1. Field evidence of topographical effects at the Roselend Natural Laboratory

Experimental set-up

Set-up of a tarp (3x3m²) located close to a 7 m height vertical cliff, in fractured crystalline rocks.

Is there an influence of a near-by cliff on 222Rn dynamics below tarps?

2. Numerical study of radon dynamics below a tarp close to a cliff

Topography can induce gas flow.

(Thorstenson et al., 1998)

Gas flow and transport modeling with the NUFT code.

222Rn is taken as a proxy to quantify changes in dynamics due to slope or cliff.

- Single gas phase
- Homogeneous porous medium
- 222Rn production in the sub-surface
- Barometric pumping at the surface

- Reduced 222Rn activity in the first meters near the cliff edge due to increased ventilation by the atmosphere.
- 222Rn dynamics below the tarps controlled by barometric pumping.
Other mechanism (e.g. water infiltration) needed to explain field data.
- Local anomaly in 222Rn background below tarps.
- Influence of gas sampling and tarp sealing?

3. Is radon dynamics in a borehole modified by wind pumping?

Set-up for numerical models

No attenuation of P_{\text{bar}} fluctuations during wind loading.

Limited influence (<1%) of wind loading on 222Rn activity at depth.

Pressure (a) and 222Rn (b) in at 1 m (black) and 10 m (red) boreholes at 1 m distance from a cliff. Periods of positive (continuous line) or negative (dashed line) wind loading are in grey.

4. Conclusions

- Models show small pressure perturbation in boreholes from wind loading.
- Sub-surface gas dynamics shows strong variability due not only to barometric pumping but also to local topography and other transport mechanisms.
- Borehole / tarp sampling less than few meters from a cliff could lead to dilution by atmospheric air.

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Bibliography


