

Interactive
Comment

Interactive comment on “Reconstruction of the solar spectral UV irradiance for nowcasting of the middle atmosphere state on the basis of LYRA measurements” by T. Egorova et al.

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In this paper, a model is proposed that allows calculations of solar UV irradiance over a relatively broad range using available measurements in restricted spectral bands. These spectra are needed for nowcasting and short-term forecasting the neutral and ionic state of the middle atmosphere. Direct measurements of the solar UV irradiance are now being carried out by the SORCE and SCIAMACHY missions. The data from the latter are, however, not available in near-real time. SORCE data usually become available within a few days. A possibility to have independent data is thus of great importance for nowcasting purposes.

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Interactive Discussion

Discussion Paper



It is an interesting paper. All, the motivation, the model and its limitations and the results, are clearly described. I believe that the paper should be published.

I have a few rather minor comments and suggestions, which authors may want to take into account.

General issues

1. p 4105 line 4 170 nm: my impression is that you have a better correlation with SUSIM already at 150 nm (205 and HERZ)

2. The reason for the lower correlations with SUSIM below 150 nm is probably the stray light, which limits the accuracy of SUSIM measurements at shorter wavelengths. The 2-sigma uncertainty below 180 nm is 14-16% (only about 6% for SOLSTICE; Woods et al. 1996). At longer wavelengths, especially above around 250-300 nm, SUSIM has a better accuracy. In general, however, I found SUSIM more reliable and suffering much less from artifacts. Based on my experience with these data, I agree with your conclusion that some of the disagreements (e.g., p 4105 lines 21-22, p 4109 lines 20-23) are due to instrumental problems.

3. p 4105 lines 9-10 I am not sure I completely agree. In that paper (Krivova et al. 2006) we did not make such a conclusion. In fact, we found an almost perfect ($R_c < -0.9$) anti-correlation between the 220-240 nm band and the irradiance above 280 nm.

The difference with your results is, to my mind, due to the time scales involved. Whereas we concentrated on the solar cycle variation (on which faculae and sunspots evolve in phase), your correlations are dominated by the variations on the rotational time scales (on which faculae and spots evolve somewhat differently). Now, at shorter wavelengths (below about 300 nm) spots play a minor role and the variations are caused by facular evolution. At longer wavelengths the role of spots progressively increases - see Figs. 9 and 10 of Unruh et al. 2008 (<http://adsabs.harvard.edu/abs/2008arXiv0802.4178U>). This would thus be a more ap-

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propriate reference.

4. For the same reason, the TSI is not expected to be a good proxy of the irradiance below 300-400 nm. Variations in the TSI are caused by both spots and faculae, while variations in the UV irradiance are driven by faculae. This is confirmed by the bottom panels of your Fig. 1: the correlation improves above 290 nm, where spots start being 'visible'. What could possibly be a better quantity to use below 300 nm is TSI - PSI (the Photometric Sunspot Index). In this way, one subtracts the sunspot contribution from the irradiance variations. The rest comes from faculae and the network.

5. Another good proxy for the UV irradiance could be Mg II index. I do not expect that you include these two quantities into the current analysis but this could be something for you to think on if you decide to improve your model in the future.

6. Finally, the quality of the figures in the printer version is rather low. In Figs. 2-5 I cannot distinguish the lines. They all appear as either solid or dashed.

Other comments and typos

abstract line 5 (also p 4108 line 8 and p 4109 line 10) spectral area - better spectral range

p 4100 line 24 the Sun activity - the Sun's activity or solar activity

p 4102 lines 3-6 The original model is not purely empirical since it involves theoretical calculations of spectra for different photospheric components. Semi-empirical would be more appropriate.

p 4102 line 4 are due to - to be due to

p 4102 line 7 with the solar UV irradiance - add measured (with the measured solar UV), otherwise it is not quite clear

p 4102 line 22 specieS

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p 4102 line 25 move proxies before available

p 4103 line 13 and of Fomichev - and that of Fomichev

p 4103 line 23 Also it - it probably refers to the model. If so, change to 'The model also.'

p 4104 line 6 according TO

p 4104 line 4 appropriate - corresponds to?

p 4104 line 14 between of - remove of

p 4104 lines 14-15 move observed with SUSIM and SOLSTICE after UV irradiance

p 4104 line 25 smoothed - please, explain, how?

p 4105 line 4 the main difference - say difference to what?

p 4105 line 27 for spectral - in the spectral

next line required - what is required by what?

p 4106 line 12 well could be - could well be

p 4106 line 23 RMS differenceS

p 4107 line 7 former process - which one?

p 4107 line 11 It - This

next line for the most part - most part of what?

p 4107 line 24 RMS differenceS or RMS difference IS

same line data setS

next line of THE

p 4108 lines 1-2 the observed enhancement of solar UV irradiance at 170-240 nm -

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enhancement with respect to what? which observations are meant?

p 4108 line 8 I do not quite understand what is meant by 'the variability of the reference solar UV irradiance' in this context

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 4099, 2008.

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Interactive Discussion

Discussion Paper

S1427

