Atmos. Chem. Phys. Discuss., 8, S47–S50, 2008
www.atmos-chem-phys-discuss.net/8/S47/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: New ground-based FTIR measurements at Ile de LaRéunion: observations, error analysis, and comparisons with independentdata" *by* C. Senten et al.

C. Senten et al.

Received and published: 27 January 2008

Answers to General Comments

The paper has been published in ACPD as a Technical Note, emphasizing the fact that the goal of the paper is not to report scientific findings, but to inform the scientific community about new FTIR observations at the NDACC complementary site Ile de La Réunion, situated in the southern tropics. These measurements started in 2002, on a campaign basis. They are the first FTIR observations carried out at that site, with a firm intention to continue them on a long-term and permanent basis. Also, on a worldwide scale, they are among the first FTIR observations in the tropics: the only two other FTIR

measurement sites that we know today in tropical / subtropical regions are situated in the northern hemisphere, at Izana (28°N; permanent site since March 1999) and at Paramaribo (5°N; on a campaign basis since September 2004). To demonstrate the FTIR capacities at the Ile de La Réunion, we show the first results and their validity, by comparing them to different other datasets, e.g., from air-borne ozone sondes, and from ACE-FTS, HALOE, and MOPITT satellite experiments.

The paper is not included in the ACE-Validation Special Issue; it has been submitted as a stand-alone paper. It is true that some data from the FTIR measurement campaigns presented in this paper have been used as part of the correlative ground-based data sets in some of the papers of the ACE Validation Special Issue. In the latter papers however, the FTIR data of Ile de La Réunion are not discussed explicitly regarding their quality. Since the FTIR data at Ile de La Réunion have never been presented in the open literature before, we think that it is useful to publish the present Technical Note, to provide this kind of reference information. It is not a hidden double publication: this Technical Note provides much more and different information about the FTIR data at Ile de La Réunion than what is available through the ACE Validation papers. Although I explicitly referred to the ACPD ACE Validation Special Issue, I did not mention it in the reference list. This will be adjusted in the revised paper, by including the reference 'ACPD - Special Issue - Validation results for the Atmospheric Chemistry Experiment (ACE), Editors: A. Richter and T. Wagner, 2007'.

Answers to Specific Comments

1) For the calculation of the errors due to interfering species, we have followed the approach explained in Worden et al., 2004, although we have not explicitly mentioned this reference and we have not used exactly the same terminology. What we have called the 'forward model parameter error' corresponds to Worden's 'cross state error', because it refers to the errors induced on the retrieved target parameter by the model parameters that are fitted together with the target parameter. To avoid any confusion, we will therefore change the name of this error term to 'cross state error' and keep

ACPD
8, S47–S50, 2008

the term 'forward model parameter error' for the error induced by model parameters that are NOT fitted together with the retrieved target parameter. We will also add the appropriate reference in the revised paper. In the calculation of the error due to interfering species, we have assumed that the vertical distribution of the interfering species is correctly known and that only the total column amount is uncertain. In other words, the interfering species is represented as a scalar parameter, and the variability of the interfering species' vertical distribution, which is a second order effect, is neglected. Since we have found that for all considered target species, the cross state error is an error source of minor importance, we think that it is justified to neglect the second order effect. Therefore, we believe that it is not necessary to adopt the full approach for interference errors explained in Sussmann et al., ACP, 2007. We will explain this limitation of our error calculation in the revised paper.

2) Section 4.4 of the paper is not intended to be a MOPITT validation exercise. The purpose is to confirm that the present dataset is in good agreement with MOPITT and - as far as differences relative to MOPITT are concerned - agrees with earlier findings about the differences between MOPITT and ground-based FTIR data at other locations.

3) The purpose of the discussions about the enhanced values of CO and their correlation with enhanced values of C2H6 is to confirm that the composition of the air above Ile de La Réunion may be affected by biomass burning emissions in southern Africa and Madagascar. This impact has been observed earlier through studies of transport and the ozone observations (Randriambelo et al., 2000) - but it has been limited to that - in the absence of other chemical observations. We have used FLEXPART to carry out our analysis, as it is a well-known and validated tool. To go one step further, we have coupled FLEXPART to a fire emission database to do not only a qualitative but also a quantitative analysis that is specific for our case. We also mention the observed correlation between C2H6 and CO as another confirmation of our conclusions, and here we refer indeed to the papers by Rinsland and Zhao. As said above, we do not pretend to

ACPD
8, S47–S50, 2008

present scientific findings, and the paper does not belong to the ACE Validation Special Issue.

4) To achieve a precision of 1DU in FTIR O3 measurements, as described in Schneider and Hase (2008)*, a special recipe has to be adopted: it includes special hardware and software modifications that cannot be implemented by all current FTIR experiments. In particular, it is well known that it is impossible to achieve the 1 DU precision with the Bruker 120M instrument and the SFIT2 retrieval algorithm. Therefore, the performances achieved by Schneider and Hase are better than what is achieved by most NDACC FTIR experiments and cannot be considered the general state-of-the-art. Again, we do not claim to make a step forward; we just want to show that our results are reliable according to the currently achieved general standards.

5) Regarding ACE validation: see par. 2 in the 'Answer to general comments'. Regarding HALOE validation: see par. 1 in the 'Answer to general comments'. We agree with the referee that "This agrees to some extent with previous findings by Russell..." is a too vague comment. In the revised paper we will correct for this by stating: "This agrees to some extent with previous findings by Russell et al. (1996a, 1996b) saying that HALOE slightly underestimates the HCl and HF vmr profiles; i.e., Russell et al. found that the mean difference between HALOE and correlative balloon measurements is better than 7% for HF and ranges from 8% to 19% for HCl, throughout most of the stratosphere. Following Russell et al. there appears to be a systematic offset between HALOE and ATMOS measurements ranging from 10% to 20% both for HF and HCl, and even reaching 40% for HF, in the lower stratosphere."

* The referee cites Schneider and Hase, 2007; we believe that he is referring to Schneider and Hase, ACP 8, 63-71, 2008.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 827, 2008.