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Atmospheric Chemistry and Physics Discussions

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

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> *Just for curiosity, what would factor c be, if not calculated in log space?*

The value of c, as calculated in log space, was $c_{\text{log}} = 1.62 \pm 0.15$ compared with $c_{\text{linear}} = 1.51 \pm 0.5$ if not calculated in log space. The benefit of calculating c in log space can be seen from a more realistic estimate of the error. The error estimate in linear space is dominated by data from Cowra and Mary River surveys, hence its value. By constrast, c_{log} is sensitive to data from all surveys.

> *Section 3.5 'Radon flux maps' would benefit from a little more detail in the description of the map. . .*

A histogram of the annual mean flux and of the latitudinal variation have been added

to this section. Radon flux approximates a log-normal distribution and decreases with increasing distance from the equator, with a steeper slope south of 35S.

> *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 . . . also play some role.*

This is an interesting issue and some more detail will be added to the manuscript to address it.

Radon flux at the soil surface is reduced by 25% from its maximum at soil moisture contents of 3% and 40%. Fig. 1 shows the number of months of the composite year (averaged 1900–2009) where the topsoil is dry enough for radon flux to be reduced by 25% from that layer. An artifact in the soil moisture data is responsible for the dry point in central Australia.

Similar to Fig. 1, Fig. 2 shows the number of months of the average year where the topsoil is wet enough to reduce flux from that layer by 25%. The subsoil is usually wetter than the topsoil, and wet soils have the potential to reduce the surface flux to almost nothing, so the overall effect of wet soils is much greater than that of dry soils. Nevertheless, it is interesting to note that in northern Australia, the seasonal cycle of soil moisture is so extreme that both effects are important at different times of the year.

> *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.. . .*

We agree with the contention that the overall spatial variability of flux density is underestimated less at larger spatial scales. This section of the discussion will be revised, as the intention was to highlight that the response of the model to changes in emanation fraction, f, is systematically underestimated.

Corrections have been made to the manuscript as suggested by the comments marked as ‘technical issues’.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 14313, 2010.

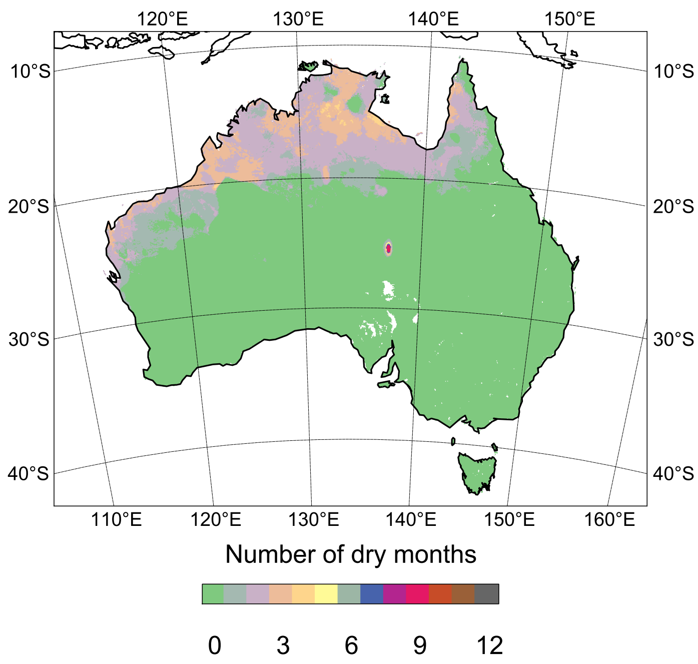

Fig. 1. The number of months where, on average, the topsoil is dry enough to reduce radon flux by 25% from its possible maximum value

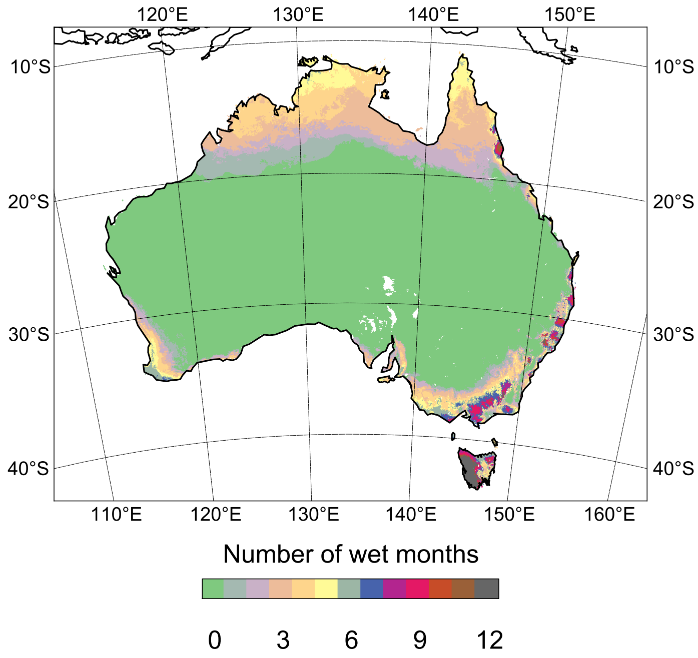

Fig. 2. The number of months where, on average, the topsoil is wet enough to reduce radon flux by 25% from its possible maximum value