

Interactive comment on “A map of radon flux at the Australian land surface” by A. D. Griffiths et al.

Anonymous Referee #1

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This work is a useful contribution to atmospheric science, where the large potential of radon as a tracer for transport and mixing is often limited by a poor description of its surface flux density. Here, mechanistic understanding of radon flux is combined with field measurements to turn continental scale soil and radiometric data into a best estimate of surface radon flux density distribution in space and time.

Methods are scientifically sound. Determination of c in log space is reasonable. Just for curiosity, what would factor c be, if not calculated in log space?

Results are clear and interesting to a wide audience. Section 3.5 ‘Radon flux maps’ would benefit from a little more detail in the description of the map. A histogram of annual mean flux density could tell us about the frequency distribution of flux densities and whether they are normally distributed or skewed.

Discussion is balanced, takes into account all relevant previous research and addresses

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major questions a reader may ask. In addition, I would be interested to know whether temporal variations in radon flux density are solely driven by changes in soil moisture larger than 0.1 moisture saturation, or whether variations below 0.1, as explained in the first paragraph of section 2.2 (and Figure 1), also play some role.

Discussing map limitations you say that “...the flux density spatial variability, resulting from changes in f , is underestimated in the final map.” (page 14329). I would argue that the magnitude by which variability in flux density is underestimated becomes smaller at larger scales. At the scale of an individual survey in an area 40 km across, you find for the same increase in equivalent specific activity of radium, that fluxes in one area (Cowra) increase by a factor 2.9 times larger than in the other area (Mary River) (Fig. 4). Yet, looking at the mean values of the two survey areas (Table 1), which are separated by 2900 km, radon flux density per unit equivalent radium activity differs only by a factor of 1.6 (calculated from data in Table 1: $((229+264)/(82.4+84.1))/(185/99.2) = 1.6$). For most atmospheric studies, variability at scales smaller than your individual survey areas may be of little importance.

Technical issues:

Please explain symbols right after the first equation they appear in (z after Eq. 1, m after Eq. 5)

Table 1, footnote b : “For Goulburn and Mary River these were point measurements made using a hand-held gamma spectrometer, otherwise data are taken from airborne measurements.”. Should it not be: “For Cowra and Mary River...”?

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