

Health Physics Issues Related to Radon – Preliminary Comments

Panel Discussion

NMA-NRC

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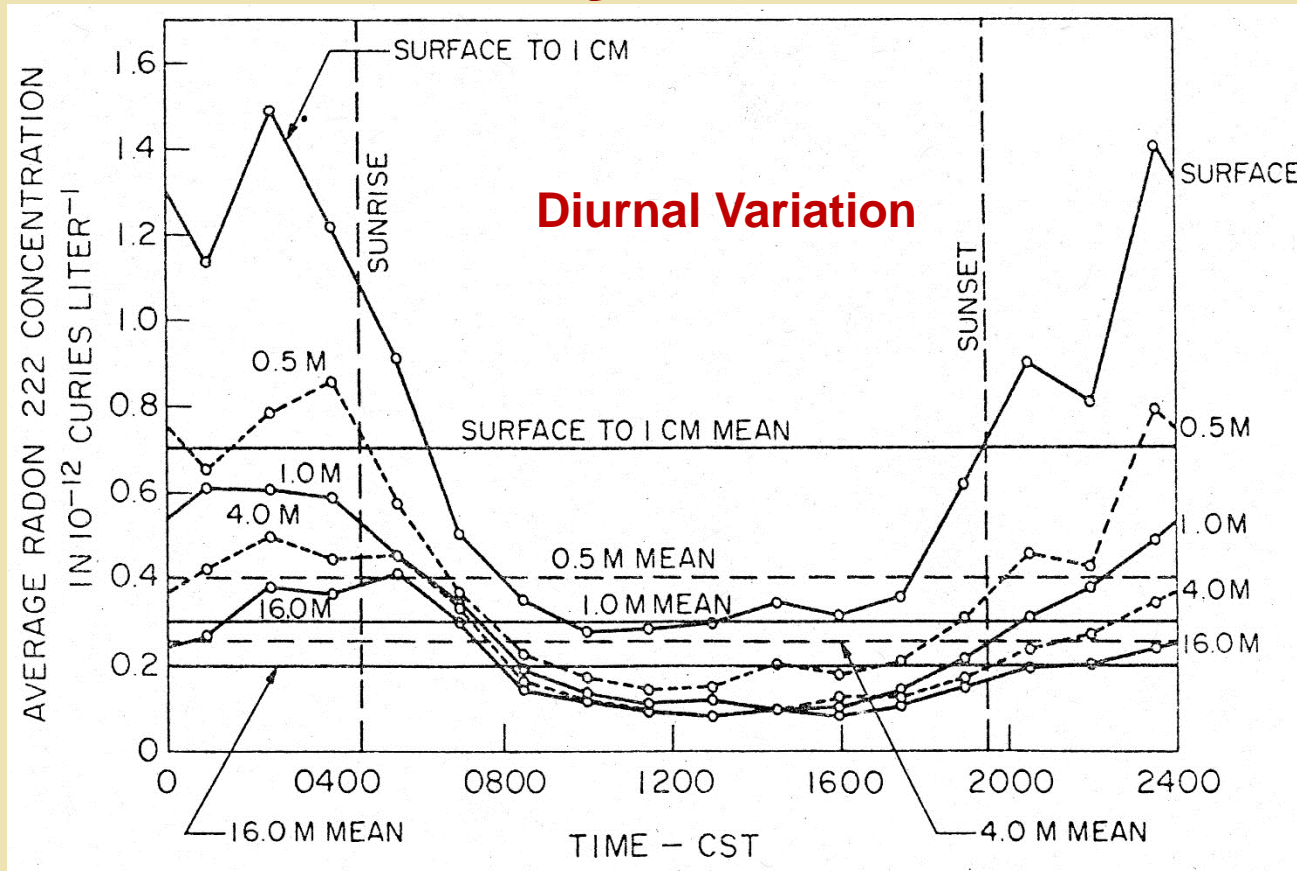
Radon -222 [Radon]

- ❖ Radon is natural and everywhere
- ❖ Radon released from Ra-226 in soils is the single largest source of Rn-222
- ❖ Radon is a radioactive noble gas decaying to solid atoms
- ❖ Radon is produced through radioactive decay of Ra-226 with a half-life of 3.82 days
- ❖ Levels of radon are highly variable

Outdoor Radon

- ❖ Radon levels in outdoor air are affected by the regional geology, meteorology, local topography...
- ❖ The NAS (1999) report many areas with outdoor radon levels ranging from 0.12 to 0.3 pCi/L
- ❖ Also according to NAS (1999), the highest concentrations in continental US are found in the Colorado Plateau where measurements ranged from 0.5 to 0.75 pCi/L of air (18.5–30 Bq/m³)

Radon levels change diurnally and by season



SOURCE: After Pearson, U.S. Department of Health & Welfare, 1967

Indoor radon levels are variable

Location	Average (Bq/m ³)	90 th Pctle (Bq/m ³)
Arizona	38	47
Colorado	107	136
New Mexico	85	122
Utah	103	113
USA	46.3 (+/- 4.4)	> 200 Bq/m ³

Note: 0.1 pCi/L = 3.7 Bq/m³

Radon and WL

❖ $WL = F \times [C(\text{radon})/100]$ (old units)

❖ $C(\text{radon}) = [100 \times F] / WL$

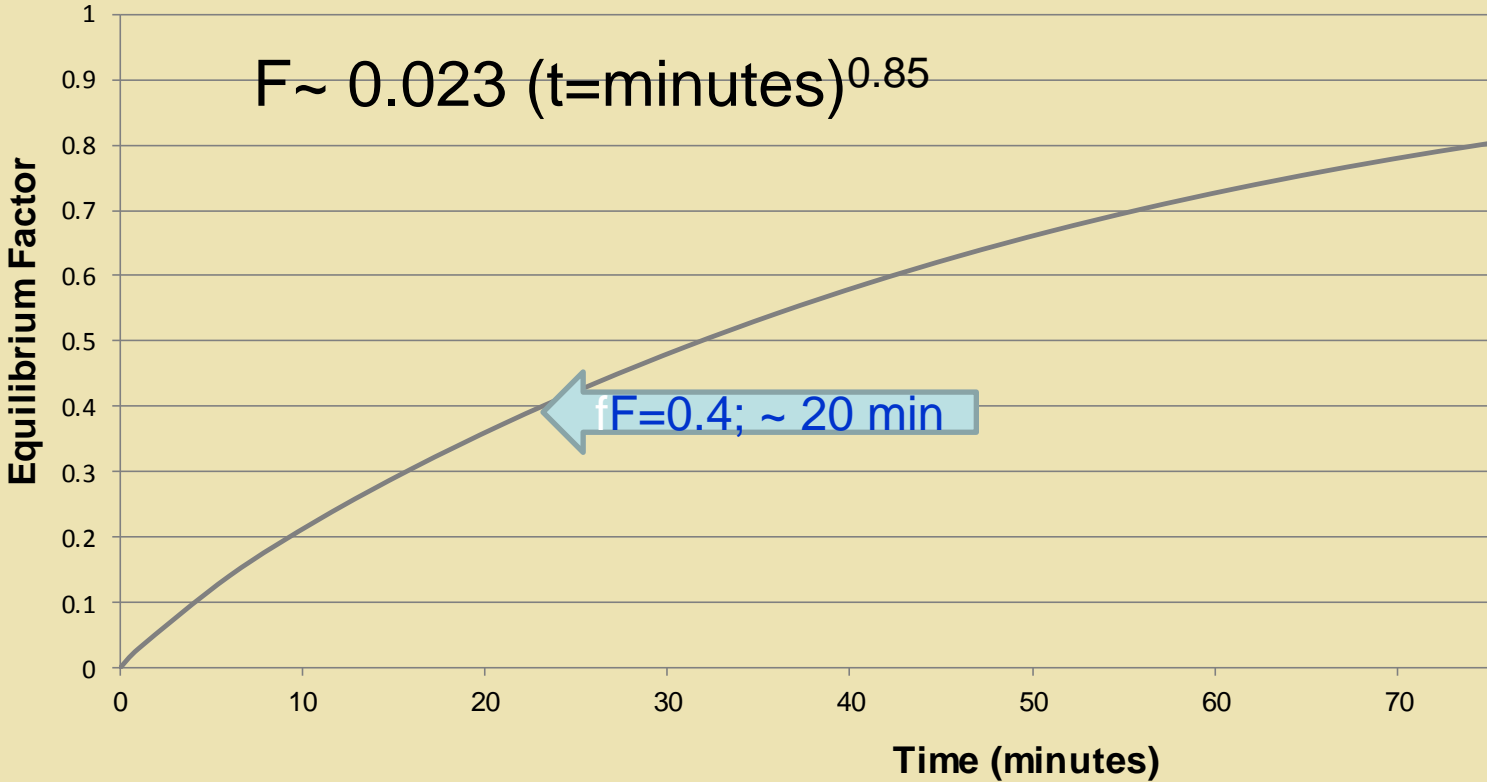
❖ “F” is important

- Indoors F depends on mean **residence time** (air change rate)
- Out of doors F depends on **travel time** from source of “fresh” radon to receptor of interest

❖ “Nominal F”

- Indoors $F \sim 0.4$ is a common assumption
- Out-of –doors $F \sim 0.6$ is a common assumption

Dose is from the ingrowth of Radon Progeny



Observations

- ❖ Radon is everywhere
- ❖ Radon concentrations are highly variable
- ❖ Equilibrium factor (F) is important
- ❖ Very difficult to measure small increments of the order of 0.1-0.2 pCi/L to background radon
- ❖ Long-term radon measurements are preferred for assessing source or environment but many challenges