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Atmospheric Measurement Techniques Discussions

Interactive comment on "Potential of the future thermal infrared space-borne sensor IASI-NG to monitor lower tropospheric ozone" *by* P. Sellitto et al.

Anonymous Referee #1

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Summary

This paper gives a detailed comparison of the performance of retrieving lower tropospheric ozone from TIR measurements between IASI and the future IASI-NG (to be launched in the 2020 timeframe on EPS-SG satellite) instrument and evaluates IASI-NG's potential of to improve the monitoring of lower tropospheric ozone at various spatiotemporal scales. IASI-NG will have better spectral resolution and measurement noise both by a factor of 2 than IASI measurements. This study uses MOCAGE CTM data as truth and use a pseudo-observation simulator that includes the use of KOPRA

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RTM to simulate IASI and IASI-NG TIR measurements and a Tikhonov-Phillips regularization based inversion algorithm to perform the retrievals. The results show that IASI-NG will significantly improve the LT ozone retrievals with better vertical resolution and reduced retrieval errors especially for low thermal contrast scenarios, better resolving LT features at various spatiotemporal scales including those relevant to the AQ. This paper is well suitable for publication on AMT. It is generally well written and organized. However, the abstract could be reduced by removing a lot of background materials, a few references are missing in the introduction, some figures could be improved and the English writing could be improved. Overall, I recommend this paper to be published on AMT after addressing the following specific and technical comments.

Specific comments

1. I agree with Reviewer 1, there is too much background material that belongs to introduction.

2. P7027, L10, it is not clear about what might cause the reduction of several months in life expectation? Do you mean some events or episodes?

3. P7027, L 17, it is better to refer to those direct retrievals from UV spectra including Munro et al., 1998 and Liu et al., 2005. To include retrievals using residual-based approaches, you should also include Fishman et al. (1990), i.e., the earliest derivation of tropospheric ozone column and change "UV backscattered spectra" to "backscattered UV radiances" since TOMS does not measure the spectra but at a few channels.

4. P7028, L 21, also include Natraj et al., 2012, Landgraf and Hasekamp (2007)

5. P7028, L 22, add reference (Fu et al., 2012)

6. P7030, L1, change "Another option is that . . . . . " to "Another objective is to determine if its added value is limited to . . . . . "

7. P7032, L16, Do you mean "surface-6 km" for LT? If so, you can add "(surface-6 km)" after "error in the LT". In L21, add "in LT ozone column" after "the estimated error" as

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error at individual layers could be much larger.

8. I suggest changing “TOC surface-6 km” to “surface-6 km TOC” or “TOC from surface to 6 km” or some abbreviation like “s6TOC” , and making similar changes to “TOC surface-12 km”

9. Have averaging kernels been applied for results in section 4.1 (Figs. 5, 6, Table 1)? Please make it clear.

10. Figs. 7 8 (especially Fig. 8) are too small some of the figure captions cannot be read clearly.

11. Fig. 12, since smoothed MOCAGE is very similar to the IASI-NG pseudo-observations, it is better to show IASI pseudo-observations instead in the second column in comparison with the IASI-NG pseudo observations.

Technical comments

1. P7026, L26, change “values of nearly 3.0 km” to “reaching nearly 3 km above surface”

2. P7027, L7, change “trace gases concentration” to “trace gas concentration”

3. P7027, L18, change “rising” to “raising”

4. P7027, L20, change “increased of up to the 50

5. P7028, L13, change “associated to” to “associated with”

6. P7028, L17, remove the comma after “backscattered spectra”

7. P7028, L24, change “when in presence of higher thermal contrasts, so for” to ‘in the presence of higher thermal contrasts, i.e., for “

8. P7029, L15, change “follows in its” to ‘follows”

9. P7029, L18, change “of a factor of 2” to “by a factor of 2”

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10. P7031, L7, remove “finally”

11. P7031, L27, change “improve of a factor 2 both the spectral resolution” to “improve by a factor of 2 in both spectral resolution and radiometric noise”

12. P7033, L5, remove “in”

13. P7040, L28, change “of more than 50

14. P7041, L23, change “contribute at” to “contribute to”

15. P7041, L28-29, add “ to be” after “appears”

16. P7042, L17, change “follow” to “follows” as “series” is a singular

17. P7042, L19, change “better suited than IASI to monitor” to “better suitable than IASI for monitoring”

18. P7044, L17, change “associated to” to “associated with”

19. P7045, L4, remove “s” in pseudo-observationS

20. P7045, L9, change “time-space” to “spatiotemporal”

21. P7045, L11-12, remove “likely” and change “may be due to better vertical resolution in the troposphere” to “is due to better vertical resolution in the troposphere resulting from better IASI-NG spectral resolution and noise” as this has been discussed in details.

22. P7045, L19, change “also” to “especially”

References

Fishman, J., and J. C. Larsen (1987), Distribution of total ozone and stratospheric ozone in the tropics: Implications for the distribution of tropospheric ozone, J. Geophys. Res., 92, 6627-6634.

Fu, D., J.R. Worden, X. Liu., S. S. Kulawik, K. W. Bowman, and V. Natraj, Character-

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ization of ozone profiles derived from Aura TES and OMI Radiances, Atmos. Chem. Phys. Discuss., 12, 27589-27636, doi:10.5194/acpd-12-27589-2012, 2012.

Landgraf, J., Hasekamp, O.P., 2007. Retrieval of tropospheric ozone: the synergistic use of thermal infrared emission and ultraviolet reflectivity measurements from space. Journal of Geophysical Research 112, D08310. doi:10.1029/2006JD008097.

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Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7025, 2012.