

***Interactive comment on* “Signature of the 27-day solar rotation cycle in mesospheric OH and H₂O observed by the Aura Microwave Limb Sounder” by A. V. Shapiro et al.**

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“2004/05 is not really solar maximum but rather the declining phase of solar cycle 23. It is indeed a period with pronounced 27-day variability. This should be stated more clearly in the text.”

The referee is obviously right and we have changed this formulation.

“Is it possible to compare at least the H₂O results with other data covering the “real” solar maximum 2002?”

Other datasets which are available for that solar maximum, e.g. HALOE/UARS or

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MIPAS/ENVISAT, contain a lot of gaps. As in the paper we use the daily time series to analyze the response to the 27day solar cycle each gap in the data (especially if it is a time running gap) could influence on the robustness of the used methods (the fourier, wavelet and cross-correlation analysis). The MLS/AURA water vapor dataset gives the best coverage for the periods of the high and low solar activity.

Specific comments:

"Page 28478: line 21/22 "The two most important cycles ...": Maybe it would be better to name the 11-yr cycle first as the spots and faculae associated with the 11-yr cycle create the 27-day variability when they appear on the "front side" or the "back side" of the sun."

Done.

"Page 28479: line 20-21: Please explain the diurnal cycle of OH briefly after the Minshwaner et al reference, i.e. the OH concentration peaks at low solar zenith angles and declines when the sun approaches the horizon."

Done.

"line 25: There is another reaction producing OH, which should also be mentioned here $\text{H}_2\text{O} + \text{O}(1\text{D}) \rightarrow 2\text{OH}$ "

Done

"Page 28482: line 14: Please insert some introductory words after "The data for 2004 and 2006 are poorly correlated with the solar irradiance .", something like "To understand this the unfiltered H₂O data at 80 km are shown in the bottom panel of Fig. 2"."

This part of the text was changed.

"Page 20483: line 24: The pronounced 27-day cycle ceases in autumn 2005."

We would prefer to leave our formulation because the cycle is not disappeared from

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2005 but weakened.

"Page 20485: line 4: Which statistical test was used? "... the twosided statistical test" is somewhat unclear."

The description of the used statistical test was added in the text.

"lines 10-11: It is interesting to see that there is still a period close to 27 days in the solar min correlations, and furthermore, that these correlations are statistically significant. What is the explanation for that?"

Even in the solar minimum the rotational cycle in the solar irradiance can still exist. The passage of a sunspot (or a sunspot group) through the quiet Sun can lead to the strong response in the mesospheric OH that can increase the correlation. For the analysis of the solar minimum we used the period from November 2008 to November 2009. During that time there were a few sunspot events that could lead to the noticed increase of the correlation. To convince the reader we remade our analysis using the time when the solar activity was the lowest (from August 2008 to August 2009) as a solar minimum period. The OH and H₂O correlations calculated for the new solar minimum period are much weaker than the correlations which were obtained for the time from November 2008 to November 2009. We also have added a new figure which presents the comparison of the solar irradiance and OH for the solar minimum period to show why we think that the period from August 2008 to August 2009 is more suitable for our analysis.

"line 14: The highest negative correlation appears at 90 km not in the range 85-90 km, so please reformulate the parenthesis "(up to -0.74 at 90 km)"."

Done.

"line 22: "... it makes the obtained correlations insignificant." This is somewhat misleading as Fig. 6, bottom, shows statistically significant correlations. Please, reformulate this sentence in a more precise way."

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Done.

"line 28: The value of the H₂O sensitivity of -1.2 % given in the text is not supported by the curve in Fig.7. At 90 km it shows about -0.95 % water vapor change per 1% change in Lyman- α irradiance."

Done.

All technical comments were implemented.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 28477, 2011.

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