Atmos. Chem. Phys. Discuss., 5, S2114–S2116, 2005
www.atmos-chem-phys.org/acpd/5/S2114/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sensitivity of Global Modeling Initiative chemistry and transport model simulations of radon-222 and lead-210 to input meteorological data" *by* D. B. Considine et al.

Anonymous Referee #3

Received and published: 16 August 2005

GENERAL COMMENTS:

This paper describes a global simulation of ^{222}Rn and ^{210}Pb in a global chemistry transport model using different meteorological input. It compares model results with the observed profiles of ^{222}Rn and ^{210}Pb in a globe. The model results are also inter-compared to evaluate the agreement of the simulations with observations. I find that the main conclusion is very interesting but is based on the zonal mean and the average profiles from observations. Therefore, the information about zonal variations caused by the zonal distributions of various regions is missing. The paper is well rewritten and

suitable for ACP, but I believe the paper should be published after the authors have made the changes below.

SPECIFIC COMMENTS:

1. On page 5332, each simulation ran for six years. Why six years? Are the meteorological fields kept the same for six years? Please explain.

2. On page 5333, a comparison of simulated and observed ^{210}Pb deposition does not guarantee a check on ^{222}Rn emissions. Deposition of ^{210}Pb depends on not only the ^{222}Rn emission, but also the various processes of transport, mixing, dry and wet scavenging that are used in a model.

3. On page 5334, globally, the simulated deposition flux agrees well with the observations, suggesting that the magnitude of the ^{222}Rn emission at the rate of 1 atom $m^{-2}s^{-1}$ is adequate. This is not exactly correct. Based on the paper by Lee et al. (2004), JGR, vol. 109, D22203, there could be high radon sources over China continent. Since the zonal mean is applied, the high radon emissions at Asian continent are smeared out. This should be mentioned in the paper.

4. On page 5339, Fig. 8 compares the simulated meridional distribution of annually-averaged surface ^{210}Pb concentrations with observations. All of the model simulations underestimate ^{210}Pb in the Northern Hemisphere midlatitudes by $\sim$15–20%. I think that the model underestimated ^{210}Pb could be higher if the authors included two more observations from China as shown in the paper of Lee et al. (2004), JGR, vol. 109, D22203 in their calculations.

5. Therefore, it would be interesting to include these two observations in Table 2 for comparisons.

6. On page 5340, the low bias in Northern Hemisphere midlatitude surface ^{210}Pb is too little ^{222}Rn emission. Could it be too little ^{222}Rn emission over the Asian

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continent? This is conflicted with the suggestion that the magnitude of the ^{222}Rn emission at the rate of 1 atom m^{-2} s^{-1} is adequate, as mentioned on page 5334. It is related to the above comment (3). Please clarify.

7. On page 5347 on line 10, is the large scale vertical transport referred to the resolved vertical winds on page 5346?

8. On page 5347, in the GMI/NCAR and GMI/GISS simulations large scale transport plays important role. In contract, convective processes contribute ^{210}Pb in the GMI/NCAR and GMI/GISS simulations, as indicated in page 5348. It seems be conflict. Please explain.

TECHNICAL CORRECTIONS:

1. GAW report 155/WMO TD No. 1201 on "First international expert meeting/workshop on sources and measurements of natural radionuclides applied to climate nad air quality studies" France, June 3–5, 2003 should be included on page 5327 as an another reference related to the use of ^{222}Rn and ^{210}Pb in global model studies.

2. Pages 5341: replace "Department of Energy (DOE)" by "Department of Homeland Security (DHS)"

3. Pages 5341, 5350 and 5351: replace all of "DOE" by "DHS"

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 5325, 2005.