

## ***Interactive comment on “Radiance-based Retrieval Bias Mitigation for the MOPITT Instrument: The Version 8 Product” by Merritt N. Deeter et al.***

### **Anonymous Referee #2**

Received and published: 25 March 2019

The authors provide an interesting, comprehensive, and well-written account of the latest MOPITT CO retrieval update (V8). This article can be published after minor revisions, which ideally address the following two points at least:

(a) Page 4 lines 11-12 mentions that the “Values of these parameters [...] were obtained by minimizing retrieval biases for the TIR-only validation results.” The last paragraph of Section 3.1 again mentions the methodology in terms of the NOAA and HIPPO ‘validation’ for bias minimization, versus the campaign validation for verification of the minimization method. This type of phrasing (terminology) and text structure is very confusing and to some extent incorrect: The TIR-only comparisons are a validation for

C1

V7 only, while they are merely a bias minimization methodology check for V8. One cannot call the latter a validation any longer. It is therefore recommended to move the content of Section 3.2 to Section 2.2 (or clearly restructure differently), and adopt the terminology from ‘validation’ to comparative ‘verification’ accordingly. This shift would also bring more focus on the bias mitigation that is mentioned in the manuscript title.

(b) Section 3: It would be very helpful to provide a map of the in-situ reference data flights with an indication of where collocations have been used for data comparison. It should become very clear than where the validation results are valid, and which data have been used for bias mitigation only.

Minor / technical remarks: - The introduction is quite long. The general description of the MOPITT retrieval process could go into a separate section. - Page 1, line 10-11: “MOPITT [...] which produces retrievals” does not sound correct. - Page 1, line 21: “the ultimate CO product” rather sounds either conceited or fatalist. Something more neutral might have been the intention. - Page 2, second paragraph: Please mention the TIR and NIR wavelength ranges. - Page 2: Figure numbering in the text jumps from 1 to 3; Figure 2 is not mentioned. - Section 2: Please briefly introduce the four aspects of the retrieval enhancement at the beginning of this section. - Page 5 lines 13-17 are not fully clear. Why change the relative channel 7 average radiance in order to obtain consistency between V7 and V8 processing? - Section 3.1: Please briefly elaborate on the “flask sampling system” - Page 7 lines 1-6 are not fully clear. First it is said that the in-situ measurements are vertically extended, than it is said that validation results for the 100 hPa level are not reported because of a lack of in-situ measurements above this level. - Page 8 lines 28-29: Does the last sentence of Section 3.4 indicate that all significant bias has been removed and that only 5 % spread remains? This is not fully clear from the current phrasing. - Figures: The authors should explain in the text how the “bias drift”, “slope”, and the uncertainties thereon are calculated.