Parameters monitorization in a Pilot House to provide data for indoor radon simulation and prediction purposes

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Overview

- **Introduction**

- **Pilot House**

- **Monitoring System**

- **Quality control**

- **Results**

- **Conclusions**
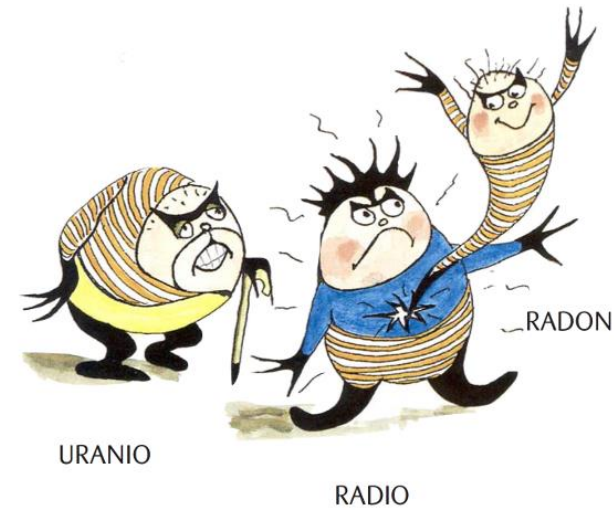
Introduction

- Radon generation, transport, immission and accumulation processes in buildings under field conditions requires to develop a simulation computer tool

- This kind of tool could be helpful to analyze of the effectiveness of prevention and remediation techniques for radon-affected sites

- RADSIM project objective is to carry out a theoretical-experimental study in order to simulate and validate a computer tool

- It is necessary to obtain quality data to validate these models
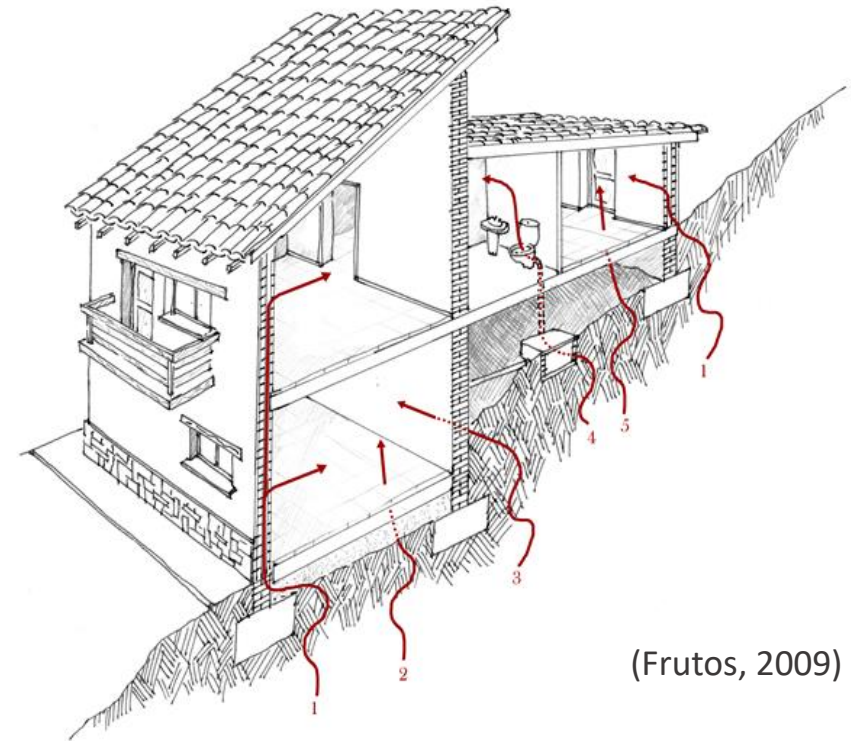
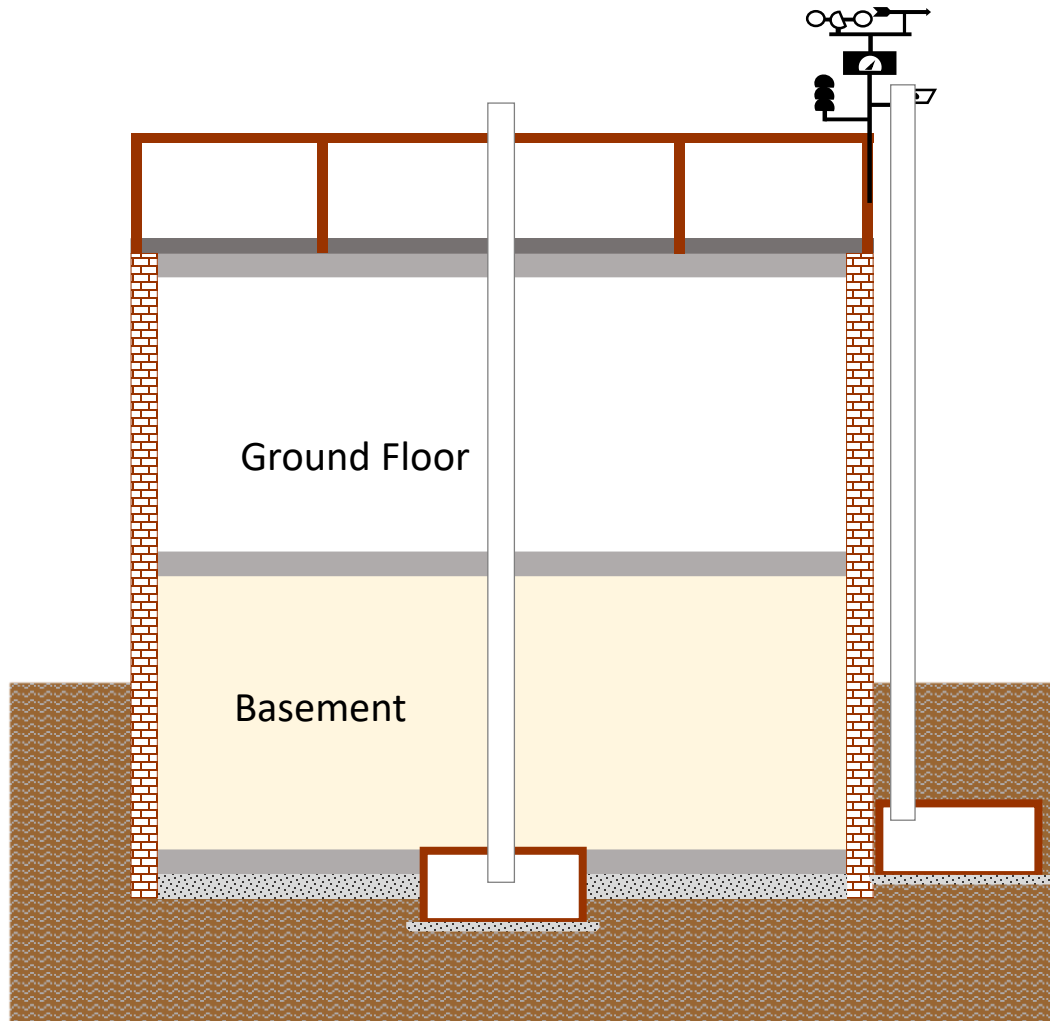(Frutos, 2009)

Pilot House

Map of Spain
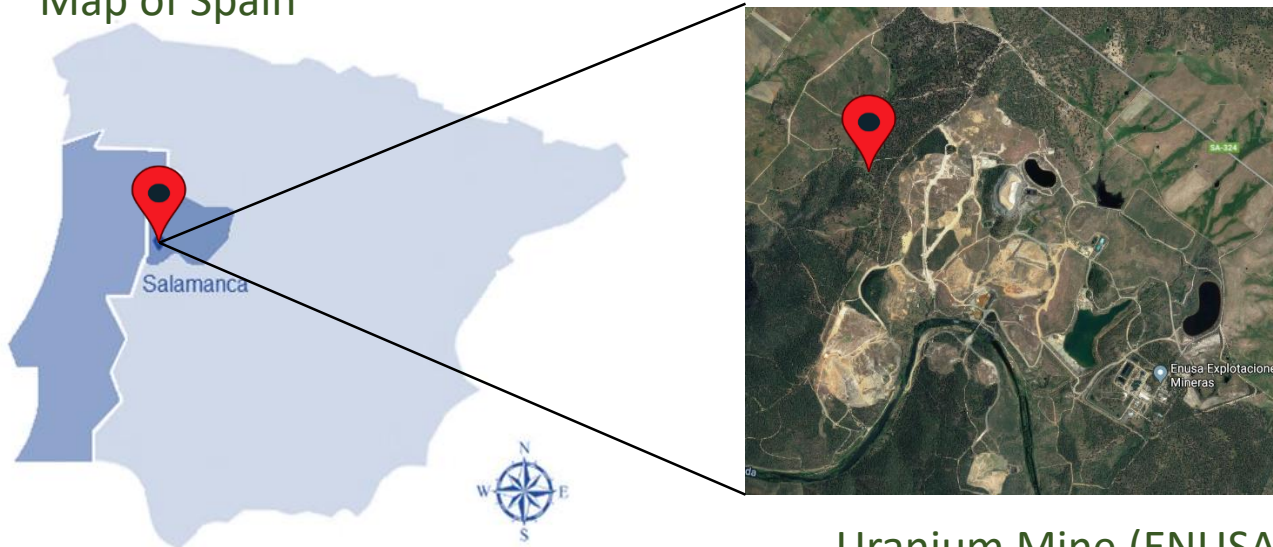
Uranium Mine (ENUSA)

Pilot House

- Selection of sites to validate theoretical models developed

- Built in 2006 within the land of a former uranium mine in Salamanca, managed by ENUSA *Ind*. *Avan*. S.A.
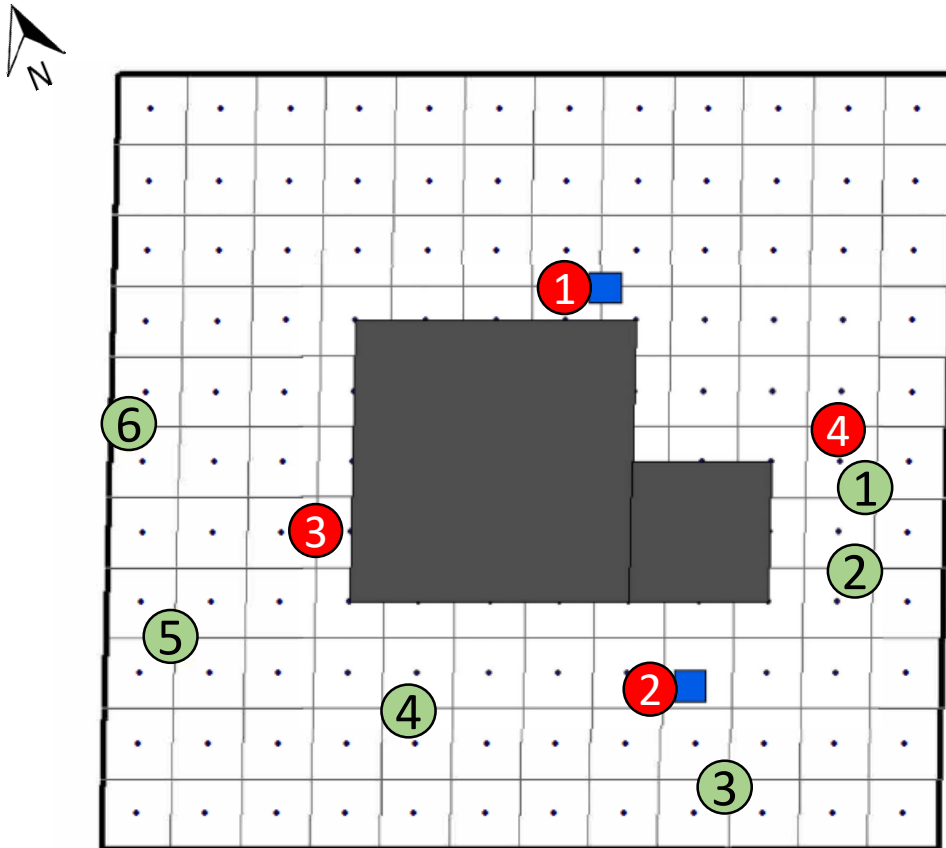
- High ^{226}Ra and ^{222}Rn in soil

Pilot House

Ground Floor

Basement

- Reproduction of single Spanish single family

- Dimensions 5x5 m

- Ground Floor + Basement partially below soil

- Two windows (north and south)

- 2 deep sumps 0.5 m deep and 1 m^2 connected to a pipe centre and side

Measurements

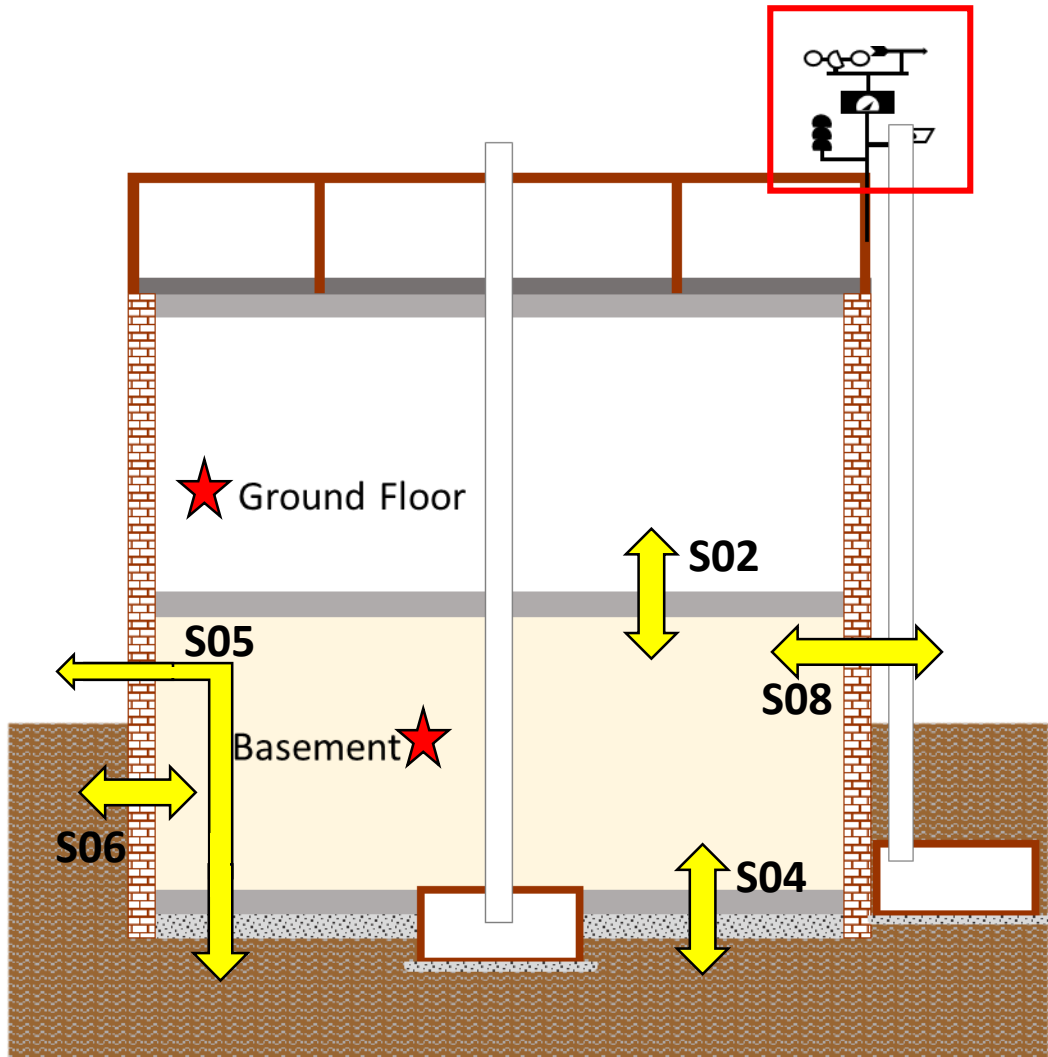**Preliminary Grab Sampling (Surrounding area)**

- Dose rate surrounding area @ 1 m height [GR135]

- **Radon in soil + permeability [RM-2 + Radon-Jok]**

- **Isotopic composition [Ge detector]**

Continuous Measurements

- **Radon in soil (North and South faces) [Barasol]**

- Radon in air (Ground floor + Basement) [AlphaE]

- Weather Station

- Pressure Sensors [ITEFI-CSIC]

Measurements

Preliminary Grab Sampling (Surrounding area)

- Dose rate surrounding area @ 1 m height

- Radon in soil + permeability

- Isotopic composition

Continuous Measurements

- Radon in soil (North and South faces)

- Radon in air (Ground floor + Basement)

- Weather: Temperature, Pressure, Humidity, Wind, Rain
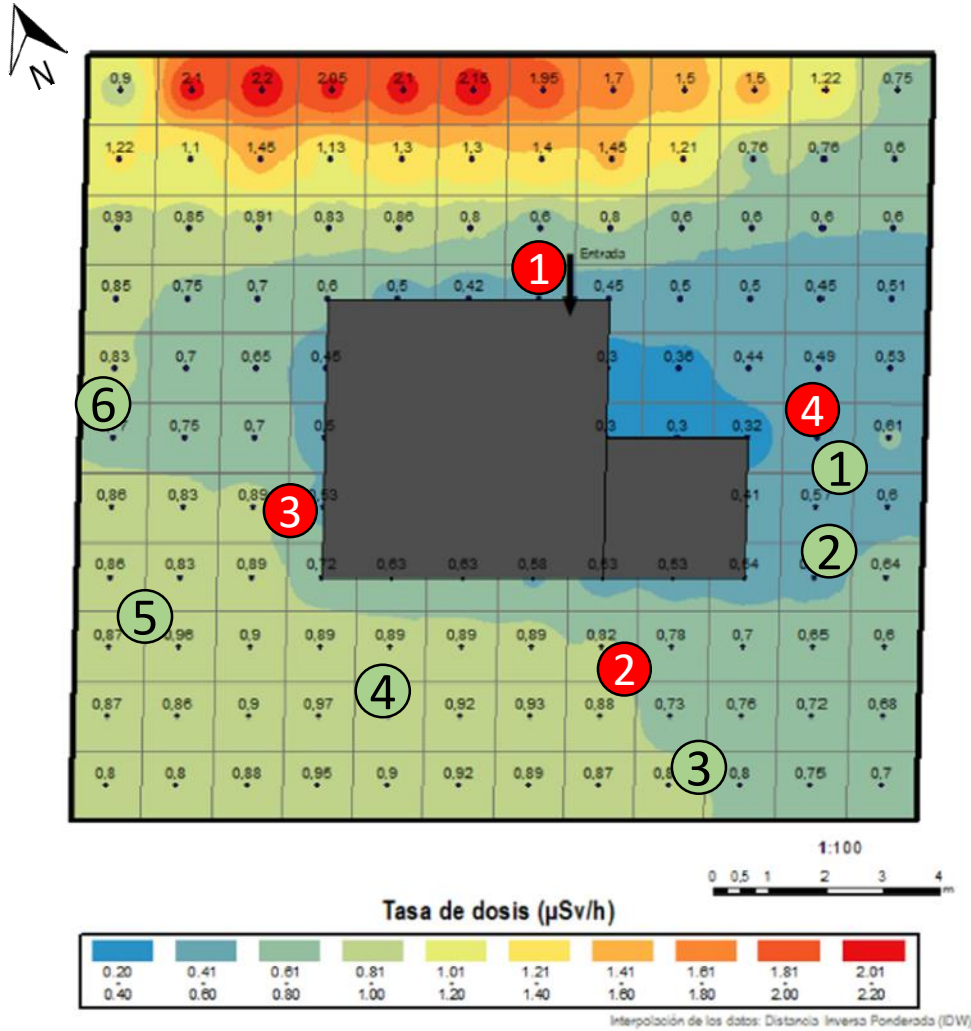
- Pressure Sensors

Quality control

- **Devices test and calibrated periodically**

- **Preliminary grab sampling**

- **Continuous monitoring:**

    - Remote system: periodically download

    - Batteries

- **Data**

    - Lost of data, devices not connected
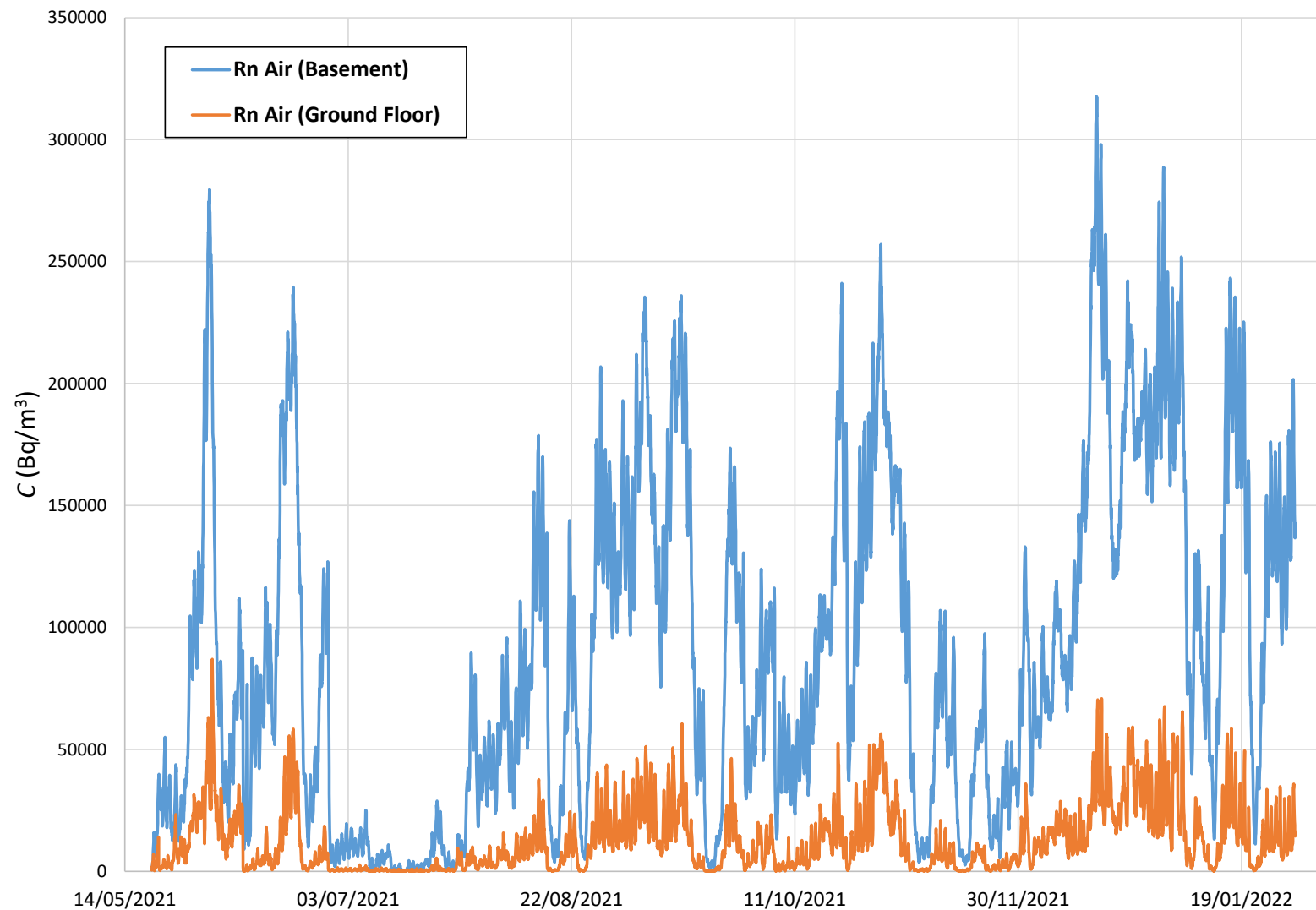
    - Depuration

Preliminary Grab Sampling (Surrounding area)

- Dose rate surrounding area @ 1 m height
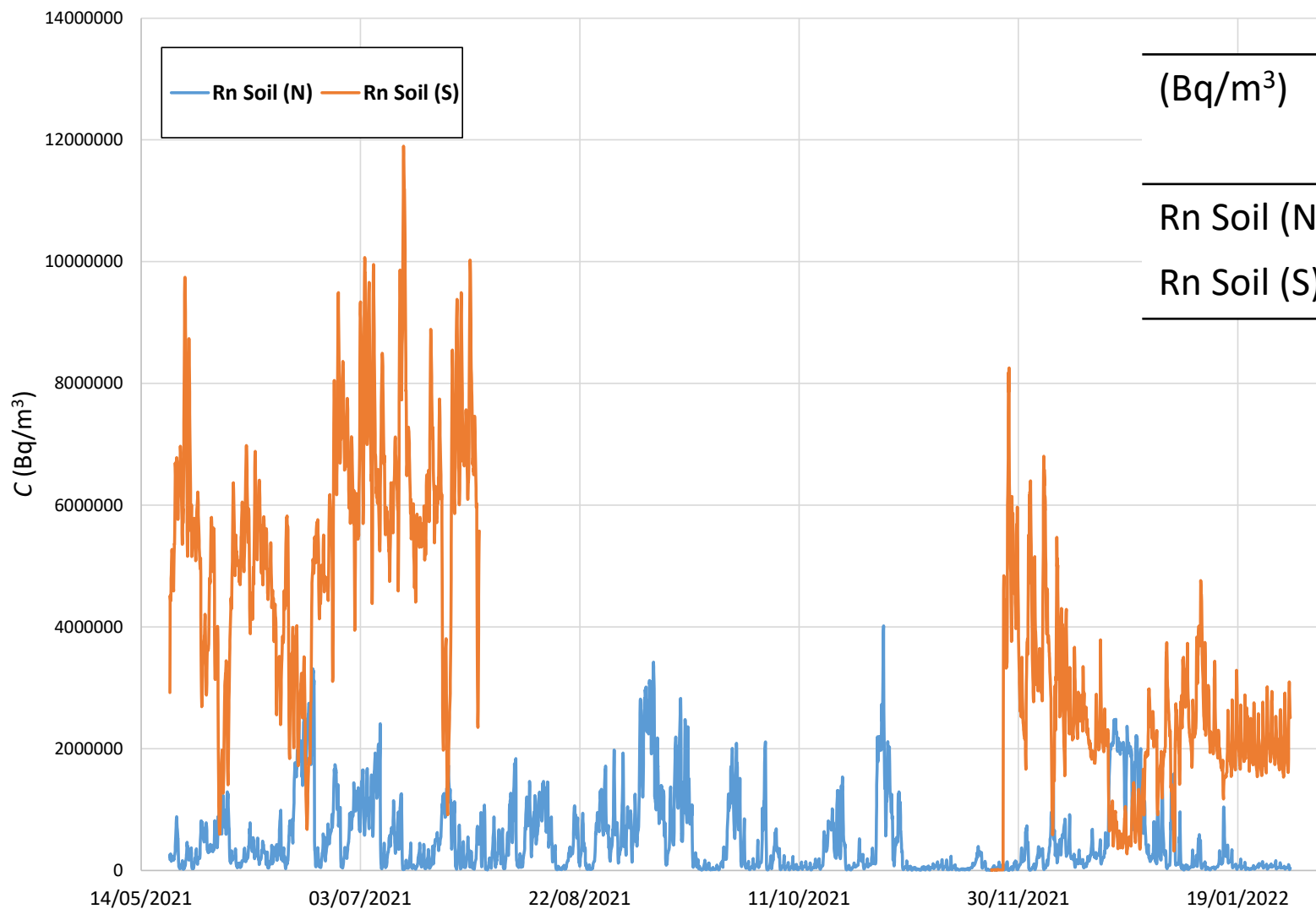
- Radon in soil + permeability

- Isotopes composition

Sample	^{226}Ra (kBq/kg)
1	2.31 ± 0.19
2a	2.86 ± 0.24
2b	2.36 ± 0.20
3	1.89 ± 0.16
4	2.06 ± 0.17

Sample	C (kBq/m³)	k (m2)
1	690 ± 26	1E-13
2	1200 ± 35	1E-13
3	744 ± 27	1E-13
4	888 ± 30	1E-13
5	887 ± 30	1E-13
6	1700 ± 41	1E-12

Results: Rn in Air

(Bq/m^3)	Mean	Max
Basement	90k	300k
Ground Floor	13k	50k
Correlation	+0,8	

Results: Rn in Soil

(Bq/m^3)	Mean	Max	*Correlation* Rn Basement
Rn Soil (N)	500k	4M	+0,4
Rn Soil (S)	4M	12M	-0,7

Results: Weather
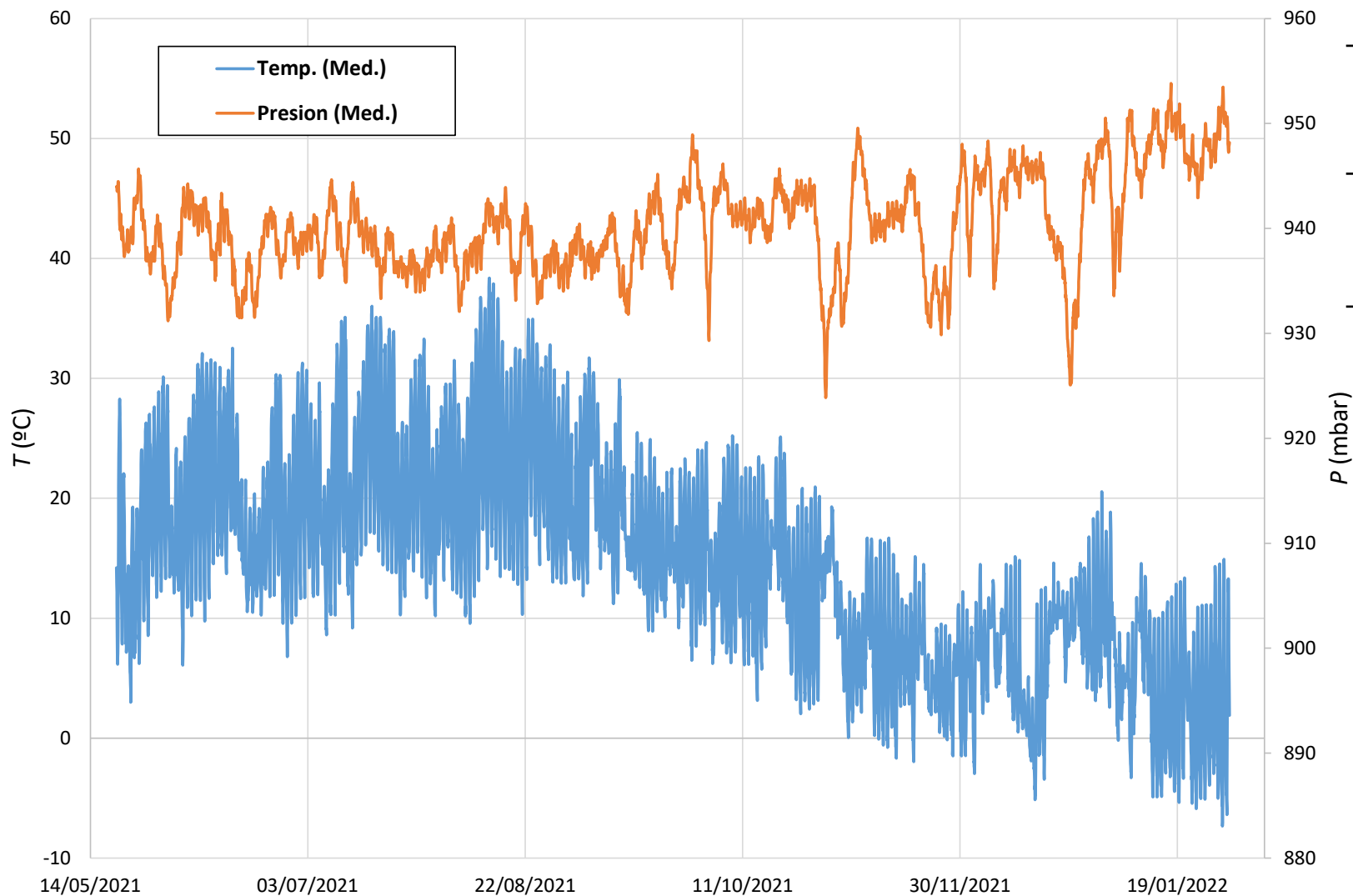
	Mean	*Correlation* Rn Soil (N)
T (ºC)	14,4	+0,3
P (mbar)	940	-0,5

Results: Weather

21-Jun-2021 05:00:00 - 30-Jan-2022 23:00:00   Date vs. Radon indoor,basement & S04
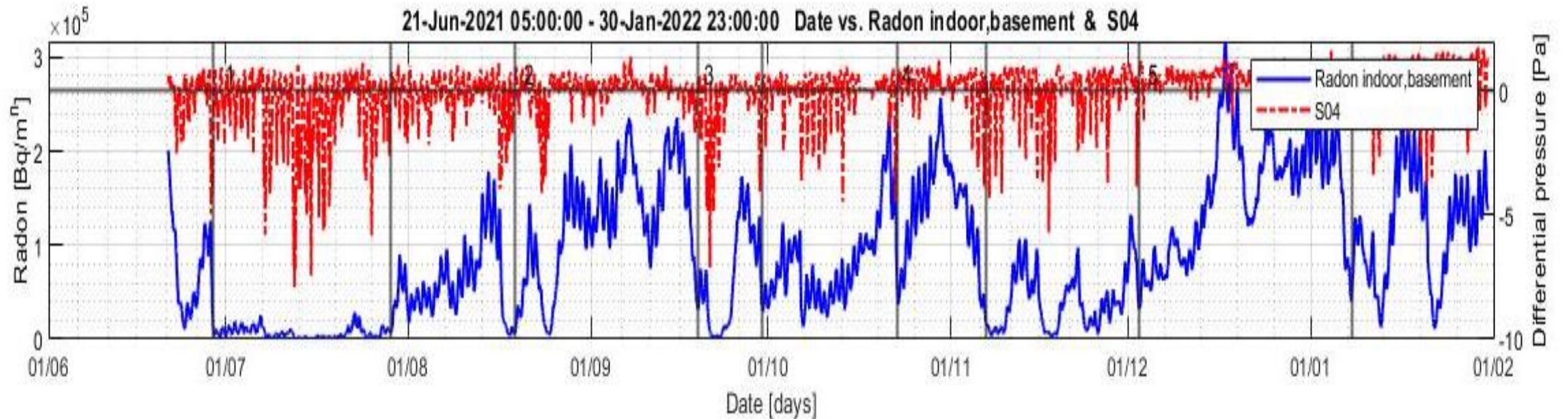
- S04: ΔP(Soil under foundation-Basement)

(Isabel Sicilia, Borja Frutos (IETCC))

Conclusions

- It has been established a data base to train and test simulation models for Rn entrance and dynamics in the pilot house

- There are a good correlations between some variables that can be helpful to feed the models

Thank you very much for your attention!