Review of , "Correcting spaceborne reflectivity …" by den Outer et al.

This paper should definitely be published. It contains a few problems, which probably do not seriously affect the main conclusions. Of particular interest is the suggestion that an optimal size for estimating LER is 1 x 1 degrees. This reviewer would suggest that the 1 x 1 degree size tends to average the structures of clouds. It seems unnecessary to mix the daily integrated UV irradiance with satellite measurements that are essentially obtained near midday. A more usual approach is to average the ground-based measurements for a period around local noon, or the satellite overpass time, and compare with the ground measured UV with the satellite estimates. This minimizes the need for introducing the effects of models, other than RT. Once again, I do not think that the use of daily integrated irradiance affects the conclusions, but will affect the correlation plots. The apparent lower agreement with OMI data is disturbing in the absence of an explanation.

A question concerns the use of EP-TOMS reflectivity as a reference. It should be well known by this time that EP-TOMS LER values drifted from the correct values early in its lifetime (within 1 year) and became significantly incorrect by year 3. **The authors stop at 2002, well after the problems appeared**. For Nimbus-7/TOMS LER, the values in the Northern Hemisphere appear to be correct, while those in the Southern Hemisphere are subject to an effect arising from the incorrect response of the photomultiplier tube emerging from darkness over the bright Antarctic ice. **The authors only analyze Northern Hemisphere data**. The LER for Nimbus and EP is currently 331 nm. The OMI LER data as supplied on the NASA website is labeled as 340 nm. However, there was a version available at 331 nm. The problem with the 331 nm LER is that it requires a correction for O_3. If this was done properly, then there is no major problem. However, there is no estimate concerning the error in using the 331 nm LER from any of the satellite data sets. All current LER work is done with 340 nm, which has very small effect from ozone and is common to most UV satellites (N-7 TOMS and SBUV, the entire SBUV-2 series, and OMI). EP-TOMS is the exception, since it had a channel at 360 nm, but none at 340. The 360 nm channel is slightly affected by O_2-O_2 absorption, which is easily corrected. **The authors should discuss the effects of using inconsistent data sets.**

The overestimate of UV irradiance from TOMS in the absence of snow/ice occurs because of the neglect of absorbing aerosol amounts and not because of incorrect O_3. This effect is not seen in areas that are very clean. The authors include aerosol loading, which usually means aerosol extinction optical depth from ground measurements. This creates a potential problem, since the scattering portion of the aerosol optical depth is included in the LER. **The authors should comment on this.**

For the procedures Cor211 and Cor2A1 on page 75, please reference Figure 5.

If you are dealing with a comparison with a ground site, the number of grid cells in a latitude band does not seem to be relevant. What should matter is the distance on the ground surrounding the ground-site, or the number of OMI pixels surrounding the ground site. This should be independent of latitude, except near the poles, but will depend on the OMI scan angle. On the scale that the authors are using, 1 x 1 degree, or about 100x100 km for nadir view, there should be no latitude effect from pixel sampling. **Perhaps, further explanation is needed to understand the effect.**

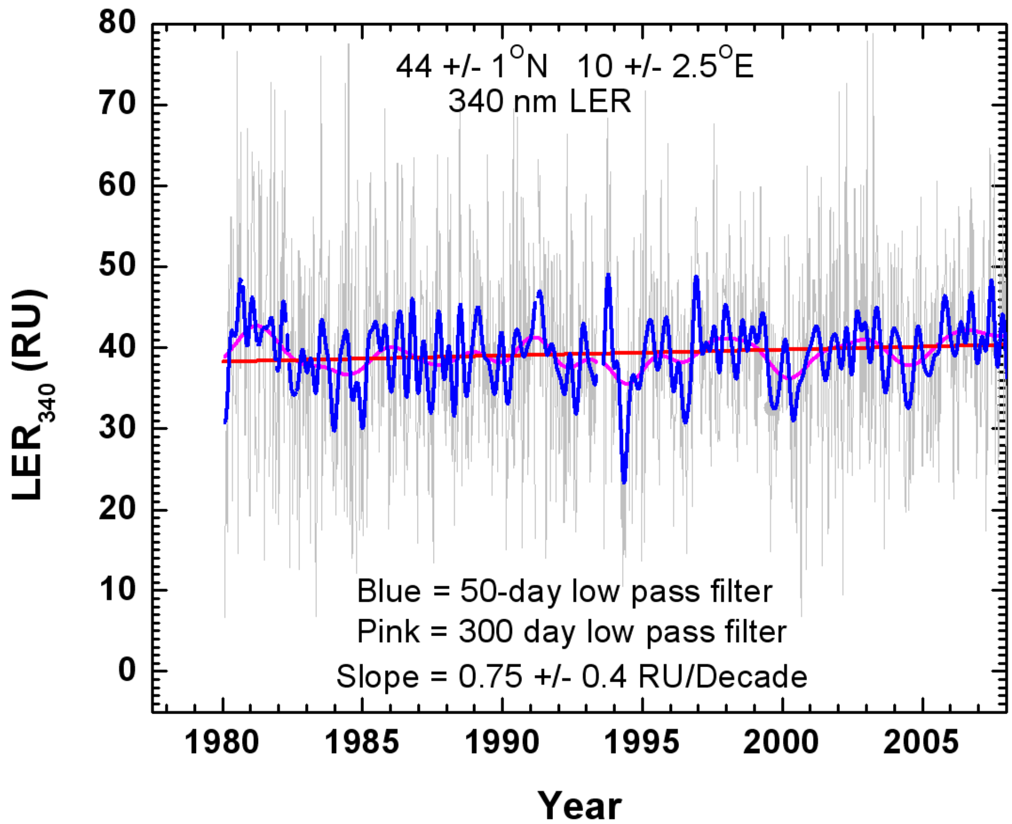
The author's observation that the optimum size of the FOV for comparison with ground stations is 1 – 1.5 degrees is quite interesting.

Is it correct that the daily integrated UV erythemal flux (joules/m2) measured on the ground are being compared with the same quantity from the satellite?

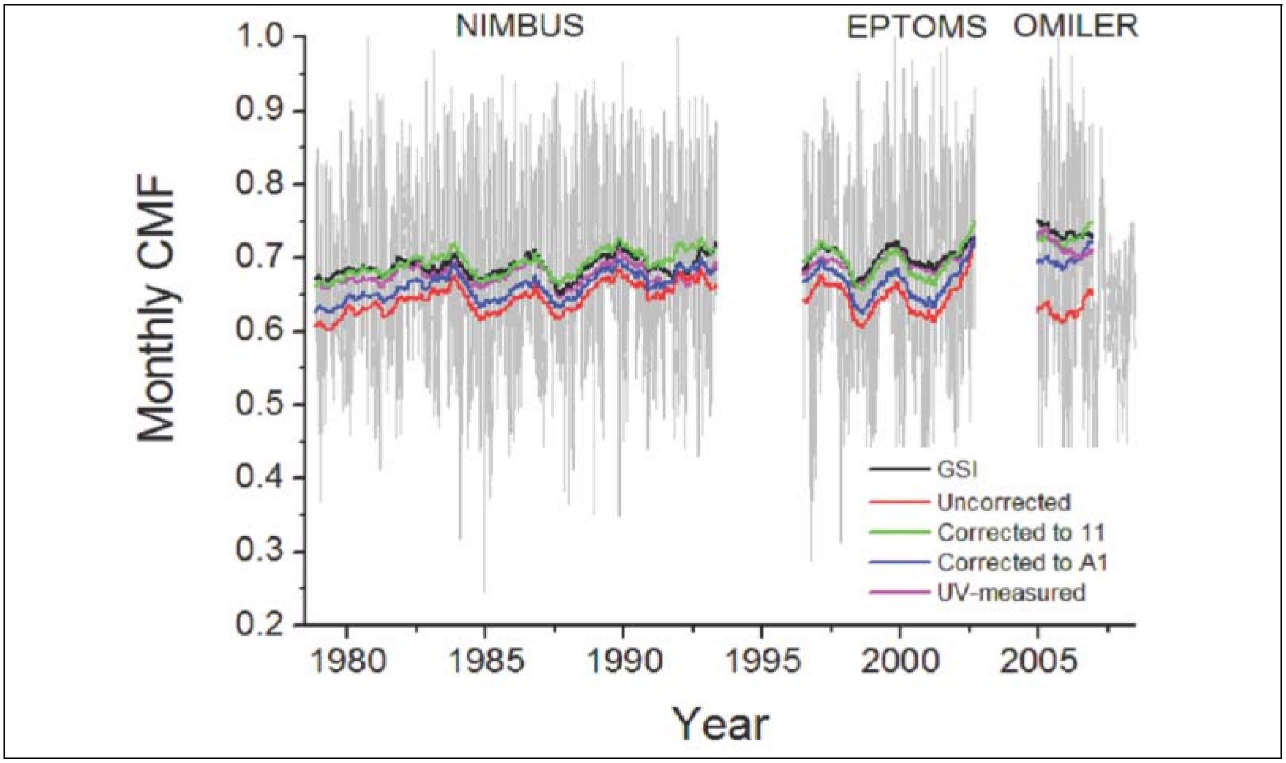
The description on page 69 lines 12 to 17 is not clear. What does it mean that the models were rescaled?

What is the difference between the two OMI LER data sets? Why does the earlier OMI LER data set not need corrections?

The use of the word "ridge" is not common. Perhaps a different term could be used or a define tion given.



A time series of 340 nm LER for the location shown in the graph. There is a statistically significant LER trend (0.75 per decade) at 1-std dev, but not at 2 std-dev.



By eye it appears that the slight upward trend seen by the authors in the TOMS OMI data set is also seen in a similar analysis of 340 nm LER (above}. The graph above does not use TOMS (neither N7 nor EP} and is entirely calculated at 340 nm.

Comments

The statement, “We conclude that the current grid sizes of the LER data (1.0◦×1.0◦ and 1.0◦×1.5◦) are a good, or even optimal, choice for calculating the cloud effect for daily UV sums.” , is essentially a statistical approximation of cloud vs clear conditions. Equally well, the ground-based measurements could be averaged over +/- 30 minutes surrounding the satellite overpass time to obtain good agreement. Experience has shown that there is significant variance on a daily comparison with ground-based measurements, but that the average values over several days (7 – 10) are quite good when the comparisons are made for stations with low UV absorbing aerosol amounts or the aerosol effects are corrected using ancillary data. The conclusion from comparisons of ground-based UV with satellite UV estimates is that both spatial and temporal averaging are required after aerosol corrections are made. It is also true that adjacent ground-based stations that are separated by a distance corresponding to a satellite FOV (50 - 100 km) will disagree with each other by an amount that is similar to the disagreement with satellite estimates after correction for aerosols. The disagreement is mostly caused by different cloud and aerosol amounts.

The use of LER to estimate UVB at the ground is quite useful. However, it contains an intrinsic error in not accounting for tropospheric ozone absorption in the presence of multiple scattering. This will cause the LER cloud transmission function to be too large. This effect has been discussed previously (e.g., see papers by Krotkov et al.)