Geogenic controls of indoor radon in Western Iberia

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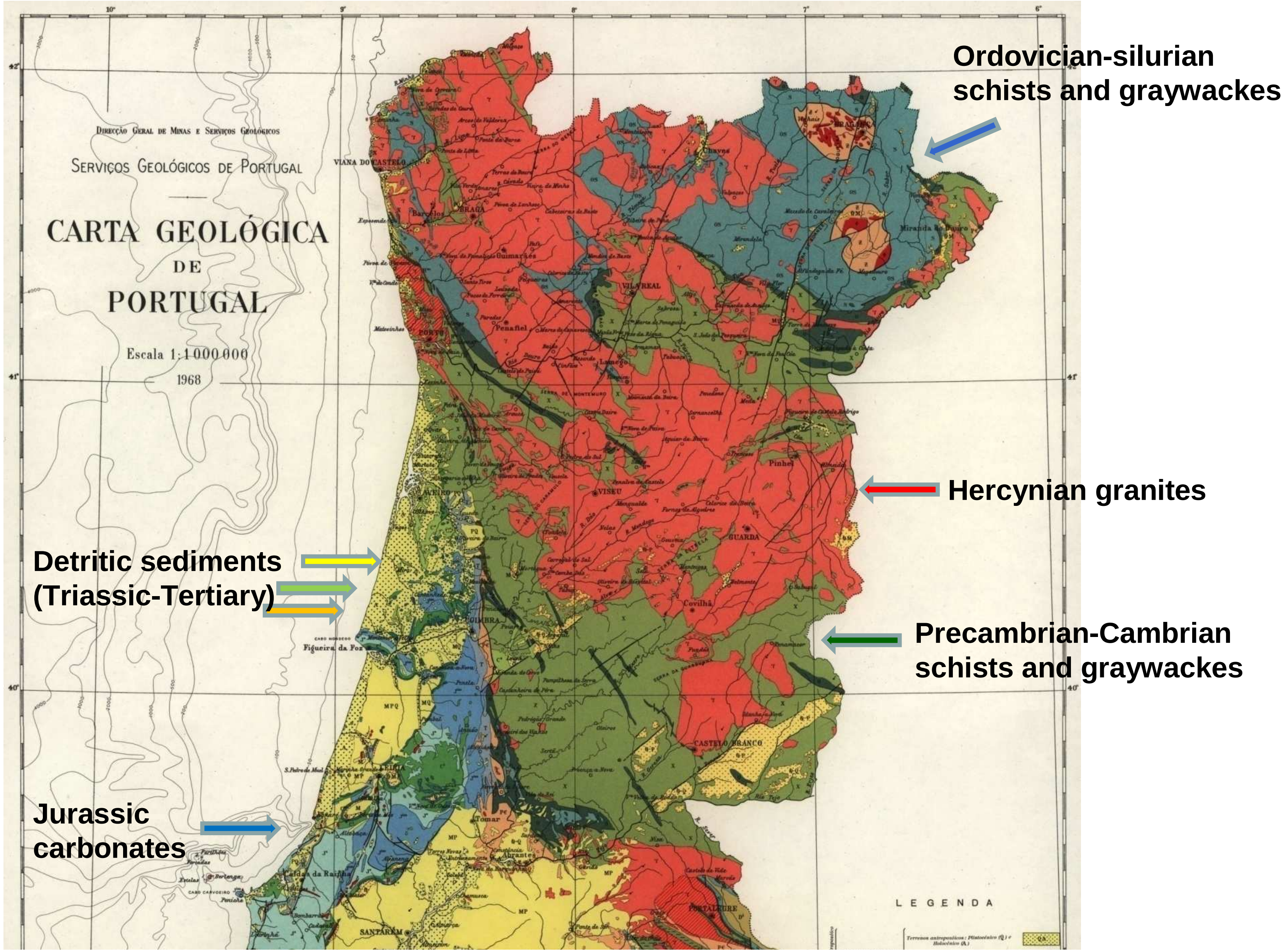
FCTUC

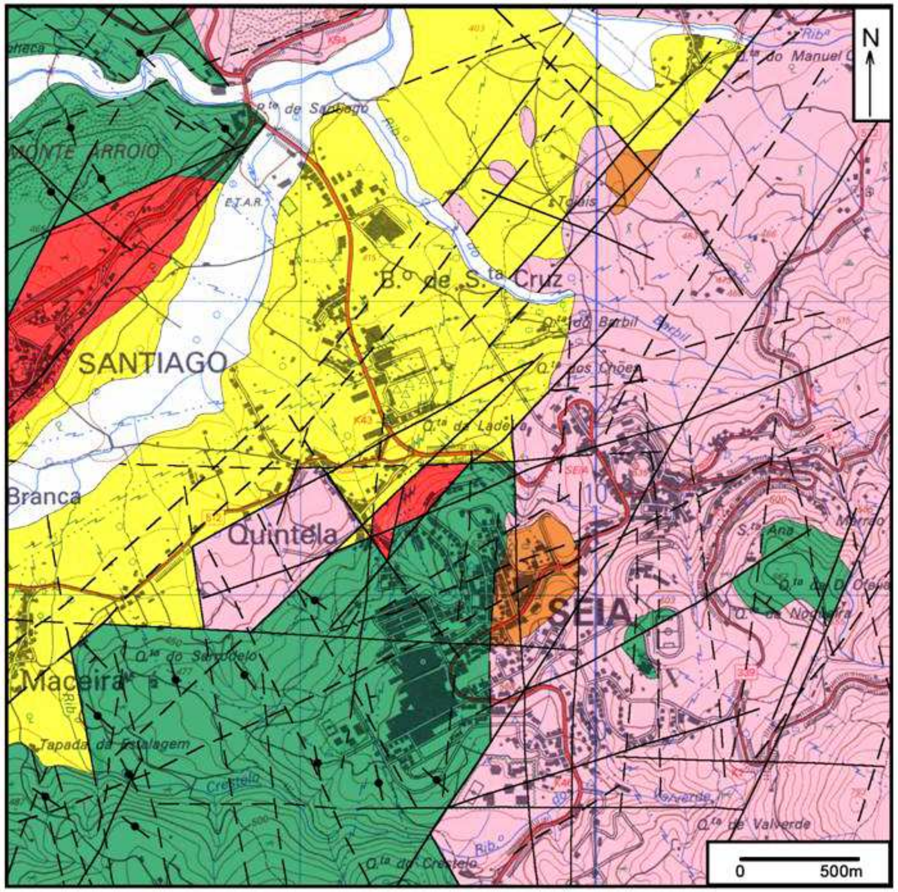
Location

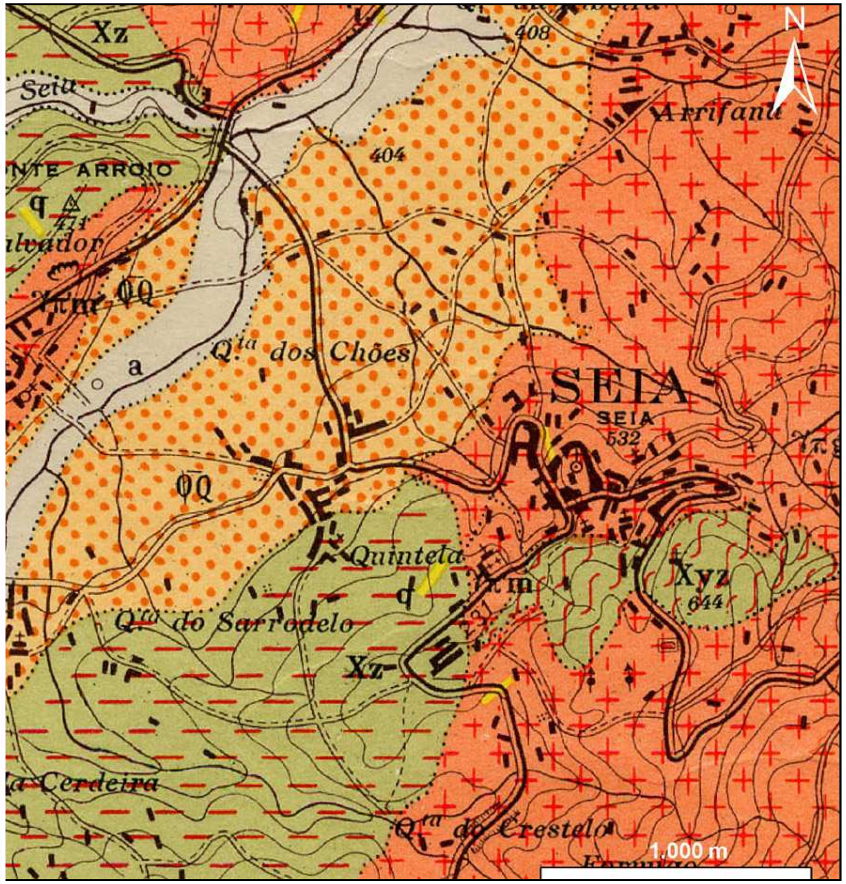

Bay of Biscay
Toulouse
Castro Terrace
Llanes Canyon
Andorra
Castilla y León
Aragón
Barcelona
(Oporto)
Porto
Madrid
Balearic Sea
Coimbra
Castilla-La Mancha
Portugal
Eivissa (Ibiza)
Pitiusas Canyon
(Lisbon)
Lisboa
Andalucía (Andalusia)
Cádiz
Gibraltar Canyon
Strait of Gibraltar

Geological Setting



Methods





Detailed map 1:10.000

Magnified map 1:50.000

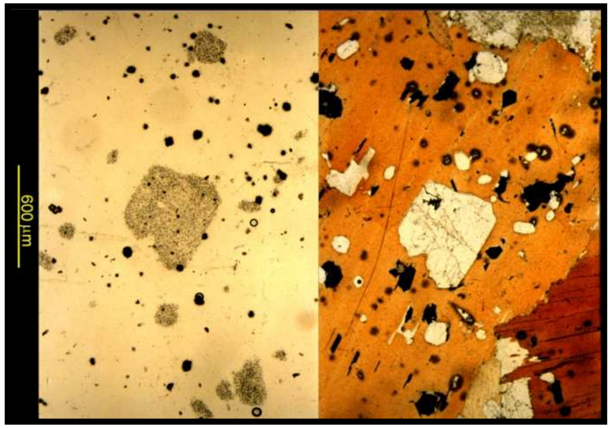
Methods

Surface gamma flux
n>10.000

Rn, Ra, U in water
by LSS n>3.000

In situ gamma
spectrometry n>1000

Fission track and electron
microprobe studies



Soil gas radon
(80 cm depth) n>1000

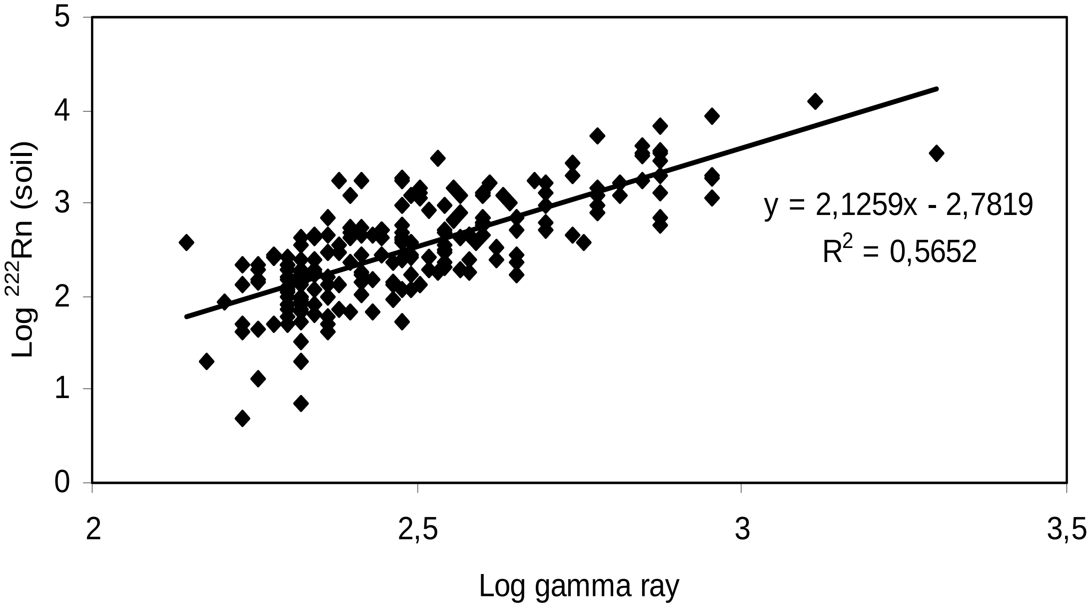
Methods

Indoor radon with CR-39 detectors (n>1.000)

Results

1. Areas without important radiometric anomalies

A good correlation is tipically found between gamma ray fluxes and soil gas radon concentrations, which means that uranium is responsible for most of the variability observed.



The same correlation can be broadly observed between the uranium contents of the rocks, soil gas radon and indoor radon.

Results

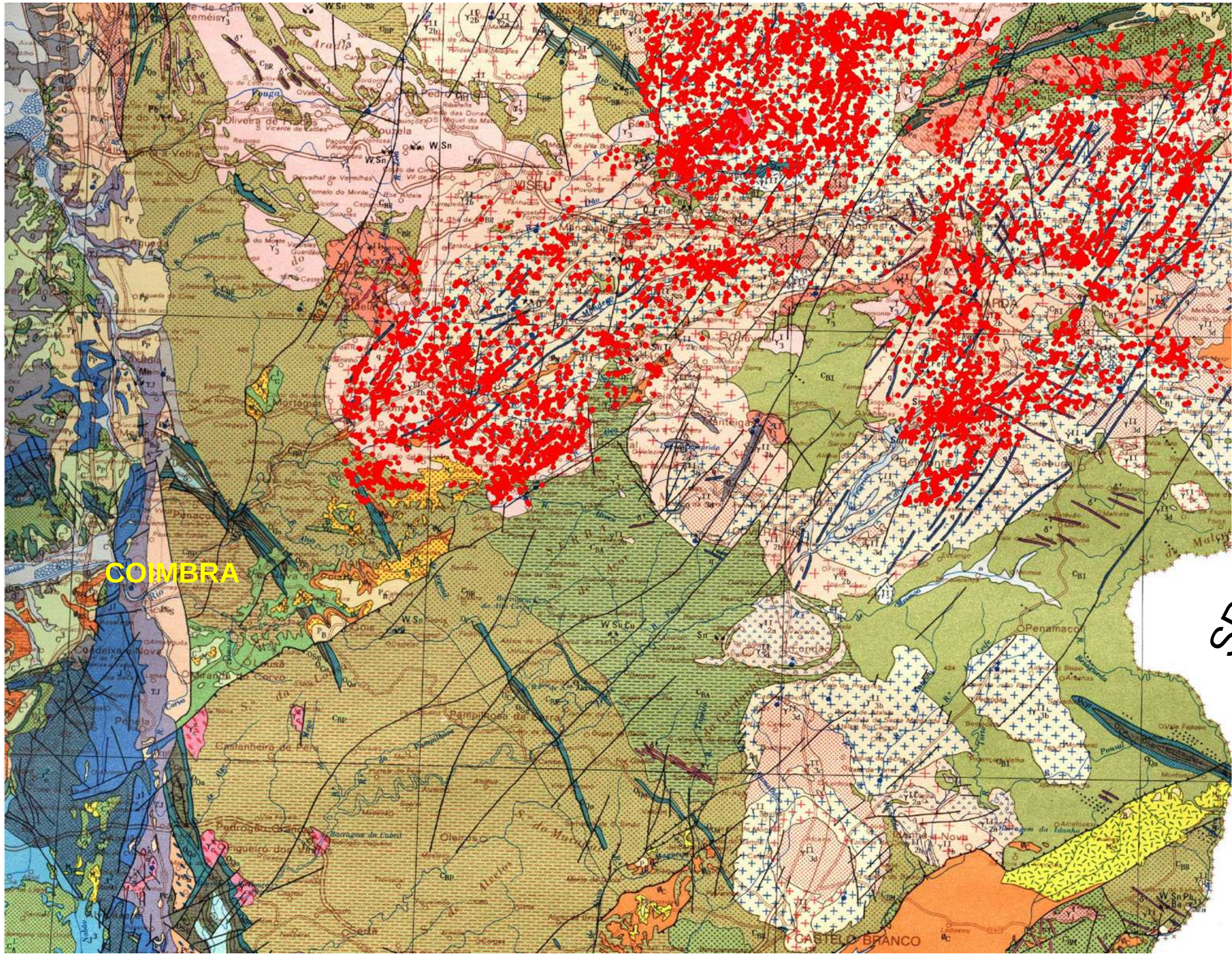
Lithology	U (ppm)	Rn soil ($kBq.m^{-3}$)	Rn indoor ($Bq.m^{-3}$)
Carbonated rocks	1.9	2	60
Detritic sediments*	3.8	6	100
Schists and graywackes	4.4	12	140
Figueiró dos Vinhos Granite	4.8	13	180
Tondela Granite	7.9	29	240
Castelo Branco Granite	8.2	26	220

** permeability can show locally some influence on indoor Rn*

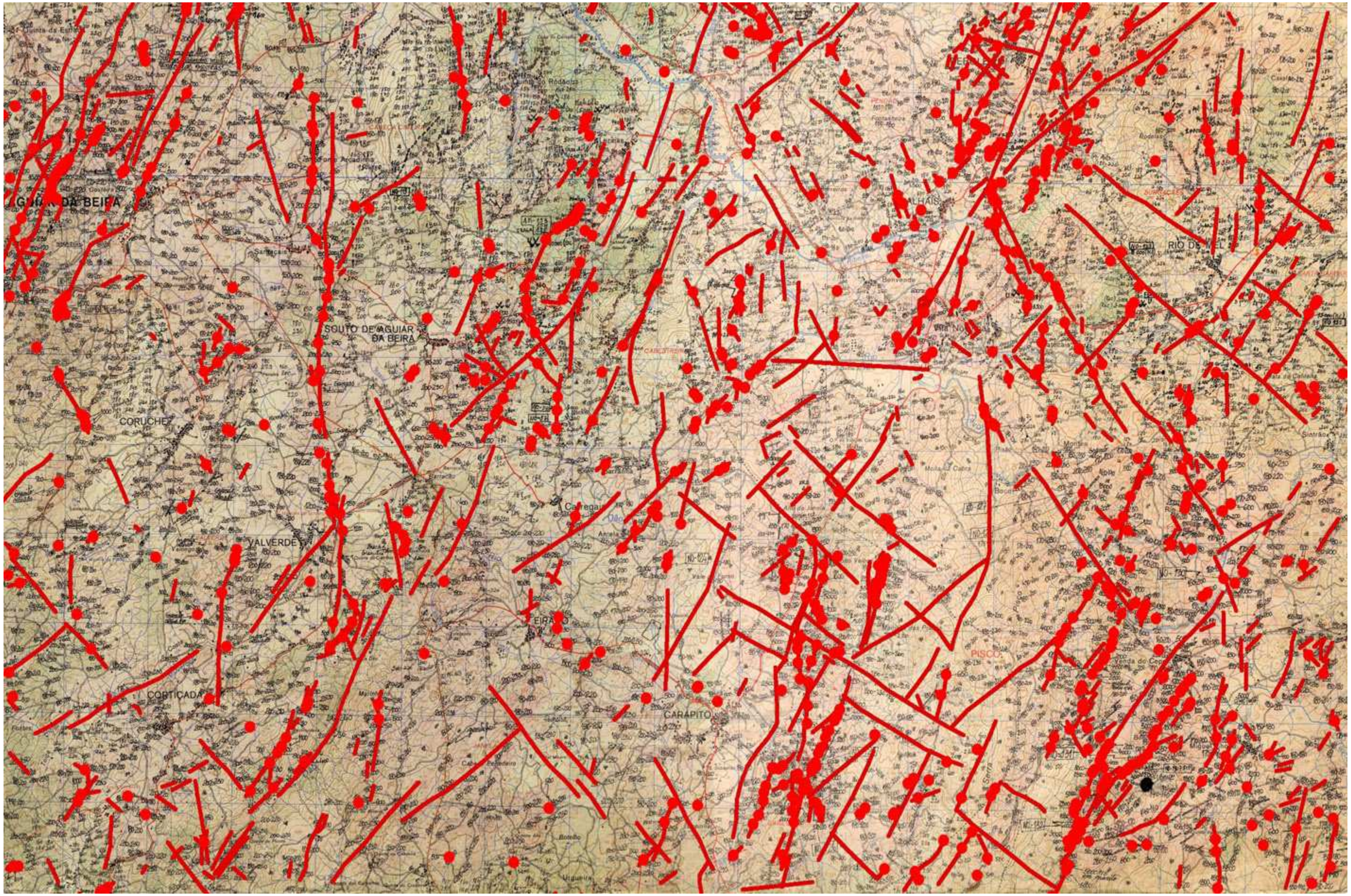
Granites, widely abundant in Iberia, show the highest indoor radon concentrations

Results

2. Areas with important radiometric anomalies (granites with primary uraninite)



Results

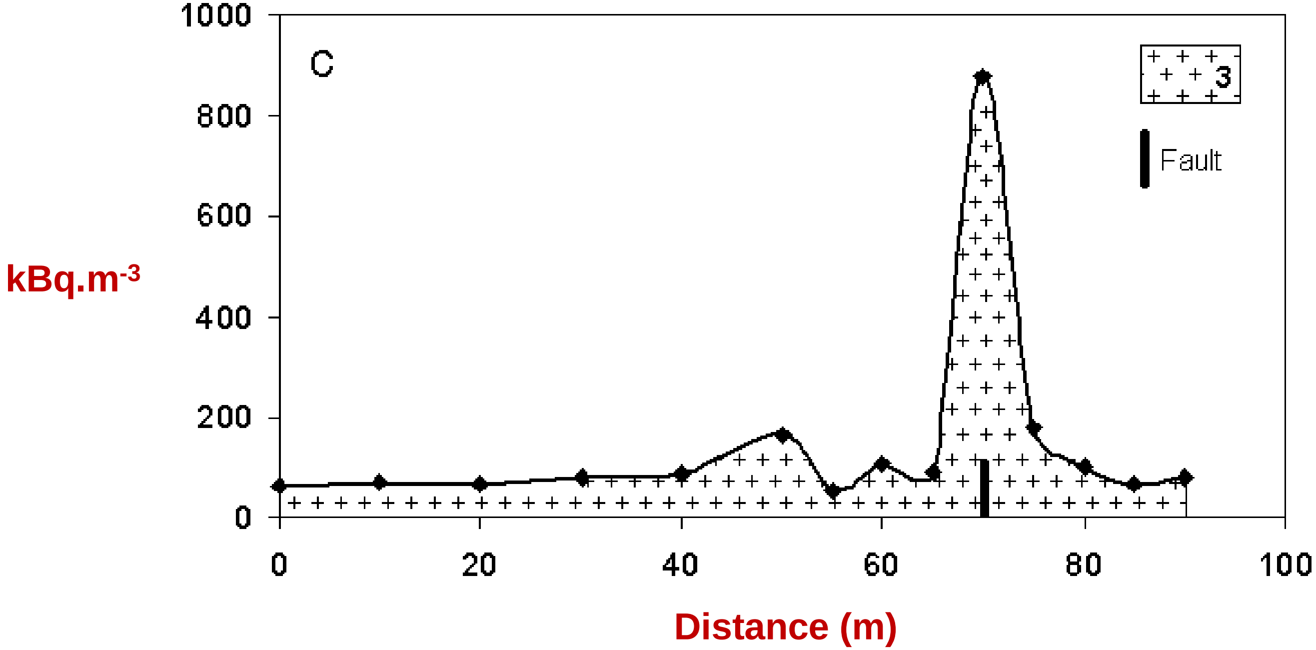


Topographic map 1:25.000, 16x10 km

Results

Radon is boosted by:

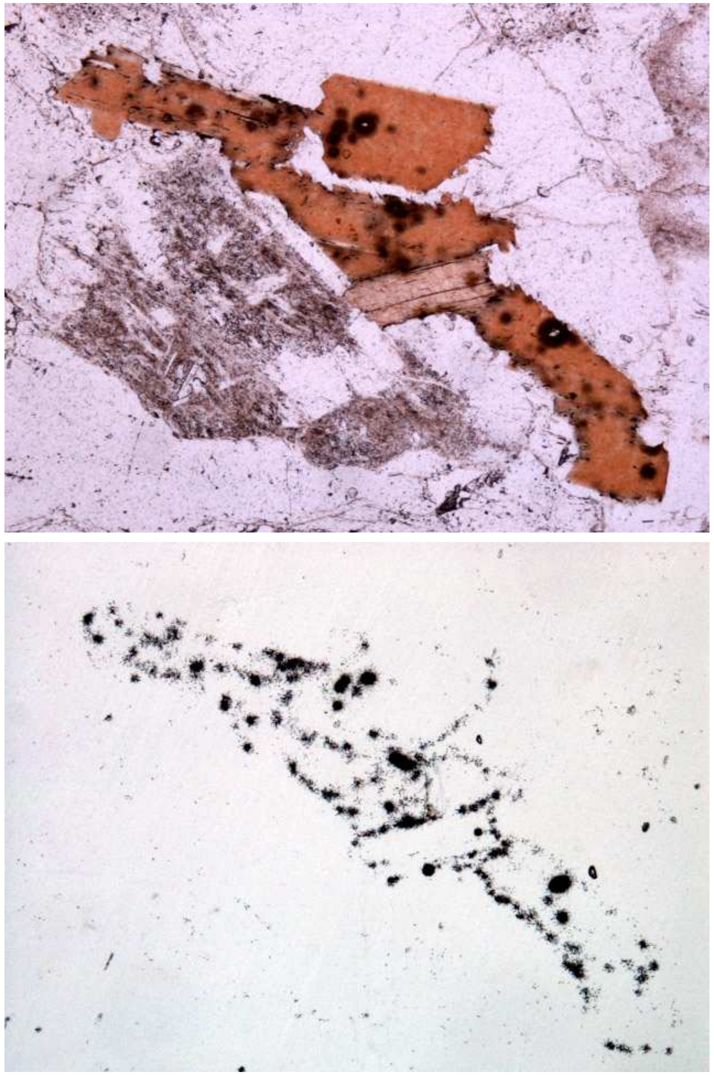
a)local very high U contents in fault filling materials, inducing extremely high soil-gas Rn concentrations;

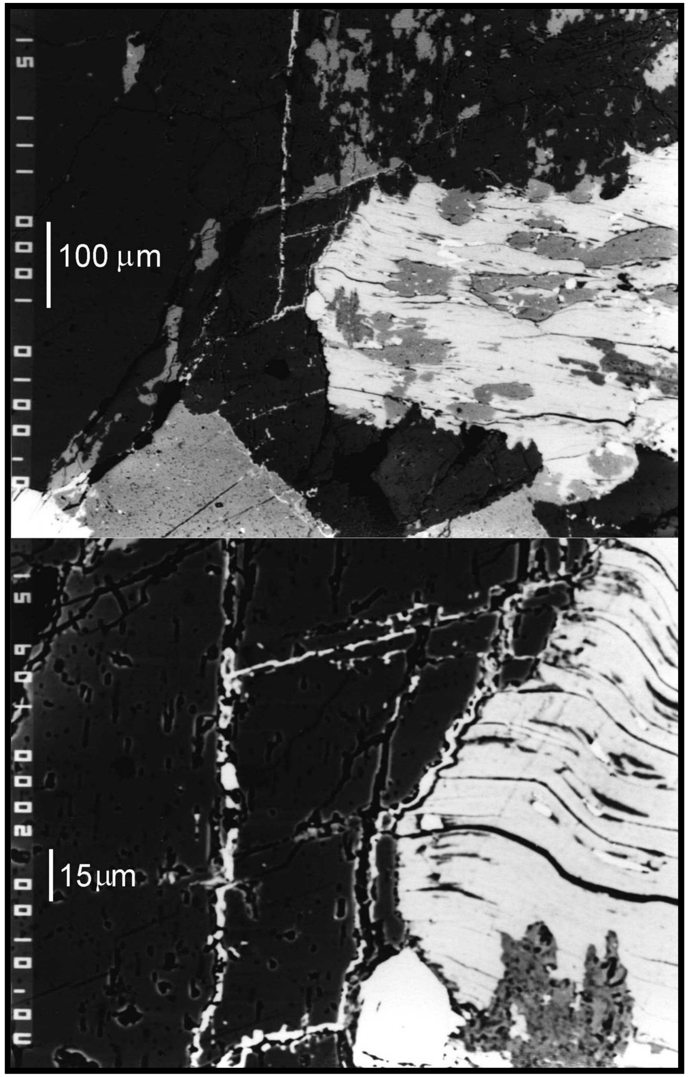


Typical fault families: N35ºE, N55ºE and N75ºE

Results

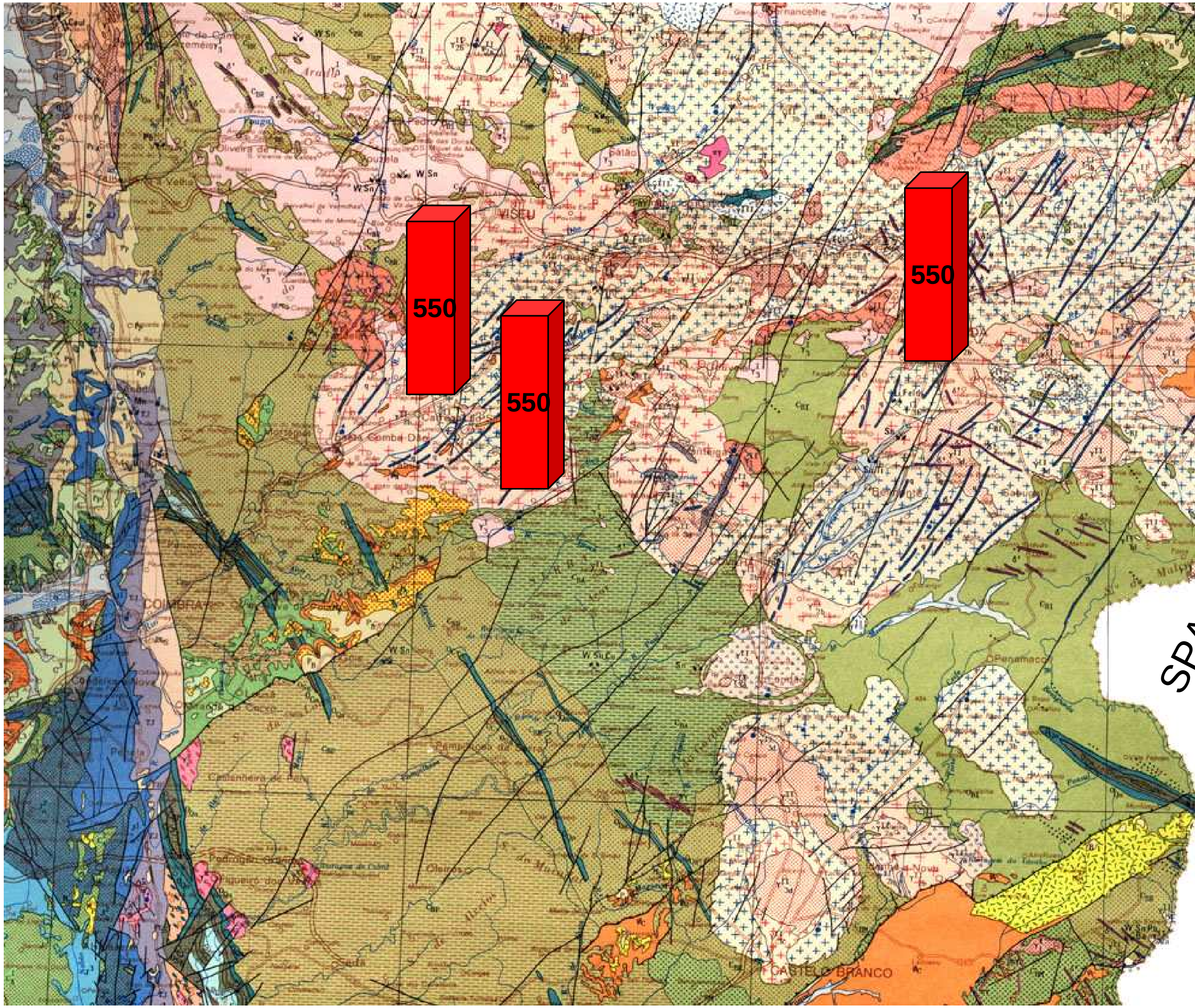
b) The presence of U not confined to acessory minerals, thus significantly enhancing Rn emanation.





Results

Atlantic ocenan



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Conclusions

1. A strong relation has been found between geology and indoor radon in the Western border of Iberia, Central Portugal.

2. Indoor radon values can exceed recommended values in a significant proportion, namely when the geological basement is of granitic nature and shows frequent uranium anomalies associated with fault-filling materials

3. Due to the geological particularities described, radon potential maps need to be developed in some areas at a very fine scale (1:10.000 or less) in order to be useful for planning purposes.

Thank you for your attention!