

## ***Interactive comment on “BEATBOX: Background Error Analysis Testbed with Box Models” by Christoph Knote et al.***

**Anonymous Referee #2**

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This paper describes the BEATBOX framework, which enables users to perform and assess several data assimilation techniques using the BOXMOX model. The tool is open-source and should be of high interest to the atmospheric chemistry community. The online examples provide appropriate guidance to reproduce the results presented here.

I have only minor concerns with the manuscript concerning clarity. There are a few sections that are difficult to follow, and could be corrected by including more details, simplifying sentences, or fixing typos. I recommend publication after addressing the points below.

Page 1, line 8: should be “allows users to conduct”

C1

Is Figure 1 referenced anywhere?

Page 5, line 17: Mention that BOXMOX is a standalone Linux executable (i.e. not written in python).

Page 6, section 2.1.2: The last sentences of each paragraph in this section are essentially the same. Include it only once.

Page 7: line 14: A single observation ( $p=1$ ) means a single observation in space, but there can be multiple observations in time. Somehow clarify the time dimension here.

Page 8, line 2: should be “can be viewed”

Page 11, line 1: Please provide more information on the setup. What meteorological parameters are varied with time? What is meant by VOC here? All measured VOCs and their oxidation products?

Page 11 line 3: ‘VOC-limited, NOX-limited, and transition region’ . . . Indicate that these refer to ozone production. How was the placement of the vertical lines determined?

Page 11 line 15: replace “slighter” with “smaller”.

Figure 4, legends are needed.

Page 13 line 22: remove period before “either”

Page 13 line 24: what is “secondary” production?

Page 13 line 26: remove one instance of “that case”

Page 15 line 5: replace “is willing to come back to” with “returns”

Page 15 line 6: replace “as” with “a”

Figure 7, bottom panel: are the colorbars saturated more often than not? If so, adjust the colorbar scaling.

Page 15 line 17: “form” should be “from”

C2

Page 17 line 22: Simplify sentence starting with “We recall that” . . . to read “Most state-of-the-art EnKF methods use this approximation”

Page 17 line 31: Fix “The adjoint inference do not strongly changes”

Page 17 line 33: Change the model “wants to go back to” to “returns”

Page 20 line 9: Replace “more at a loss” with “negative”.

Page 20 line 10, Simplify the sentence starting with “If we now . . .”, to read “The CR rates are significantly faster than the AR ensemble rates, and the slopes of the rates (i.e. the second derivative of the concentration evolution) also differ”.

Figure 9: These are difficult to compare with the different y axis. Consider an additional plot that contains net production and net loss for each run, and including these all on the same axis (without individual reactions).

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2017-188>, 2017.