

Review of gmd-2022-168: *Bayesian transdimensional inverse reconstruction of the ^{137}Cs Fukushima-Daiichi release*, authored by Joffrey Dumont Le Brazidec, Marc Bocquet, Olivier Saunier, and Yelva Roustan

Summary: This paper proposes the use of a reversible-jump Markov chain Monte Carlo sampling algorithm for use in Bayesian inverse problems for source reconstruction. Among the benefits of the method is the ability to capture temporal behavior of the source release in fine detail. The proposed method is applied to source reconstruction for the Fukushima-Daiichi release and results are compared to those from previous studies.

In general, the paper is clearly written. Please see below for a short list of items to address.

1. On line 176, the authors note that “This average wind speed value has not been extensively researched and is only used to estimate the potential of the method.” The statement is appreciated. However, is it possible for the authors to comment on any potential sensitivity of the method to values of the wind speed?
2. On lines 275-276, can the authors quantify the terms “good match” and “similar in magnitude”? It will be an aid to the reader when referring to and interpreting the associated figures.
3. Some of the labeling in the figures needs to be fixed:
 - (a) Figure 3: the powers are missing (or cut off) for some of the labels on the vertical axis
 - (b) Figure 4:
 - i. some of the labels on axes are cut off (or incorrect), for example “0.” instead of “0.8” on the vertical axis of the first subplot
 - ii. the labels indicating magnitude (i.e., the 10 , 10^{-1} , 10^1) are misplaced
 - iii. there are several “n”s around the sides/top/bottom of the subplots and it is not clear what they are labeling
 - (c) Figure 5: same as for Figure 4 above. In addition, the legend in the first subplot needs to be corrected (they have symbols, not words)
 - (d) Figure 6: same as for Figure 5 above.
4. Some typos or suggested rewording:
 - (a) end of line 80: The phrase “Here, it is here” should read “Here, it is”
 - (b) beginning of line 135: The phrase “intervals are not fixed neither regularly space” could be reworded as “intervals are neither fixed nor regularly spaced”
 - (c) end of line 345: the phrase “sample the both source” should read “sample both the source”