

Interactive comment on “Comparison of TOMS retrievals and UVMRP measurements of surface spectral UV radiation in the United States” by M. Xu et al.

Anonymous Referee #2

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The manuscript by Xu et al. is good and the work it describes is very important. In particular because it drives the message that retrievals of ground irradiance using satellite data (in this case from TOMS) have large biases with respect to the in situ measurements by the ground stations. The authors use extensive USDA network of UV-MFRSR's and VIS-MFRSR's. The latter could and should be emphasized more in the paper. They concentrate on UV data to compare results with the retrievals from UV channels of TOMS. Clearly the surface albedo, cloudiness and aerosols pose a great problem for retrievals from satellite data. One could calculate that the amount of signal in UV that carry information about the lower parts of troposphere in TOA radiance is very small, so the sensitivity to the state of lower parts of troposphere is very weak.

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The presented results do not give us much hope that the situation could be significantly improved. The bottom line conclusion should be that the ground based stations are indispensable in monitoring the state of atmosphere and never will be replaced by space based remote sensing.

The authors should address the most important epistemological aspect that appears in works like theirs. The comparison between measured and retrieved (constructed) irradiances should include “the placebo test” results. Authors showed that measured irradiances are, say by X% smaller than the retrieved irradiances. The question is whether the given value of X is large or small or rather “good or bad”. How “good” is irradiance retrieval from TOMS? We do not know answer after reading this paper; we only know the value of X. Let suppose we had no TOMS data but instead performed irradiance synthesis from climatologic data only. This would be the placebo test. Suppose we obtain results that differed from ground based measurement by Y%. Comparing X% and Y% values can tell us how good is TOMS data set for what it is being used. If $X \approx Y$ one would not need TOMS and that would imply that TOMS is on the level of placebo effect. Could authors show how much (if) X is smaller than Y?

Xu et al. should expand the cited literature to put more emphasis on the importance of their work in contrast to what was done before. Instead the authors use a lot of space to deal with technical aspects of measurement and retrievals and pepper their manuscript with way too many citation concerning these details. In fact the format of this journal - that requires placing the names and years in brackets - is really very wasteful and it makes reading difficult, disrupting the flow of the major narrative. It would be much better if citations were in the form of less intrusive footnotes. But this is not authors fault; they merely adhere to this journal format requirements.

The captions under figures should be more elaborate. For example they should state at which wavelength the AOD is shown. In fact, the general rule is that figures should be self sufficient and to make it unnecessary to search the paper for the description of the figure.

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The results are presented chiefly in tables for 27 UVMRP stations. While the bar plots give a full picture of the results of comparisons, they are not easy to interpret and draw any conclusions. It remains a mystery to this reviewer what is the reason for the particular order the stations are listed. Perhaps station could be ordered according to geographic latitude or averages AOD value.

Perhaps, an addition of plots showing mean and standard deviation as functions of AOD, cloudiness, albedo, latitude, longitude would be a better form of presentation unless there is no meaningful correlation. But authors show Fig. 4 where correlation is rather low with respect to SO₂ abundance.

I suggest shortening the paper, reducing amount of technical citations concerning how instruments were calibrated, etc and try to emphasize the differences between TOMS and UV-MFRSR's and do a budget of errors that could attribute the errors to instruments, methods and factors related to the state of atmosphere as well as help to explain the reasons for the discrepancies.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 10969, 2010.