**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Radon activity in the lower troposphere and its impact on ionization rate: a global estimate using different radon emissions" *by* K. Zhang et al.

Anonymous Referee #1

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Review of manuscript "Radon activity in the lower troposphere and its impact on ionization rate: a global estimate using different radon emissions" by K. Zhang and co-authors

The manuscript proposes a modeling study on radon activity and its effect on ion production in the atmosphere. A global radon emission map has been compiled and tested in the manuscript. The paper is interesting, well written and it fits the scope of ACP, therefore it merits publication.

Minor comments:

1) Introduction. It is quite long and contains parts that should be moved to other para-

graphs of the manuscript: - The reference to Fig 1a should be moved to paragraph 2.3 - page 2, left column, line 6 to 30 (According to these criteria. …. ionization in this study) contains a very detailed description of the radionuclides' properties, which could fit better in paragraph 2.2 "Decay of radon and its progeny" - page 2, right column, line 36 to 53 (Based on the studies. …. Global mean emission) contains the description of the global radon emissions compiled in this study. This part should be moved to a new paragraph in "2 Model and simulations" and form a new emission paragraph

2) 2.3 Ionization. Equation (1), the units of mean ionization rate are missing

3) 3.4 radon concentrations at individual sites: - Figure 8 displays the comparison of model results and the radon measurements in cities. The model has a coarse resolution compared to a scale necessary to resolve a city, could you comment on that in the text? - Figure 10, why the gray areas are not calculated for all the sites in the figure?

Typo correction

Introduction, page 2, right column, line 23: …TM5 atmospheric tracer model and results showed that (delete: the) it improves the average model predictions

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