

Interactive comment on “Simulations of the transport and deposition of ^{137}Cs over Europe after the Chernobyl NPP accident: influence of varying emission-altitude and model horizontal and vertical resolution” by N. Evangeliou et al.

Anonymous Referee #1

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The authors modeled the emission and global transport and deposition of radioactive Cs from the Chernobyl nuclear power plant accident using the LMDzORINCA model at different resolutions. Concentrations and deposition quantities were compared to measurements and other studies in the literature. This type of study is certainly of value in the context of the simulation of the atmospheric transport of radionuclides. The reviewer recommends publishing this paper with major revisions in response to the following questions and comments.

General Comments:

C1719

Sec. 4: Although it's important to provide the technical specifications, too much detail, all available in other publications, not unique to this study and unnecessary for the scope of this paper is provided on the parameterisation of deposition processes in the model. This section serves as a digression and should be shortened and simplified.

The treatment of statistics in Sec. 5 needs to be improved. For this point, also see individual comments below.

Individual Comments:

Please find below individual comments prefixed by page and line number.

p7687 l1-3: It's not clear in the text that the model was nudged for this study. Please add additional details: What reanalysis data was used (eg. ERA-40), time constant?

p7687 l8: Please clarify in the text how Cs137 is treated in the model – "mostly" here is ambiguous. Also, if no gas phase chemistry is included in your simulation, sentence on line 6 p.7686 should be removed as it's unnecessary and may confuse the reader.

p7687 l26-27: No need to quote each day and percentage. Just refer to Table 1 to improve legibility.

Table 1: You refer to Devell et al, 2002 in the caption; yet only Devell et al. 1996 appears in the reference list. Further, the 1996 publication does not include the day-by-day or vertical profile for the emissions. Please provide correct references.

p7688 l21: Particle size distribution functional form should be added to the text for completeness.

Fig. 6: What are the R^2 values? No description is given in the caption or the text.

p7693 l13: "altitude of the source" -> number of emission vertical levels; spread of emissions was greater -> emission distribution had more points; layers were denser covering lower distances-> layers were separated by shorter distances

C1720

p7695 l8,9: From Fig. 7 the isosurface does not "dominate the higher layers across all Europe". For example, nothing appears above Western Europe. Also, the 19-layers run rises to a higher altitude (lower pressure) than the 39-layers in the figure, in contrast to what is claimed in the text l.14,15. If this is not the case, both panels should be plotted against the same scale in the vertical for the panels to be comparable. A vantage point more similar to Brandt et al. is also needed to help facilitate the comparison. Overall, I don't think that as it is Fig. 7 contributes much to the paper and it should be improved or removed.

p7696 l8: What does "averaging" refer to? Should be clarified in the text.

p7696 l14: "determination recoveries contrast between methodologies" is not clear.

Figs 8-10 captions: Website should be moved to references. Location (North Europe, etc.) should be moved to the first line. You mention "north, west, south-eastern", yet present "central-western, north, south-eastern". Sentence beginning "They were examined according..." appears in the text and it's superfluous to be included in each caption.

p7697 l.5: "Educated guesses" needs to be elaborated upon. How were they calculated?

p7697 l.22: What do you mean by "the correlation coefficient at 95% confidence level"? A p-value needs to be computed for the test to decide significance at 95%.

p7698 l.5: See previous comment on statistical significance.

p7967 l.25: 0.81 does not appear anywhere in Table 3. What do you mean by "real emission altitude", when you also refer to "the emission altitude was taken into account" in l.22? The text needs to be clarified.

p7699 l.1, Fig.12: It's my understanding that the Pearson's linear relation coefficient indicated the strength of the linear relationship but says nothing about the slope. Good agreement can be claimed if the lines fall close to the 1:1 slope. What is the case here?

C1721

Fig. 20 caption: "Linear fitting" here refers to the 1:1 line? Should be made clear.

Technical Corrections:

p7683 l9: be -> by

p7686 l15: plane -> dimension

Sec 5.1 title: versions -> resolutions

Figs. 2-5: The captions read that every 10 days in May are shown, yet only one plot appears for May in each.

p7697 l.23: confident -> confidence

p7699 l.23: Remove "consequently" p7699 l.25: Remove "briefly"

p7700 l.1: appeared to be a local event -> was limited locally.

p7700 l.25: is not able to estimate -> underestimates

p7701 l.10: Remove "where"

p7703 l.1: deficiencies -> discrepancies

The emission inventory used in the study (Devell et al.?) should be included in the abstract.

Abstract l11: "The best choice for the model validation was the"-> "The model is validated for the"

Abstract l12: Second sentence: no need for "However,"

Abstract l24: "Atlas" here is ambiguous. Please add better description or reference

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7681, 2013.

C1722