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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Predicting terrestrial ^{222}Rn flux using gamma dose rate as a proxy" *by* T. Szegvary et al.

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General Comment

The authors have done a tremendous and very useful work by measuring radon fluxes at many sites in Europe. It would be worth publishing these data as a map or as a table, together with details about how the measurements have been done. But I'm not convinced that the data shown in the paper submitted are sufficient evidence for the claims made.

Specific Comments

Figure 2 shows that terrestrial dose rate and radon flux are not well correlated. There are several good reasons for not using terrestrial dose rate as a proxy for the amount

of radon escaping to the atmosphere :

1) Decay products from the 228Ra series and 40K contribute the same order of magnitude to the dose rate as 226Ra decay products do. Neither the 228Ra/226Ra nor the 40K/226Ra ratios are constant and thus terrestrial dose rate will not be a good proxy for the 226Ra concentration unless these ratios are known.

2) Depending on where the 226Ra is located, emanation coefficients can vary by a factor of 10. Only some % of the radon produced inside a grain will escape to the pore space, whereas up to more than 50% of the radon produced from radium adsorbed on thin layers covering the grains (Mn- or Fe-oxyhydroxides) will be available for transport through the soil. The soils mentioned in the Von Gunten et al. paper are an extreme case but large variations for the emanation coefficient are known from other studies too. So even if the 226Ra concentration in the soil is known, the radon concentration in the pore space cannot be calculated unless the emanation factor is known. Figure 1 c clearly shows that 226Ra and radon flux are not well correlated.

3) Dose rate is a measure for the radon (and thoron) that could not escape to the atmosphere. A high emanation from the soil thus would result in a decrease in the dose rate and not in an increase.

4) Dose rate is not very sensitive to layered soil structures (and if, it goes the wrong direction), but radon emanation clearly is. Frequently soils are less permeable close to the surface due to fine grained weathering products. This reduces radon emantion, but will not reduce dose rate, rather increase it because of radon decay products building up below this less permeable layer.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 1877, 2007.