

Interactive comment on “Ground-based FTIR retrievals of SF₆ at Réunion Island” by Minqiang Zhou et al.

Anonymous Referee #1

Received and published: 7 December 2017

The manuscript submitted by Zhou et al. presents measurements and trends of SF6 in the atmosphere using remote sensing techniques with ground-based FTIR spectrometers on Reunion Island. These are supplemented with analysis of measurements from in-situ instruments and space-borne sensors. This work is very significant and I recommend its publication after a few items below have been addressed/clarified.

General Comments

Column averaged dry mole fractions of SF6: To readers not familiar with this method, elaboration of this procedure is necessary. How are the dry air total columns measured/obtained? Since the XSF6 trend would depend on this, it would be important to establish and/or show the robustness of the dry air total column measurements.

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Pseudo-lines: Please explain/justify the use of pseudo-lines, e.g. how are they derived? Do ACE and MIPAS use pseudo-lines as well?

Smoothing error: From my understanding, the smoothing error can be evaluated if there is an independent measurement of the true profile, an estimate of its variability and covariance matrix (e.g. Barrett et al., 2002 did this for Ozone, <http://onlinelibrary.wiley.com/doi/10.1029/2001JD001298/abstract>). Though I understand that following this would be difficult for SF6 at the site, would the authors please comment on this?

On the use of the retrieval window and improved fits: What criteria is used to determine a “better fit”? For example, in Fig. 2. (right panel), the residuals at 948.0 cm^{-1} seem to indicate that something is not fitted well.

Specific comments

Instrument and ILS: A mention of the spectral resolution used in the actual retrieval and the goodness of the ILS would be helpful to readers. For example, in Section 2.1., it was mentioned that the max OPD of the instrument is 250 cm, is this the same OPD used for SF6 measurements at both sites?

Page 6 line 10 “balloon measurements” appears here for the first time. I think this should be defined earlier in the manuscript. I assume these are sondes, right?

On Table 2, Please elaborate on how the systematic and random errors under “SF6 Spectroscopy” were calculated.

Technical Comments

Page 2, line 2: I suggest to change “SF6 emissions reduced” to “SF6 emissions decreased”

Page 2, line 17: “aboard a shuttle”: please specify which one, if possible.

Page 4, line 19: “In order to extract as much as possible information” -> “In order to

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extract as much information as possible”

Page 4, line 28: Consider rephrasing this sentence: “That means when we use the FTIR retrievals, only the total column should be trusted instead of the profile.”

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