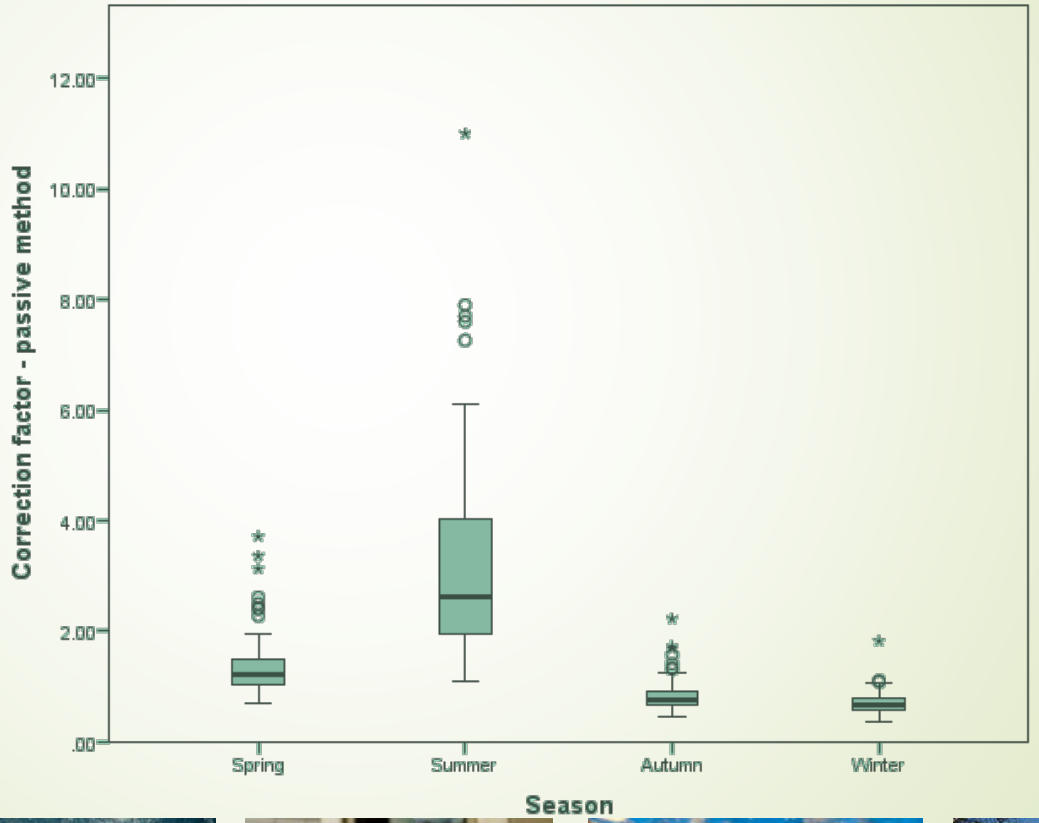


- **Active**
  - Dec/Jan/Feb
  - Correlation: 0.82



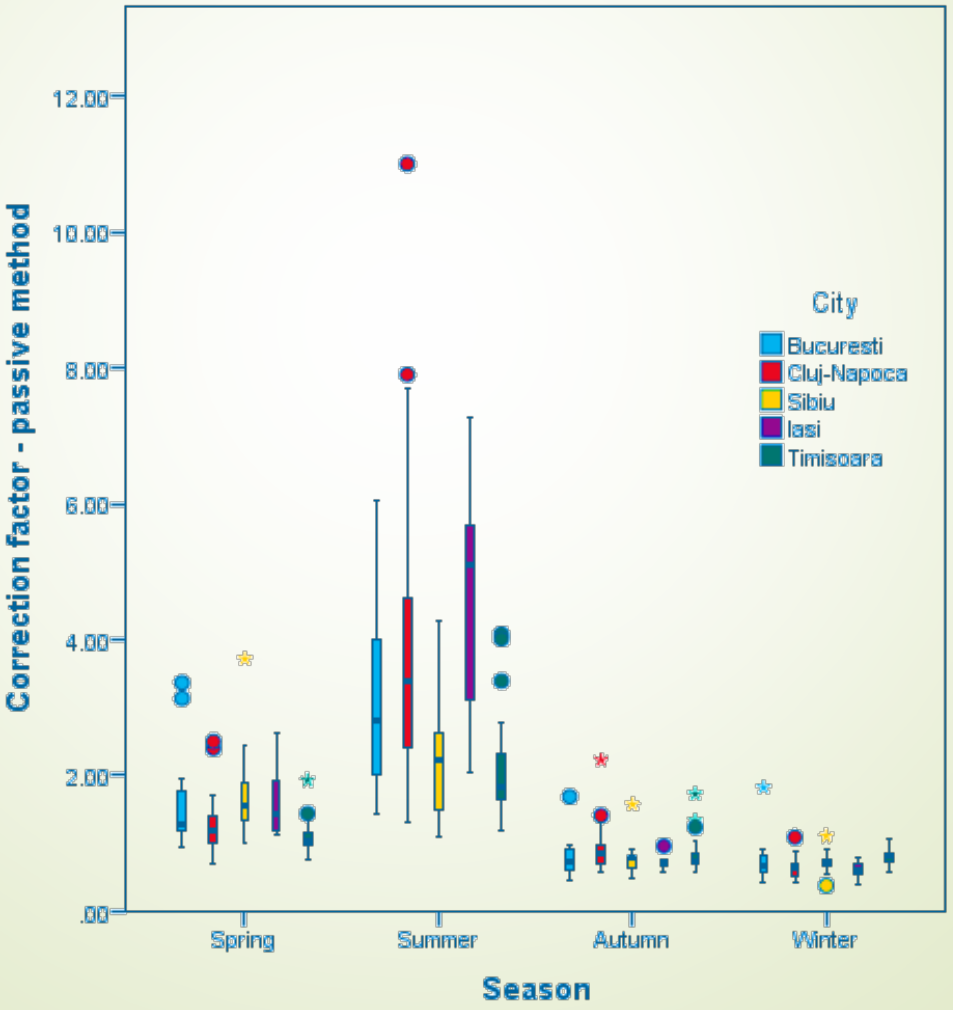
Temporal corrections

- Seasonal correction factors - national



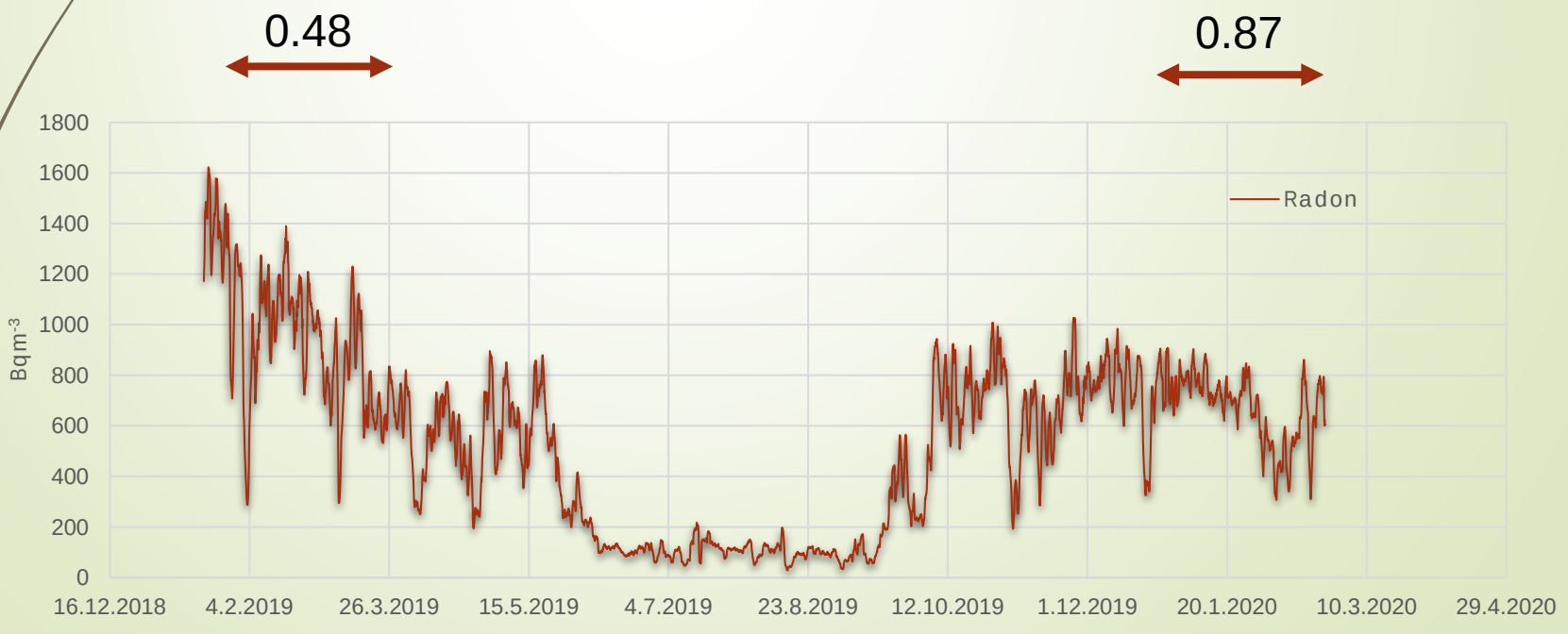
Temporal corrections

- Seasonal correction factors - regional



Temporal corrections

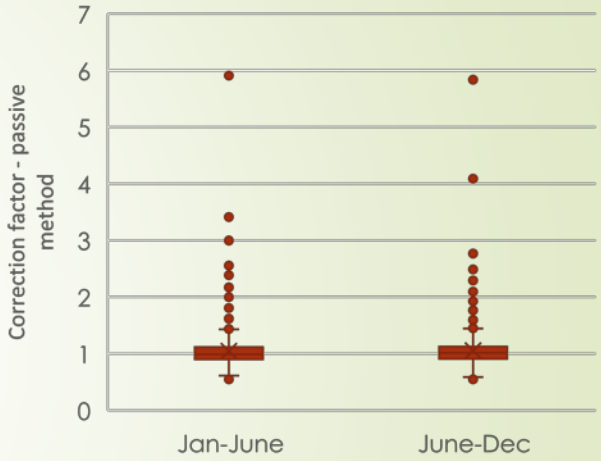
- Seasonal correction factors
  - Local



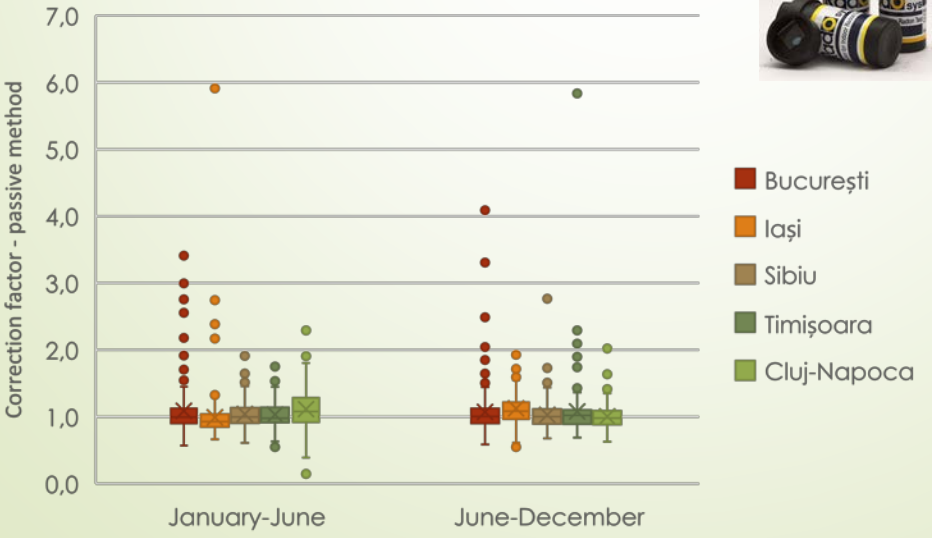
Temporal corrections

- Biannual correction factors

- National

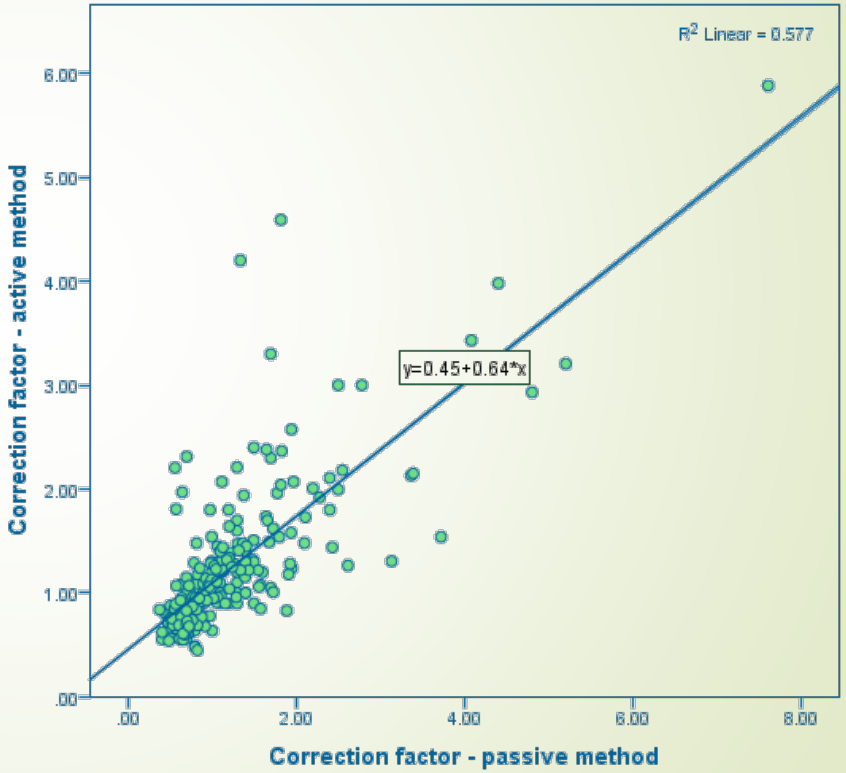


- Regional



Temporal corrections

- Seasonal correction factors – passive vs. active



Correlation with indoor/outdoor parameters

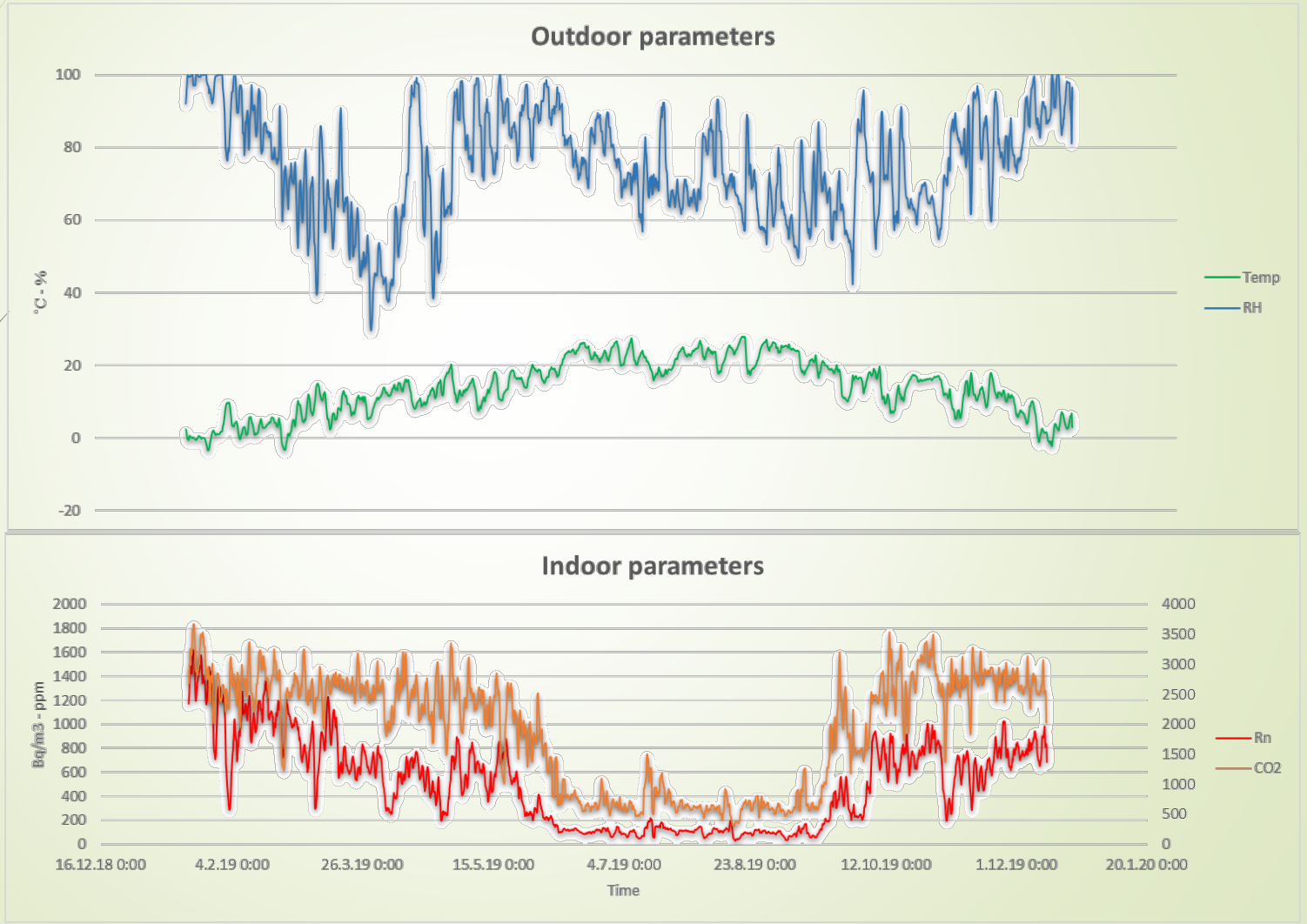
- Nonparametric correlations of correction factors - National

Spearman's		Δ T	Δ RH	CO_2
Passive	Correlation Coefficient	-0.778**	-0.548**	-0.303**
	Sig. (2-tailed)	0.000	0.000	0.000
	N	235	235	236
Active	Correlation Coefficient	-0.646**	-0.426**	-0.296**
	Sig. (2-tailed)	0.000	0.000	0.000
	N	235	235	235

** Correlation is significant at the 0.01 level (2-tailed)

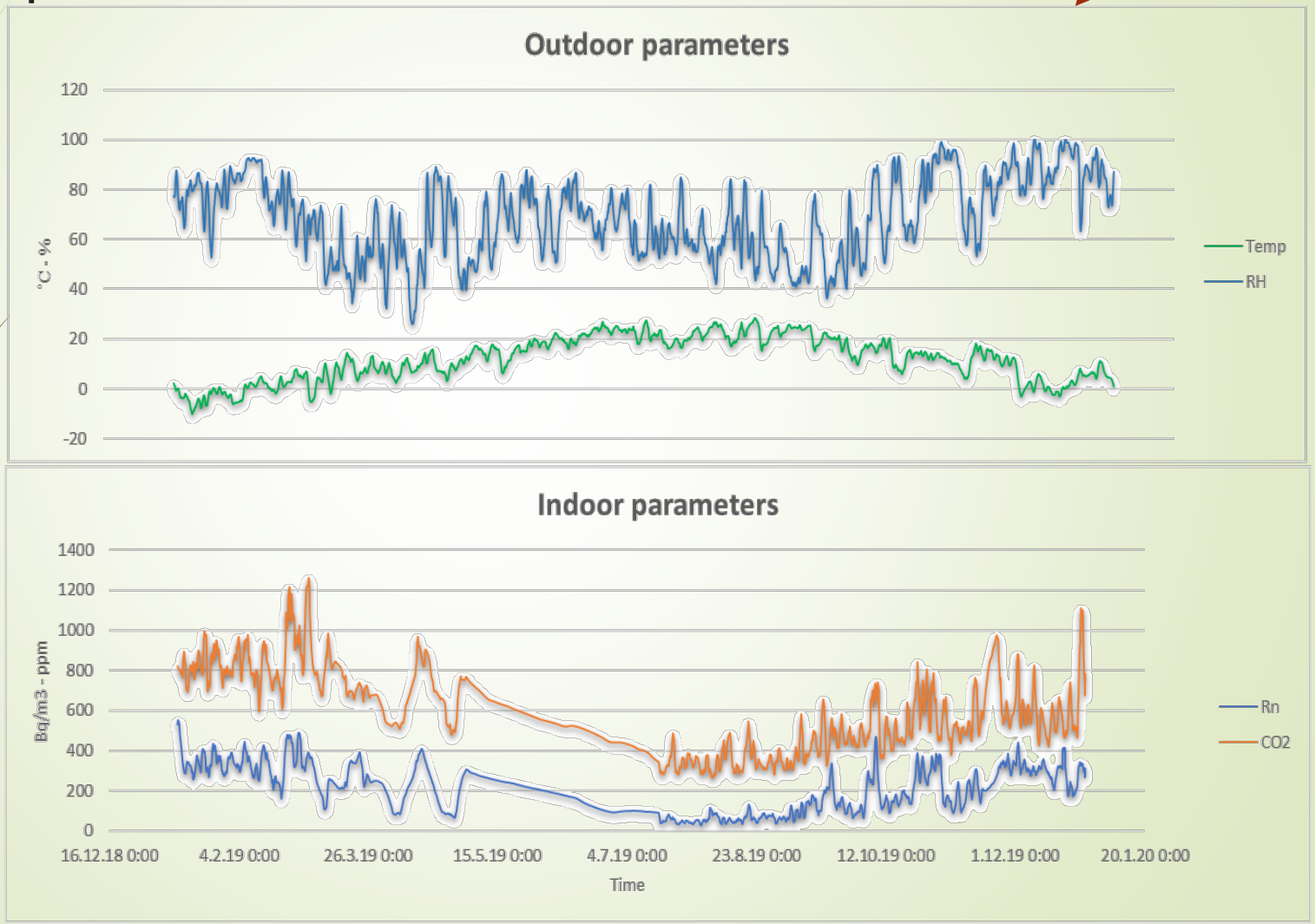
Δ T - indoor vs. outdoor temperature; Δ RH - indoor vs. outdoor humidity; N – nr. samples

Correlation with indoor/outdoor parameters



VISUAL CONFIRMATION

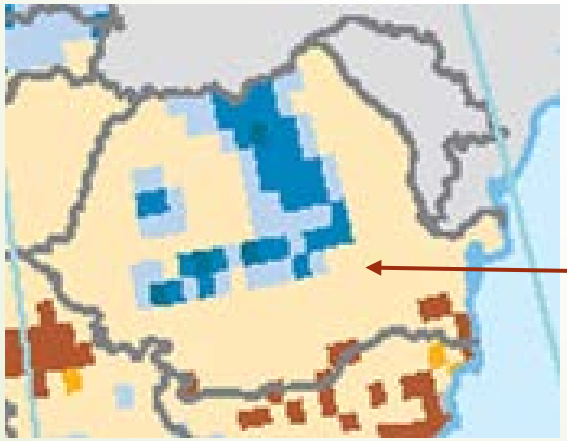
Correlation with indoor/outdoor parameters

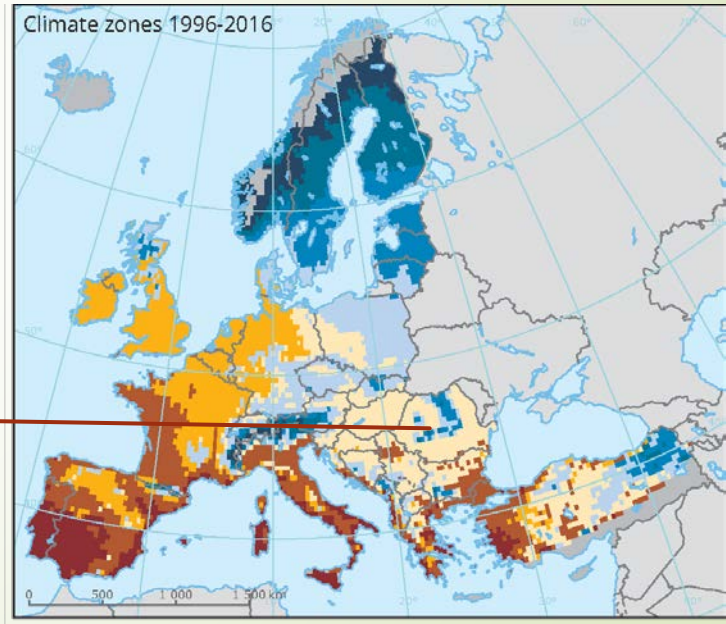


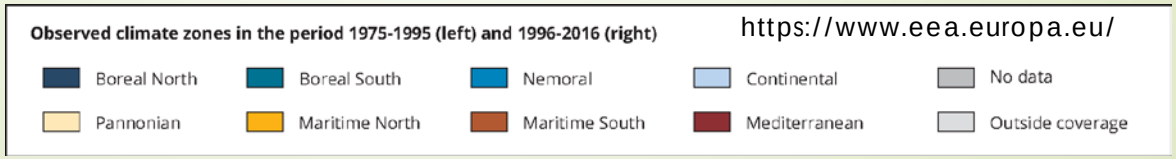
STATISTICAL CONFIRMATION

Correlation with indoor/outdoor parameters

- Climatic zones – relevant parameter in radon prediction.







Discusions

- Is there a right way to measure indoor radon?
- Passive or Active method?
- Medium-term active measurements could provide a „false mitigation”
- Passive detectors are easily misplaced and require long-term exposure
- Correction factors – ‘one size fits all’?
- Correction factors in workplaces

Conclusions

- Occupational patterns can influence seasonal correction factors
- High range of seasonal correction factors within the same season
- Significant differences found between correction factors of various regions
- Biannual measurements showed less variability

Thank you