Geoscientific
Model Development
Discussions

Interactive comment on "Source-receptor matrix calculation for deposited mass with the Lagrangian particle dispersion model FLEXPART v10.2 in backward mode" *by* Sabine Eckhardt et al.

Anonymous Referee #1

In this manuscript, the authors describe an addition to the FLEXPART code which allows for backward trajectory calculations of wet and dry deposited material. They test their scheme by comparing forward and backward trajectory runs, and show a real-world application for black carbon deposition in the Arctic.

This is a potentially useful contribution to GMD, that details a bit of very nice development to the FLEXPART code. So in principle I think that this manuscript could be suited for the GMD special issue.

However, the manuscript would benefit greatly from some careful proofreading and revision of the text and presentation. At times it is somewhat sloppy, making it hard to

follow the authors' thoughts

In particular, I have the following major comments:

1) The order of paragraphs and ideas in the introduction is somewhat haphazard, making for a quite confusing read. I suggest the authors careful lay their ideas in a comprehensive ordering

2) The authors might want to consider adding a schematic or similar to the discussion of their implementation in section 2; that might make it much easier to follow exactly what the authors have done

3) The authors on multiple occasions state that results are 'similar' (e.g. page 5 line 20, line 30). Can this 'similar' be quantified? Is it possible to use some statistical tests to assess whether the two experiments are statistically indistinguishable?

4) Section 5 is at points particularly confusing. I is not clear why a MFB=-51% is considered accurate (page 8, line 18), while an MBF=-36% is considered an underestimation (page 8, line 30). Also this section would likely benefit from a map of these MFBs, as a new Figure perhaps

Furthermore, I also have some minor comments

- In the first paragraph of the introduction, this depends on the interpolation scheme used, I assume?

- Page 2, line 34: calling ones own research a milestone is a bit grand..

- Page 3, line 2: Remove 'briefly' here

- page 3, line 13: How can both interpolation schemes be equally accurate? Do the authors mean 'exactly the same' here? Surely that can't be the case?

- page 3, line 30: This sentence is quite confusing and vague for someone who isn't experienced with using FLEXPART

- page 4, line 8: how shallow is 'shallow' here?

- page 6, line 8-13: Are there any references from the literature here that can be used to back up these claims?

- page 7, line 7: refer to Figure 4 here?

- page 9, line 4: so the sources from Canada are definitely not anthropogenic?

- page 9, line 10: I am surprised there is no source at all from shipping (i.e. over the ocean). Is this a limitation of the technique? Or are there really no Black Carbon sources from shipping?

- Figure 7: What is plotted on the background in this Figure?

- Figure 8left: is the unit here really in nanosecond per cubic meter?

Type-os etc:

- Page 1, line 26 & 32: replace 'Firstly' and 'Secondly' with 'First' and 'Second'

- page 5, line 18: 'extends over the entire atmospheric column'

- page 6, line 6: 'with increasing number of particles'?

- page 7, line 21: Is 'nice' the right word here? Something more technical?

- page 7, line 23: Is 'folding' a type-o?