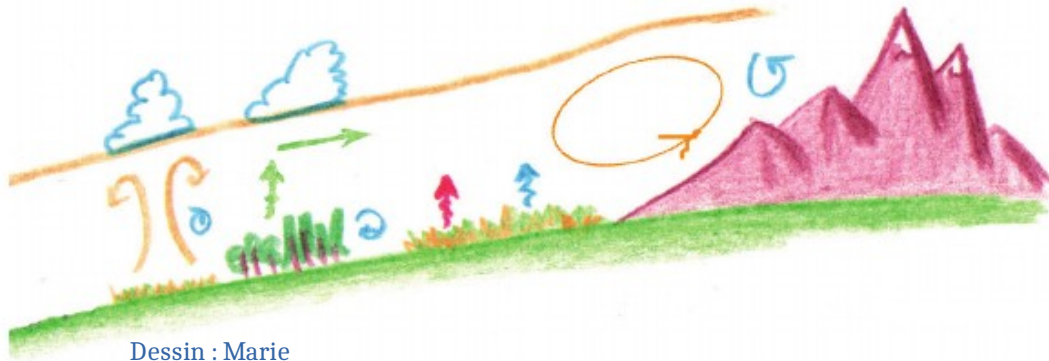
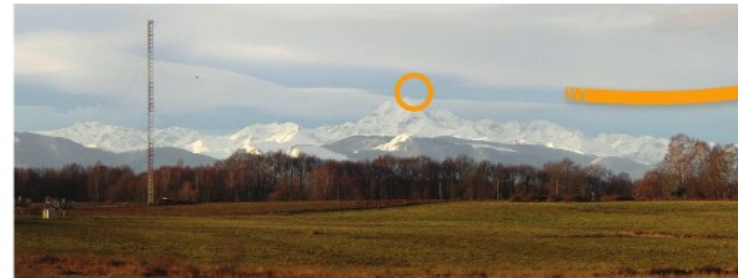


The Pyrenean Platform for observation of the Atmosphere : radon measurements at Pic du Midi (2877 m)



Dessin : Marie Lothon

François Gheusi (resp. sci. P2OA)



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DE TOULOUSE

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RECHERCHE EN SCIENCES
DE LA TERRE ET DE L'UNIVERS

Laboratoire d'Aérodynamique
Laero

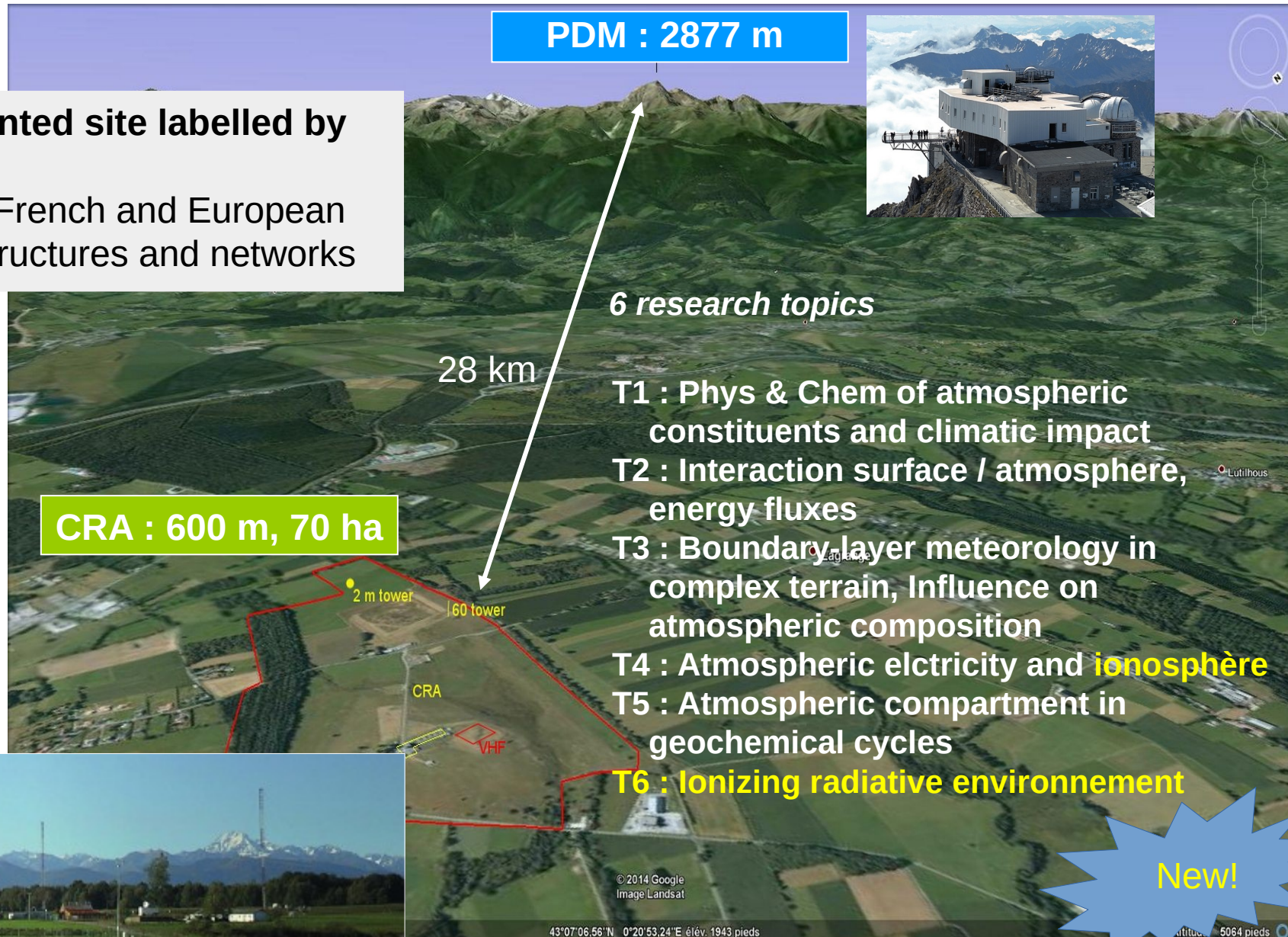
cnrs

ACTRIS
FRANCE

The instrumented site



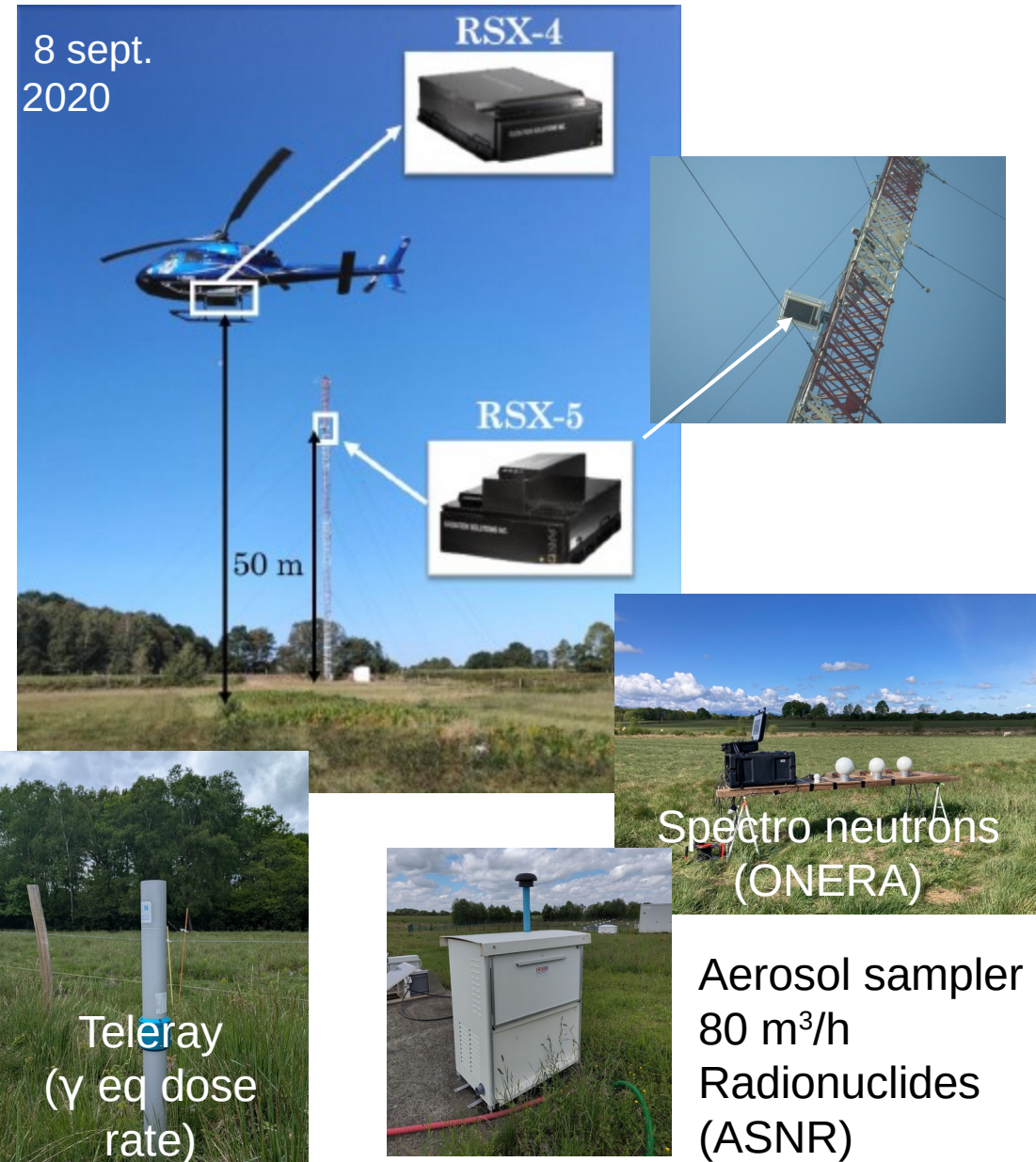
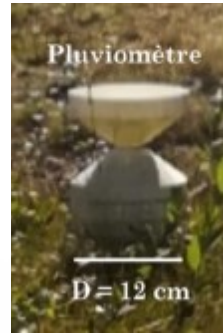
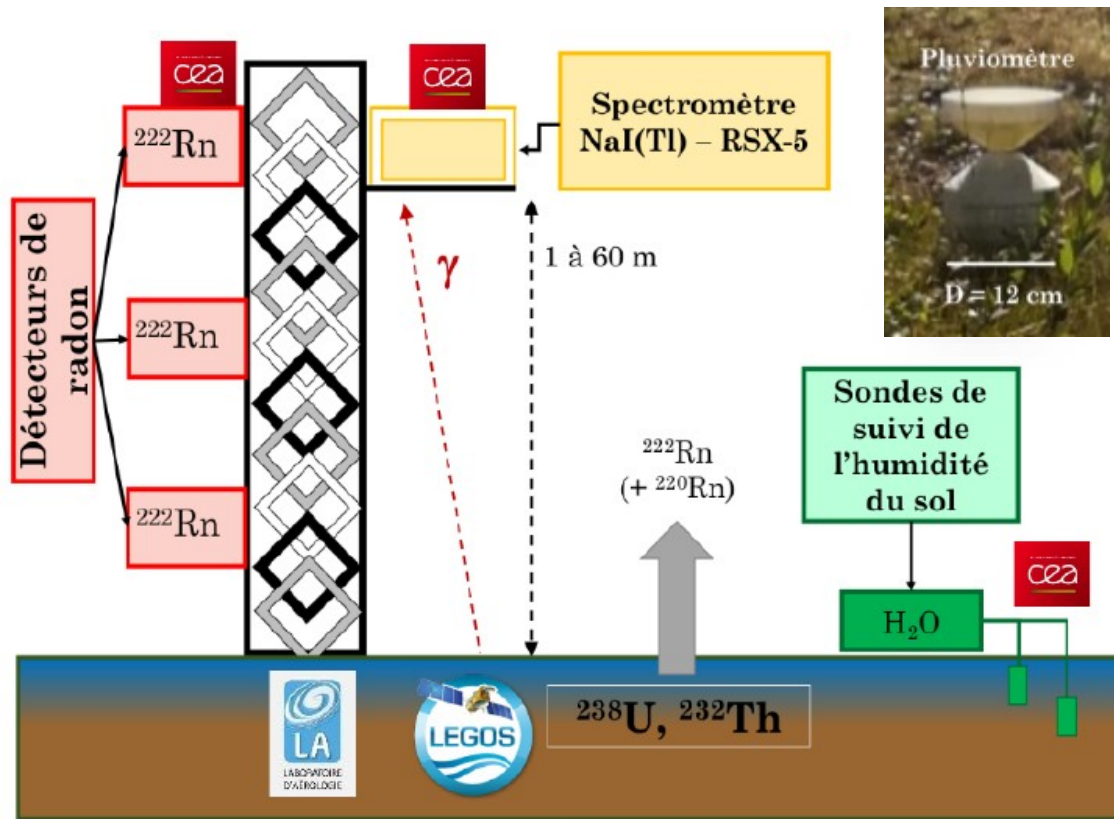
- Multi-instrumented site labelled by CNRS INSU
- Contributing to French and European research infrastructures and networks



Ionizing radiation measurements at CRA

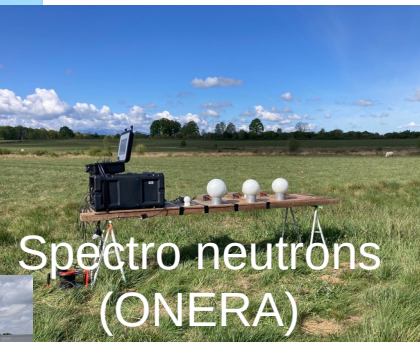
→ cf. J. Amestoy (P.-Y. Meslin) et A. Philibert

CEA/IRAP instruments installed at CRA (2019-2025)

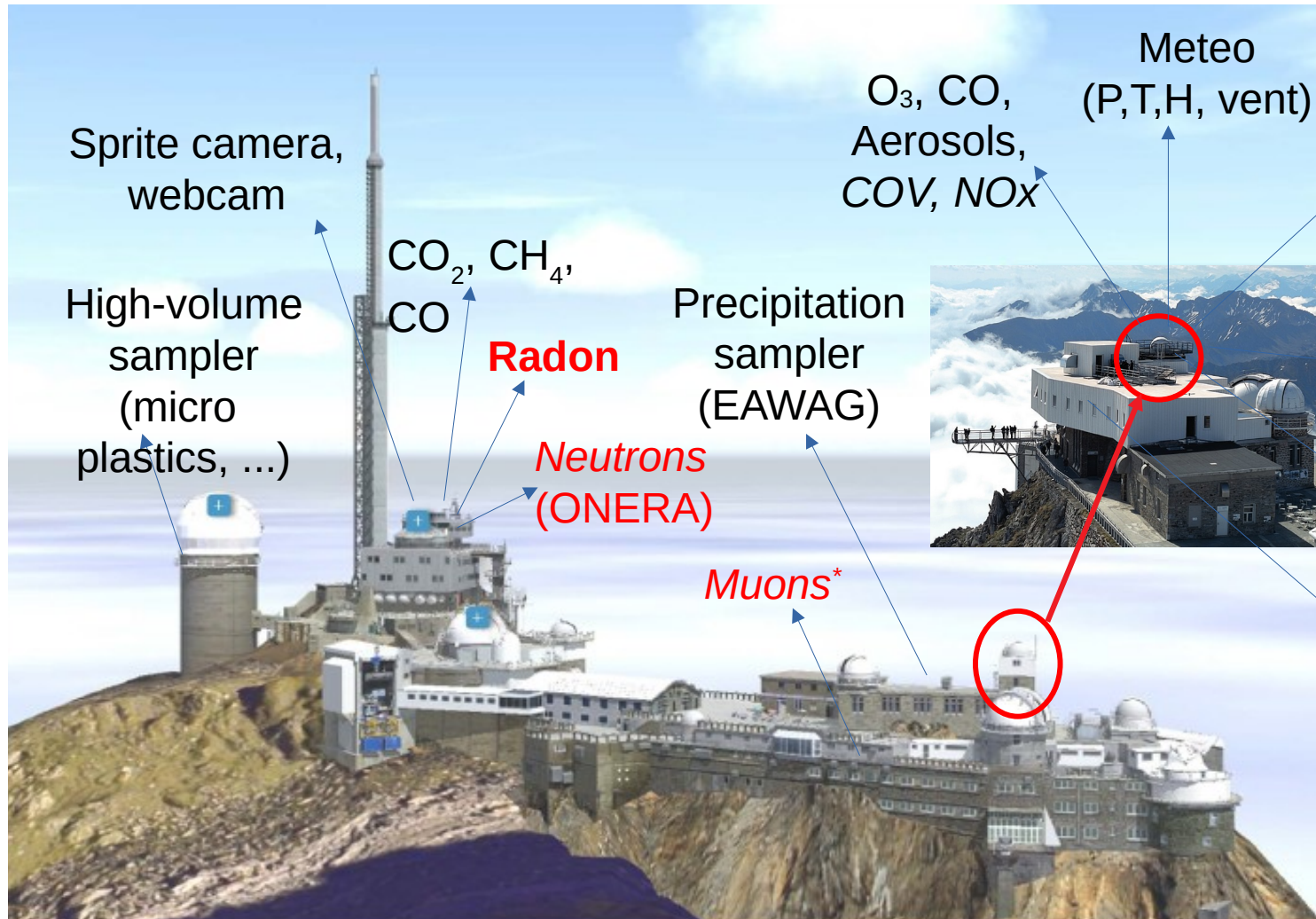
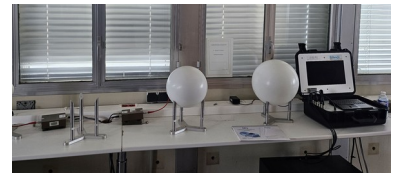


Soil analysis: U, K, Th, ^{137}Cs

Radon flux



Long-term atmospheric measurements at PDM



*Teleray
γ eq
dose
rate
(ANRS)*



*Full-sky
camera*

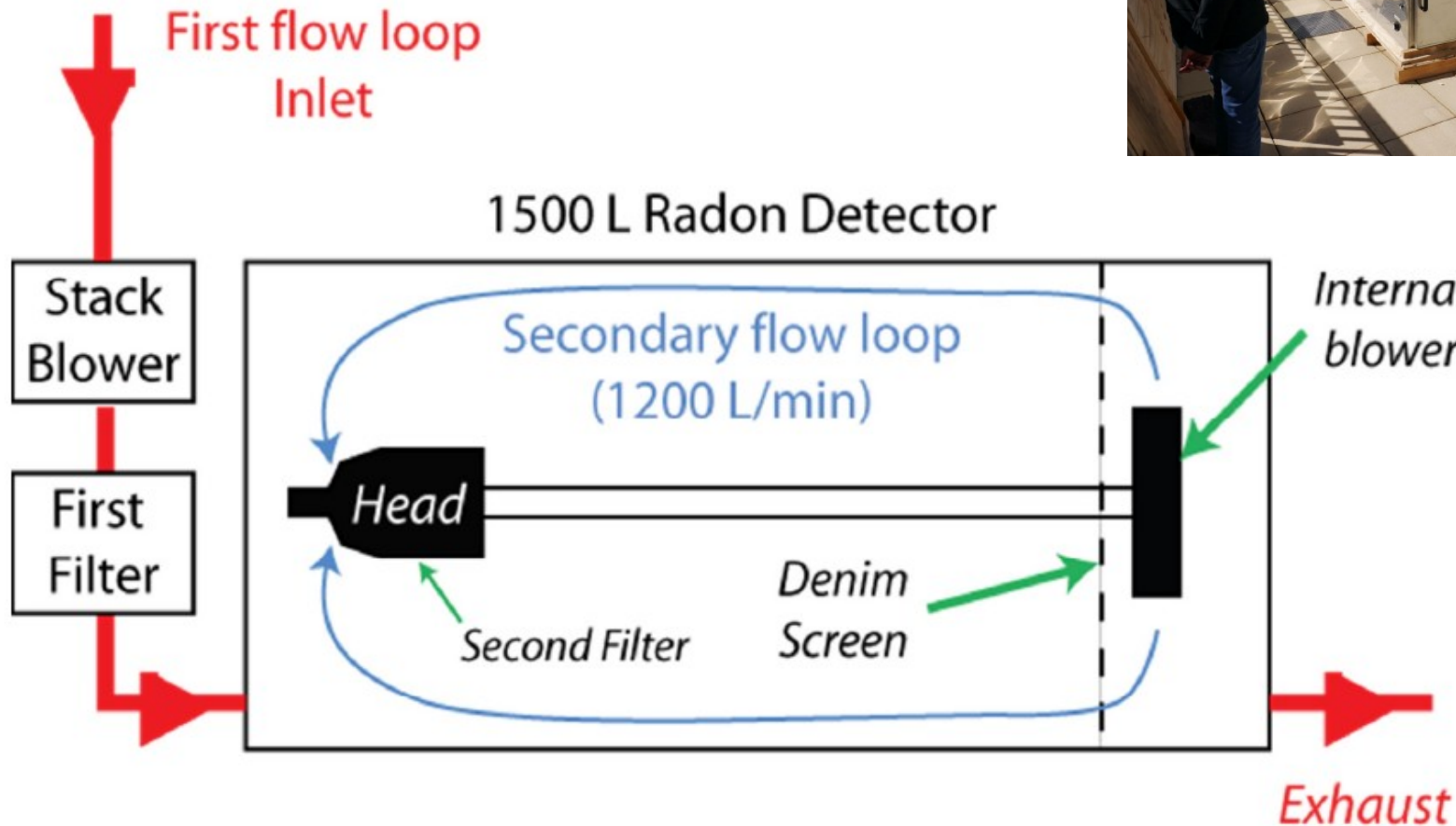
GPS

*Sampler
900 m³/h
radionu-
clides
(ANSR)*



* <https://eperon.omp.eu/>

The ANSTO 1500 L radon detector at Pic du Midi



1500 L, 80 L/min $\rightarrow$ ~ 20 min residence time

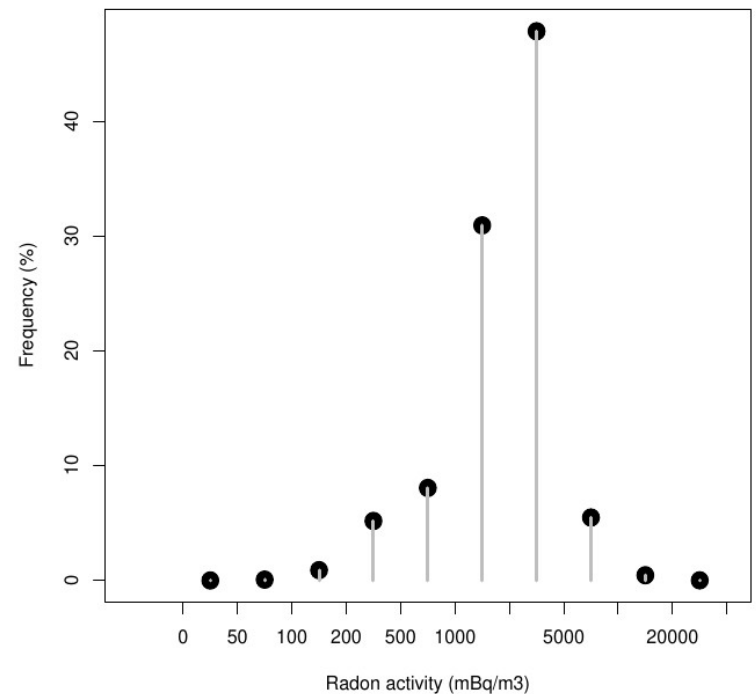
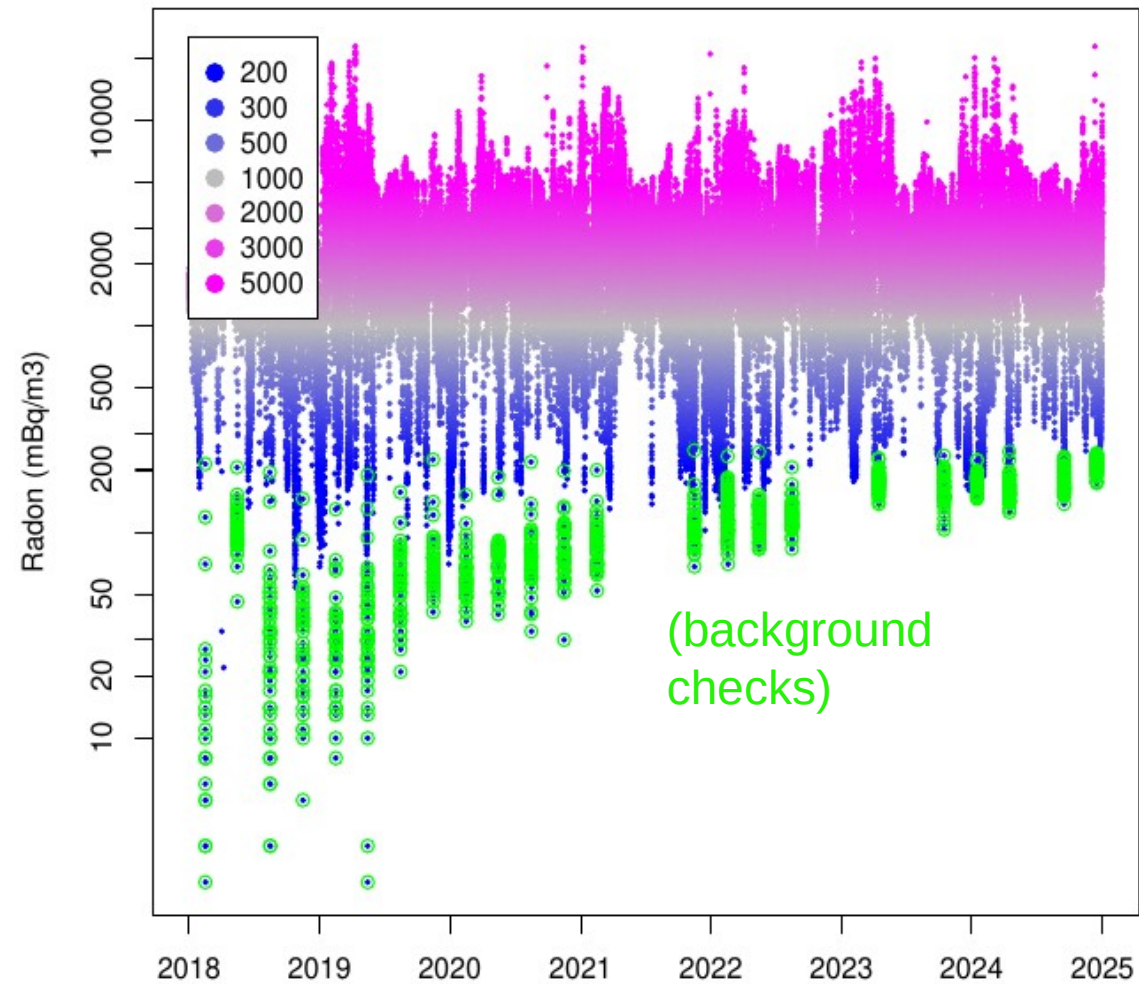
Count time 30 min

Sensitivity $\sim 0,2$ cps / (Bq m⁻³)

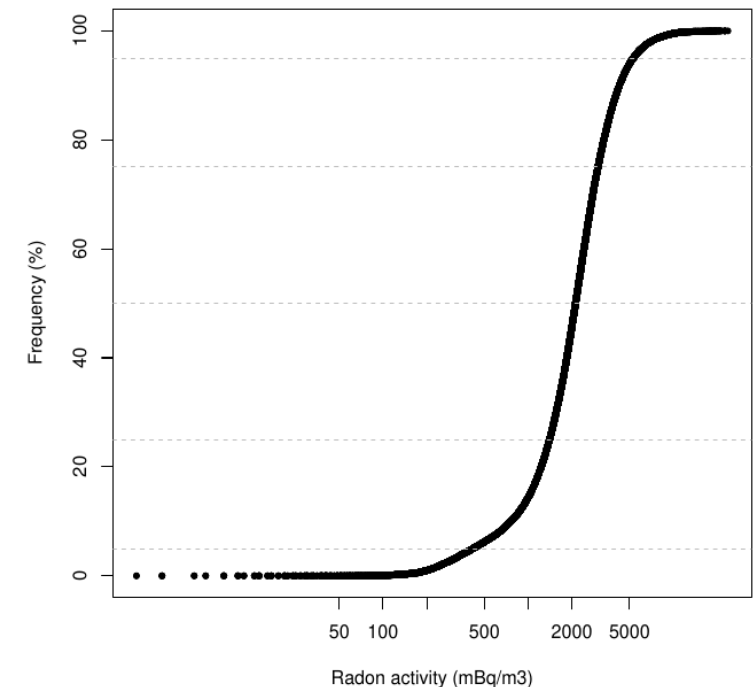
Lower limit of detection $> 30\text{-}40$ mBq m⁻³ increasing with time
(²¹⁰Pb deposition on detector head)

Radon in ambient air at Pic du Midi (2018-2024)

Activité du radon (mBq/m3)



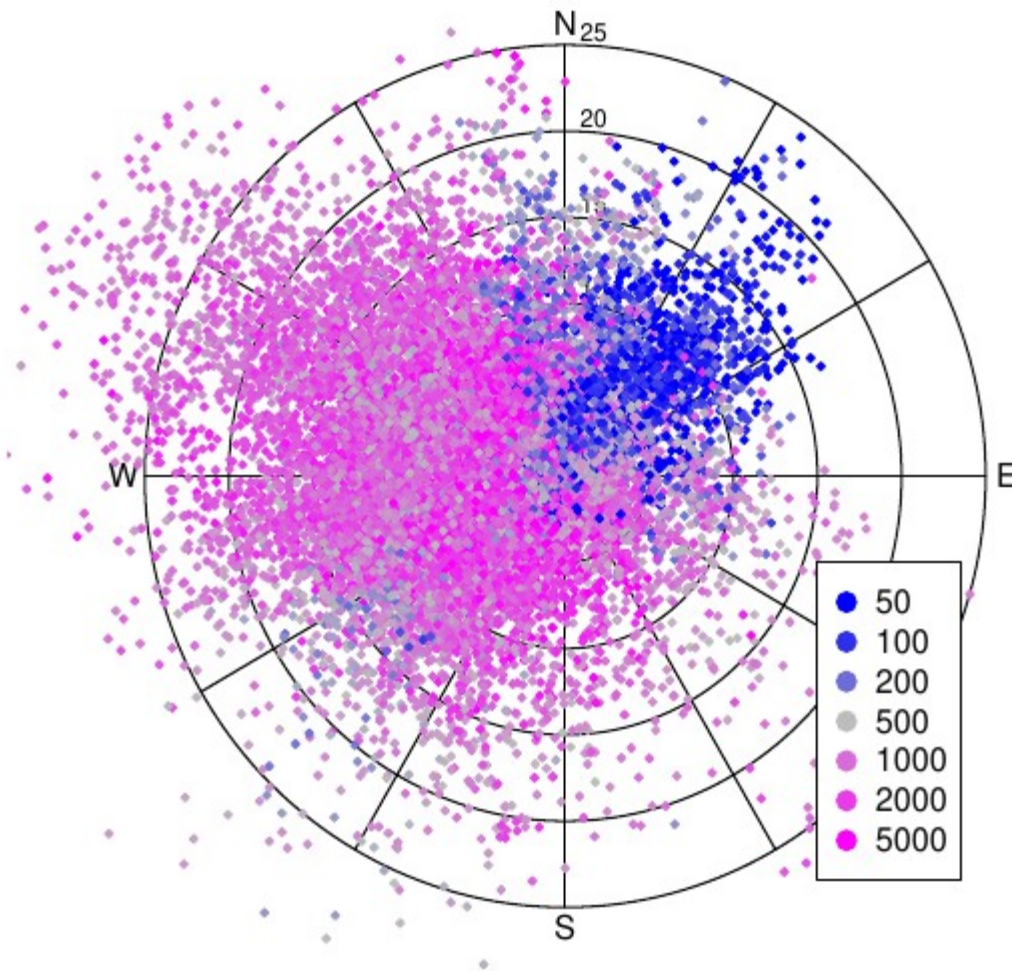
Cumulative frequency of radon activity



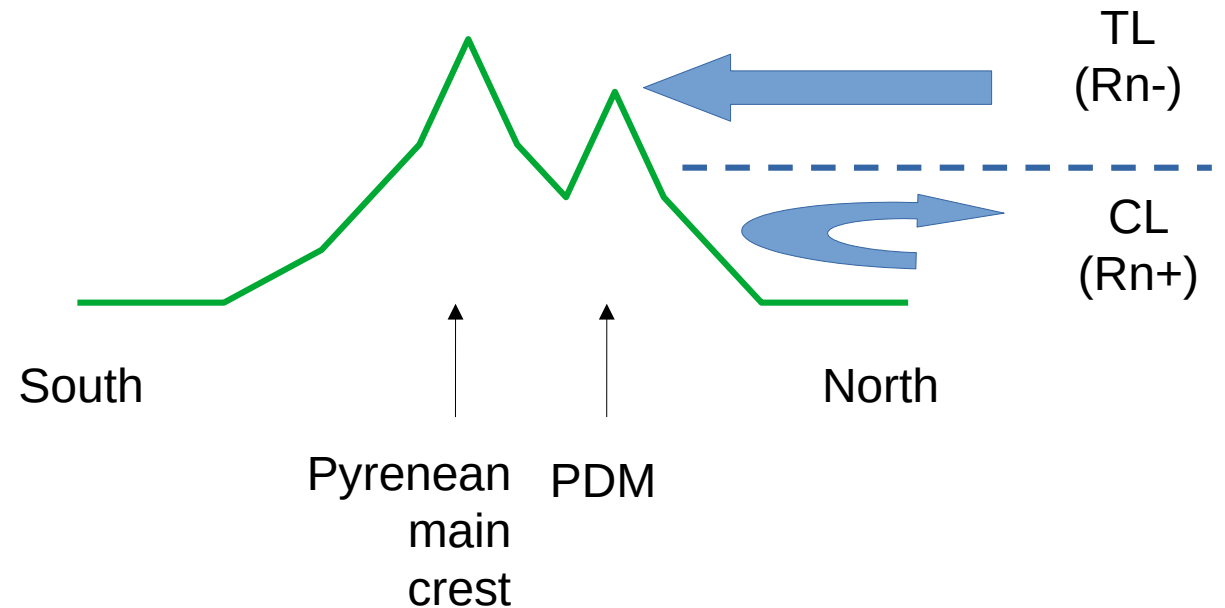
Episodes of low radon activity at PDM

Radon (mBq/m³) en fonction du vent VHF (m/s)

Radon as function of wind at 3000 m

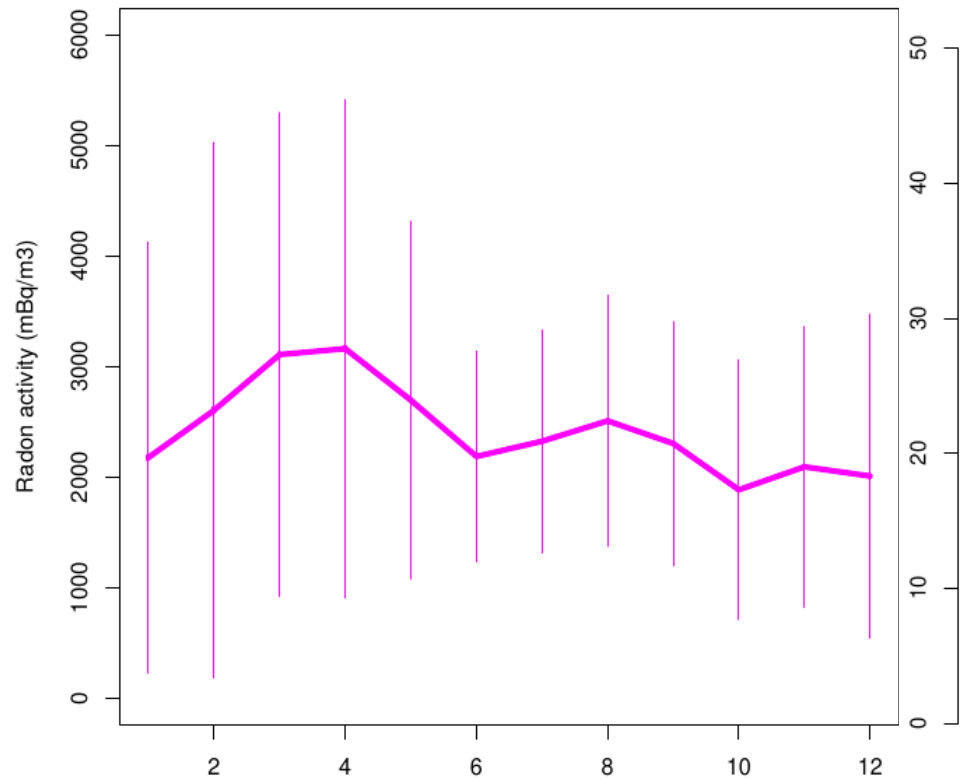


Winter high-pressure episodes, stable lower atmosphere, northeasterly wind

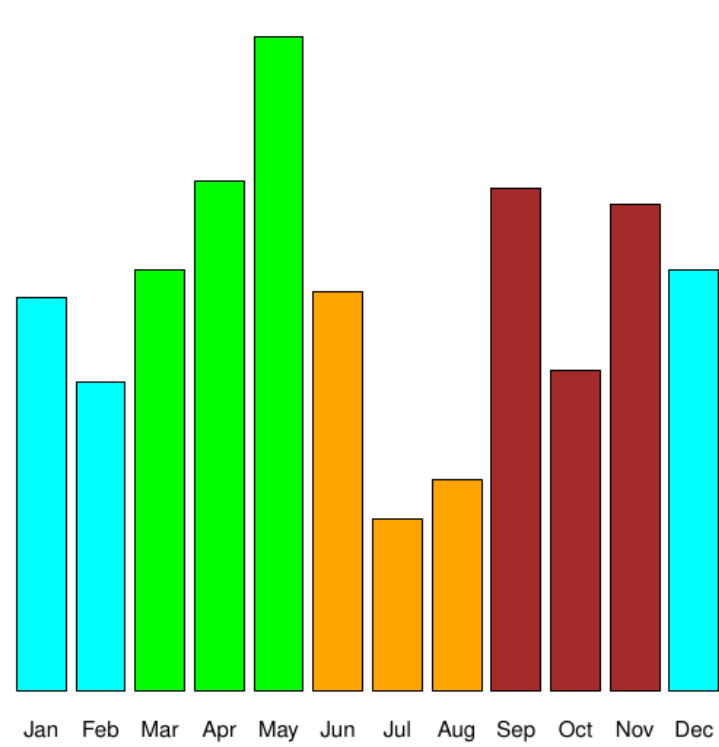


Seasonal variability

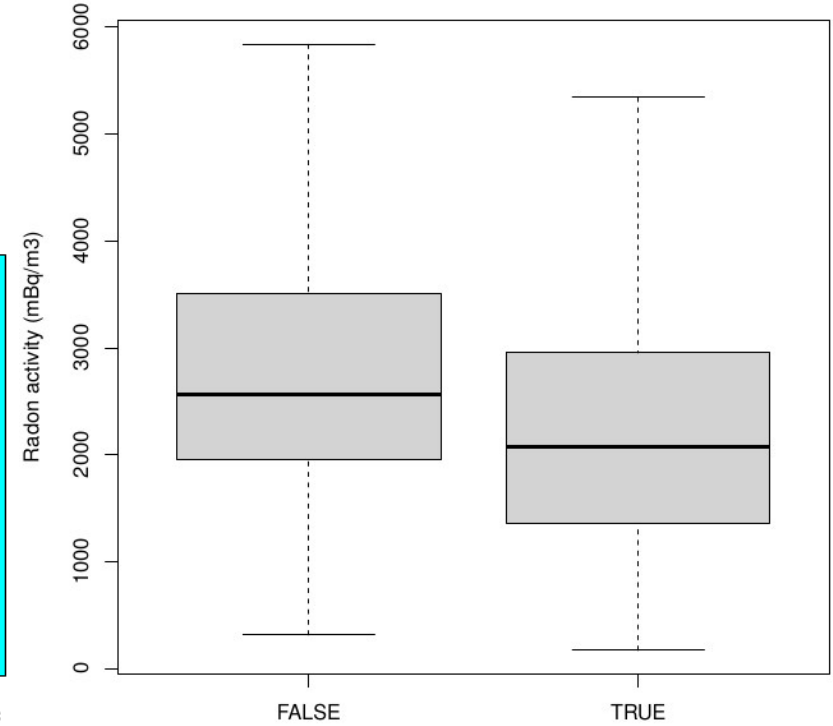
Monthly means



Time fraction in cloud at PDM (%)



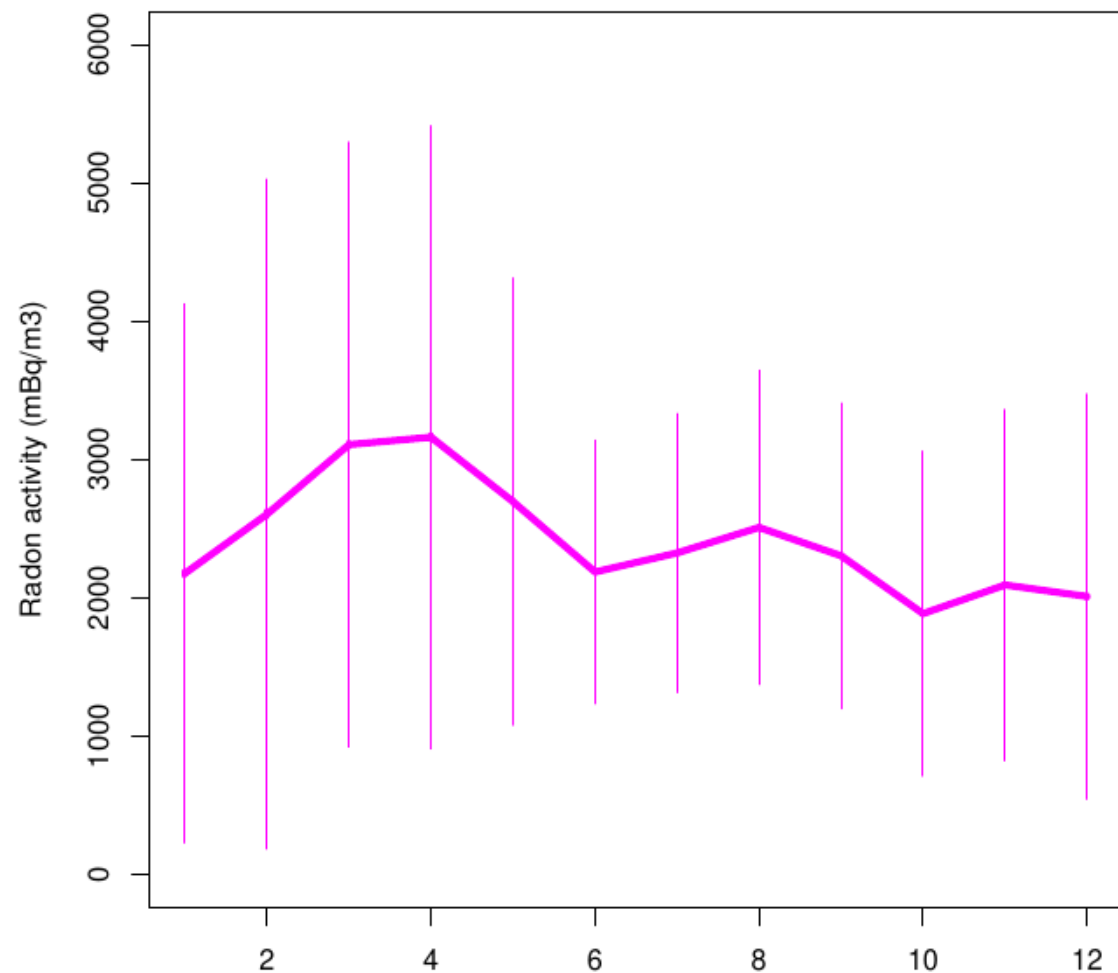
Month (2022–2025)



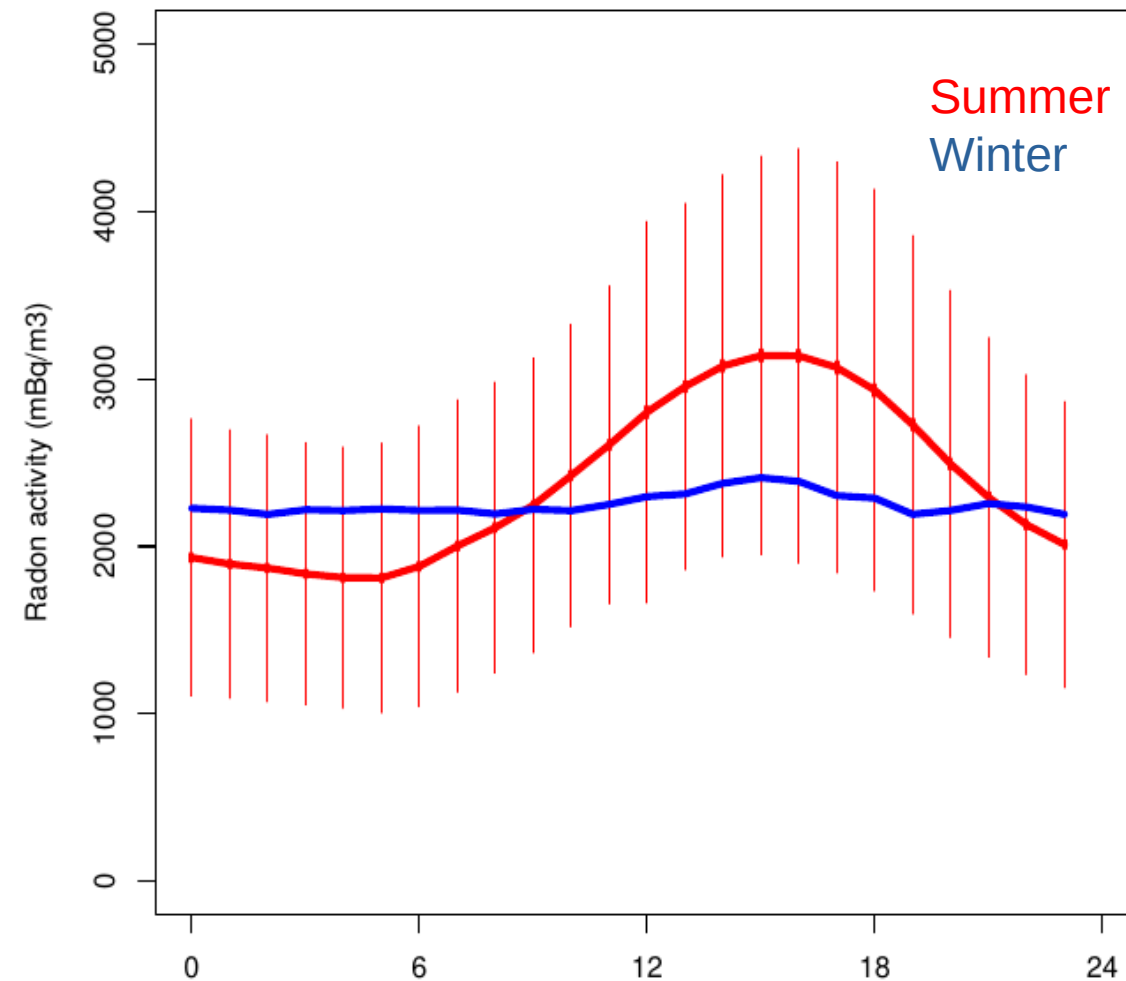
Clear sky at PDM

Seasonal and diurnal variability

Monthly means



Meas diurnal cycles in Jul-Sep and Dec-Feb

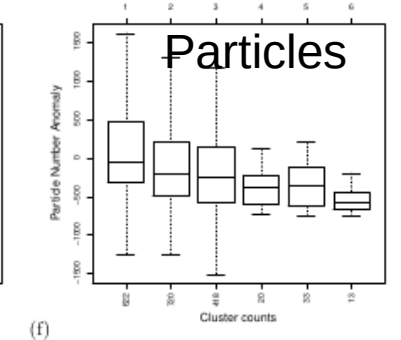
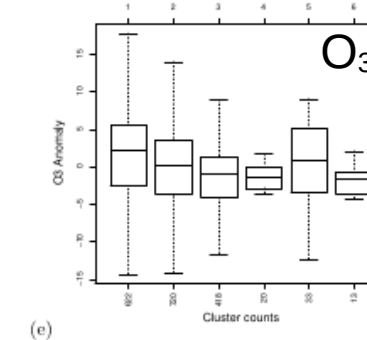
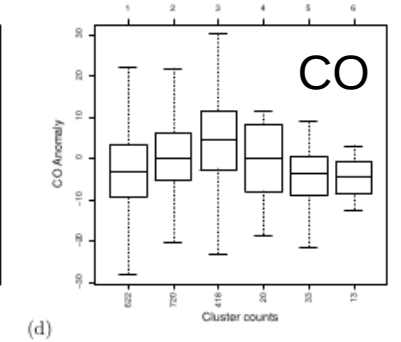
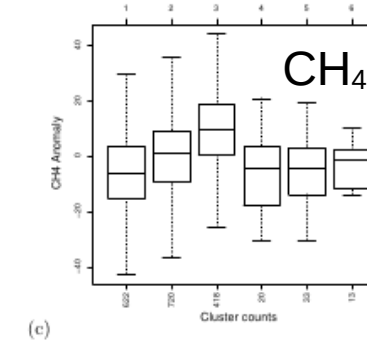
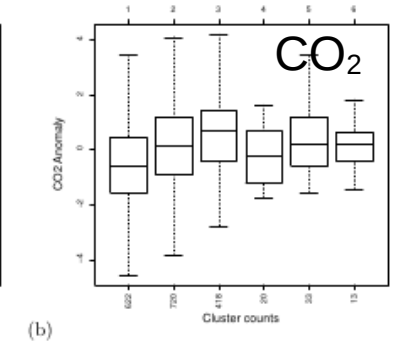
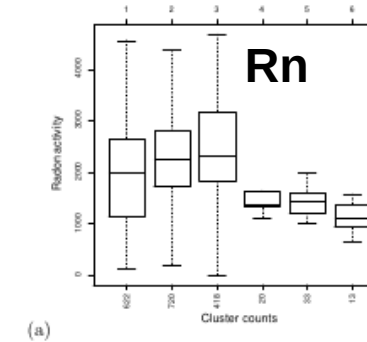
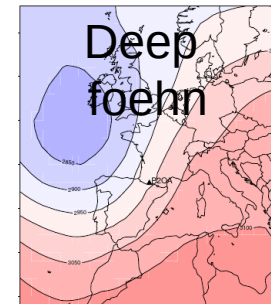
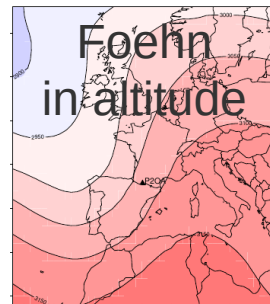
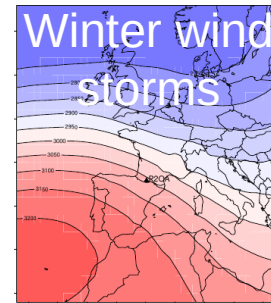
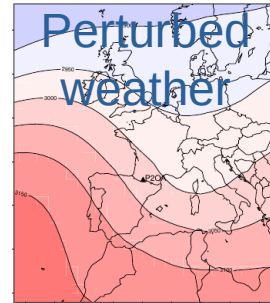
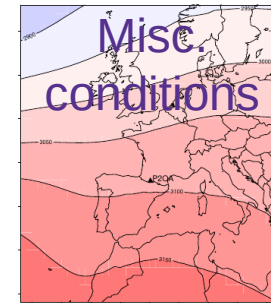
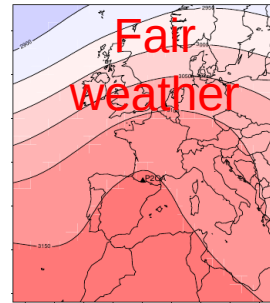
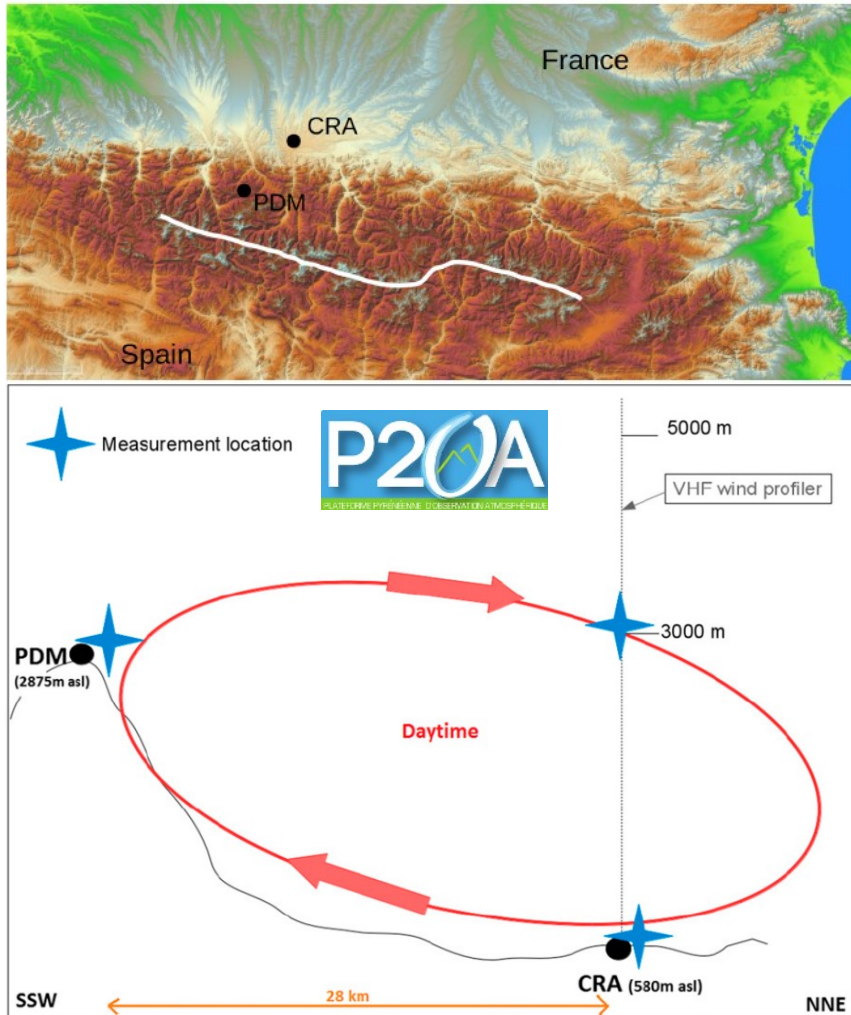


Weather regimes in the Pyrenees

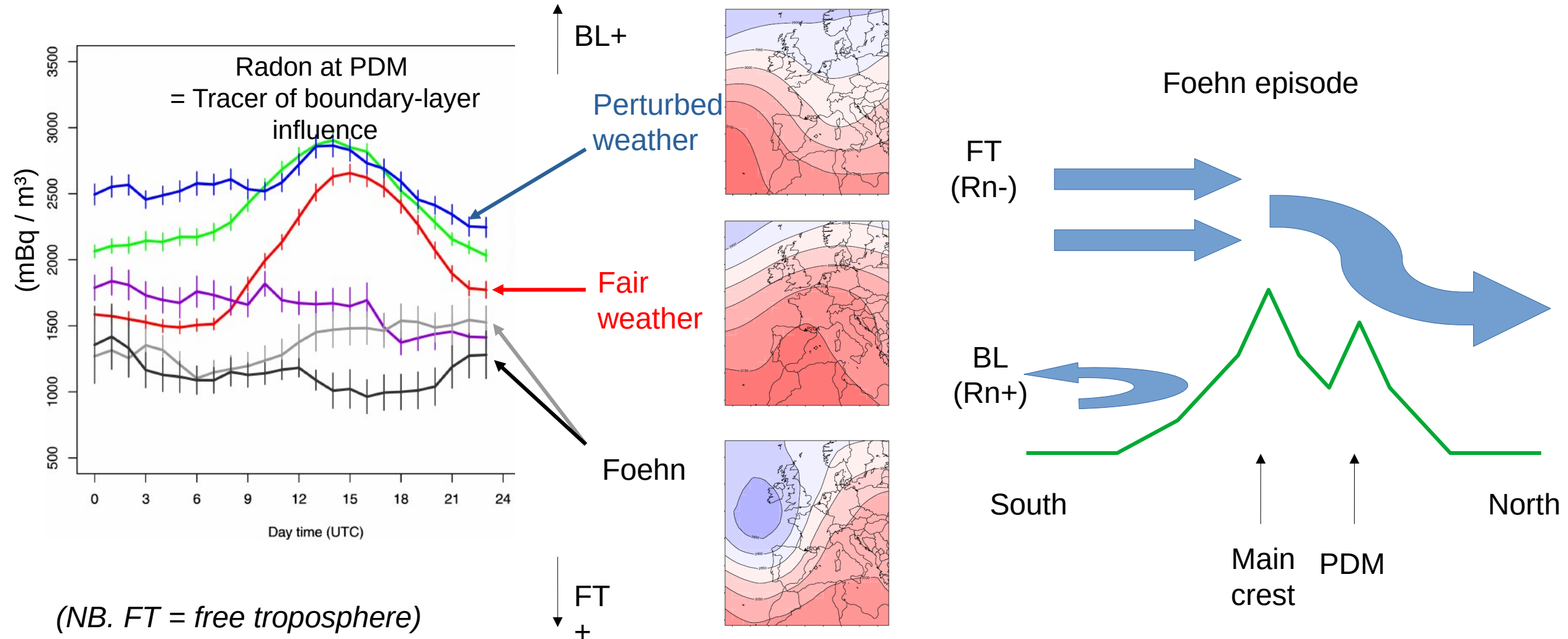
Influence on air composition measured at Pic du Midi

(PhD thesis J. Gueffier, 2023 ; Gueffier et al. ACP, 2024)

23 meteo variables at PDM et CRA → classification (non supervised) → **6 weather regimes**

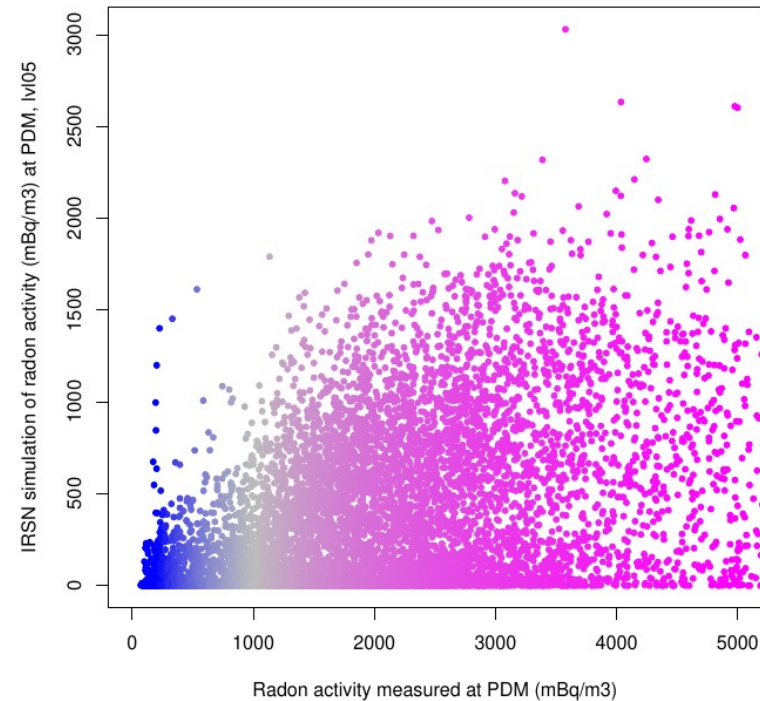


Influence de la couche limite révélée par le radon dans trois types de temps



Future work : why so much radon in air at Pic du Midi ?

LDX model (ASNR) vs obs
at PDM



Williams et al. JAS, 2011,
Airborne campaign in
Australia

10.1175/2010JAS3576.1

→ **Much more radon than expected at this altitude !**

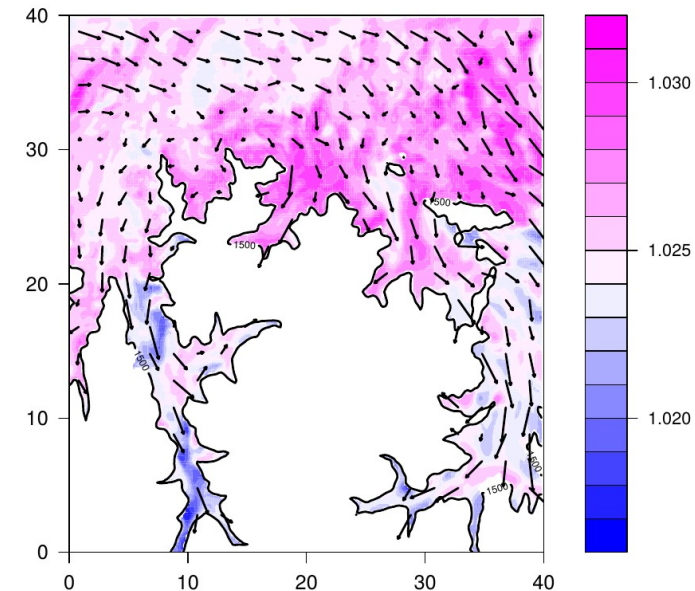
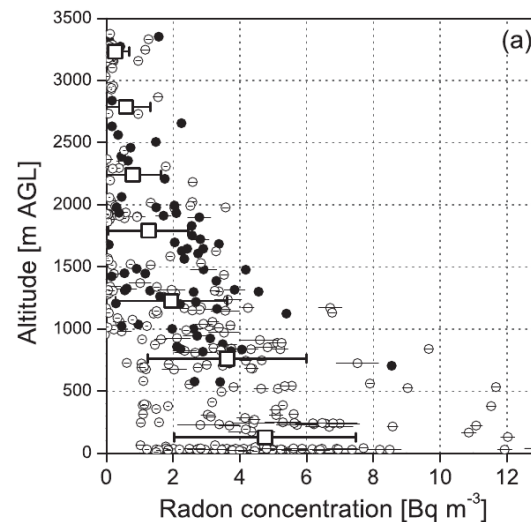
Local emission source (building, rocks at PDM)?

Regional source (Pyrenees)?

Continental source (Spain and Portugal)?

Strong vertical mixing over the relief?

→ Proposed master thesis : modelling radon emission and transport at very high resolution (~200 m) with Meso-NH (collab. with Arnaud Qu  rel, ASNR)





Details and data at [**p2oa.aeris-data.fr**](https://p2oa.aeris-data.fr)

Presentation and scientific review : doi.org/10.5194/amt-17-6265-2024

Thanks!