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Atmospheric Chemistry and Physics Discussions

Interactive comment on "All weather IASI single field-of-view retrievals: case study – validation with JAIVEx data" *by* D. K. Zhou et al.

D. K. Zhou et al.

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We are very thankful for the efforts of the reviewers and their good comments and suggestions. We have carefully considered the questions and suggestions of the referees. Detailed responses to these questions and suggestions are indicated. Reviewer comments are quoted using [...]. No specific corrections required in response to "Referee 2". Some changes in the manuscript have resulted from the referee's suggestions. We are submitting a revised paper for publication in ACP.

Response to the "Anonymous Referee 1":

[Section 1, page 21003, line 9: the use of 'formative' in this context is confusing. Consider using 'precursor'.]

Agree, and Changed.

[Section 2, page 21005, line 6: please state version of SARTA model used.]

Agree, and added.

[Section 2, page 21005: Is emissivity retrieved in the physical inversion, or only in the regression?]

Emissivity is from regression as indicated by the reference of Zhou et al. (2002).

[Readers might be interested if, how (and where) IASI performs better than AIRS. e.g. IASI should provide better vertical variability of moisture distribution.]

Detailed analysis is needed to draw any conclusions. This is not the scope of this paper.

[The authors might consider evaluation of IASI cloud products with A-Train products (future plan?).]

Good suggestion, but no plan has been made yet.

[Section 3.2, page 21010, line 20-29: this is a very long sentence, 2 sentences (e.g. second one starting with 'although the cloud') would be better.]

Yes. It's changed to 2 sentences.

[Section 3.3, page 21012, line 7: remove 'which' in 'distribution is shown even though the retrieval which is performed independently...']

Yes. Removed "which".

[Section 3.3, page 21012, line 24: 'Figures' instead of 'Figure'.]

Done. "Fig." or "Figs." are used to meet ACP style.

[References, page 21018, line 19-33: put the papers by Zhou et al in chronological order.]

Done.

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[Figures, page 21032, Fig. 13 caption: replace 'on' by 'of' in 'Locations of two dropsondes and on one radiosonde...']

Changed.

[Figures, page 21034, Fig. 14 caption: 'differences' instead of 'difference'.]

Changed.

Response to the "Anonymous Referee 3":

[On the p. 21006, l. 18 "The IASI retrieval presented herein uses 5008 spectral samples for the EOF regression retrieval and 1697 samples for the second step physical retrieval, as 20 indicated in Fig. 1." What are the criteria for channels selection?]

A full description of the retrieval channel selection (and this retrieval algorithm) is not the scope of this paper. We did not intend to fully describe the algorithm but it can be found by using the references. Here we add a line "Channel selection criteria are very similar to NAST-I described by Zhou et al., (2002)." at the end of that paragraph.

[Starting the same page and further in the text the term "accuracy" is not defined and used loosely, what causes some confusion.]

We modified the sentence "Retrieval accuracy analysis can be estimated ..." to "Retrieval accuracy can't be precisely determined for this type of "ill-posed" solution but can be estimated..."

[On the page 21006 the bias of the retrievals from simulated spectra is introduced. What is the cause? Addition of the random noise to the spectra can not result in the noticeable bias (considering the large number of the sample and provided that the forward model in the retrievals is the same as the one used for the spectra simulation.]

This could be somewhat related to the "ill-posed" problem. An overall bias (vertically profile integrated) might be zero. However, profile-to-profile and/or parameter-to-parameter (e.g., temperature vs. moisture, skin temperature vs. emissivity) can

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have small but significant cross talk; it depends on vertical altitude. This may result in a small bias for one of the retrieved parameters with an overall radiance bias near zero.

[Considering the magnitude of the STD for temperature in the Figure 5 it contains seasonal variations. That may be misleading when compared to the STDE of the retrievals. Seasonal variations are reproduced by climatology and models quite accurately, so no retrieval skill in that.]

The data set (Fig. 5) does contain seasonal variations as well as the retrievals. It indicates that retrieval can capture atmospheric variation as shown in the original database, and it has nothing to do with climatology model.

[On the page 21009 the sentence starting at line 5: "Fitting residuals shown in Fig. 7a and b for clear conditions are much smaller than fitting residuals shown in Fig. 7c and d for cloudy conditions; this is expected since there are more variables to be retrieved under cloudy conditions." This statement in its current form is not true. In general, the more fitting parameters we have the smaller residual can be made. That doesn't necessarily mean better quality of the retrieval. Probable cause of higher residual under cloudy conditions may be the cloud forward model error.]

This is a good point. However, the radiative transfer model error usually introduces error in the retrieval products. When the radiance is simulated using the retrieval, the radiance error is minimized (i.e., the inverse and forward calculations cancel the model error). The cloud model error does introduce extra "noise" in the retrieval model. We modified this sentence as "Fitting residuals shown in Fig. 7a and b for clear conditions are much smaller than fitting residuals shown in Fig. 7c and d for cloudy conditions. This is expected since there are more variables to be retrieved under cloudy conditions, and the radiative transfer model error (also considered as "equivalent noise") is increased when the cloud model is introduced."

[General comment to the graphics: most of the figures are very busy, that result in a small size of individual panels what make very difficult to capture the details. My

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suggestion would be to decrease the number of the panels per figure and, maybe, the total number of the panels in the paper by removing redundant and not very informative pieces. For example, Figure 13, the panels d, e, f) showing temperature profiles: they reflect stable gradient in the troposphere, hence, don8217;t make much sense; the adjacent panels showing the differences do the job. On the same figure for RH: it may be beneficial to show on the same graph all three drop-sonde profiles and three differences. That would illustrate that the differences/errors are noticeably smaller that natural variations of the RH profile.]

Thanks for the suggestion. But we prefer to keep the figures as. Since this is an online paper, readers can enlarge the electronic images to see the details (we will provide high quality images).

[In the Figure 14, panels b) and f) exhibit the same structure in the area between 26°N and 29°N. At the same time b) is the RH field as observed by AIRS and f) is the difference between AIRS and IASI. From the text it is not clear why this illustrates the consistency of the satellite data.]

We don't see any confusion here from both the figure and text. The cross section is from the area between 22°N to 42°N as labeled on the x-axis. Both figure captions and text clearly state what the data are. In the text we have explained that the difference between the two satellites is from "the diurnal effect (or temporal difference)..." and "Instrument measurement performance, such as spectral resolution and noise level, also contribute to the retrieval performance and difference between AIRS and IASI results."

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 21001, 2008.

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Interactive Comment