

Interactive comment on “27-day variation in cloud amount and relationship to the solar cycle” by Y. Takahashi et al.

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Dear Dr. P. Thejll,

First of all we deeply appreciate your essential and constructive comments on our paper and so sorry for not respond to them immediately due to personal condition.

1) Is the spectral power in the WPWP statistically significant? Reporting on one of the strong peaks in a power spectrum is one thing, reporting a significant amount of power is another. The calculation of levels of significance for spectral peaks should be attempted, I suggest. Otherwise the reader is not sure of the spectral peak is a Common occurrence in random series of this length and type. Possible methods could include the use of 'surrogate data', generated repeatedly with the aim to make a large

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sample of 'spectrally realistic but random' data in which to test for the occurrence rate of spectral peaks.

Reply: Regarding to the validity of this analysis, we are acutely aware that the error estimation is important but it's not easy. We calculated the standard deviation at 27-day as about $2 \text{ (W/m}^2\text{)}^2$ from all the data of selected intervals in the present analysis, which suggests sufficient difference between maximum and minimum years. We will try some other method to evaluate this validity as next step.

2) The geographic location of the signal is of course interesting for physical reasons, as discussed in the paper, In our own work (Gleisner and Thejll, GRL vol. 30, p. 1711 (2003)) we found a significant 11-year signal in the tropospheric thickness (upper and lower) for all tropical latitudes except the central and eastern Pacific, consistent with the present work. However, we did not find a significant response to the solar cycle in the vertical velocity in the WPWP region. We would expect that a large-scale dynamic signal should be apparent if an external modulating factor was present - but the use of higher-resolution data, as in the Takahashi et al paper may be the key to find these cases.

Reply: Thanks for the perspective comments. We were motivated from the finding of 28-day periodicity in Schumann resonance (SR) power [Sato and Fukunishi, 2004], which represents global lightning activity, and good correlation between SR power and global cloud amount for a certain half year. But this correlation is not always true for other years. Therefore, we examined the OLR spectrum, dividing into squares with an order of 10 degree. It was found that in the region of WPWP the OLR spectra for 25 years shows prominent spatial enhancement in the frequency range around 27-day as well as Indian Ocean. But the spectrum of Indian Ocean shows enhancement in the broad frequency range and in many cases the peak is not prominent around 27-day while WPWP tends to have a clear peak around 27-day especially in solar maximum years. Another important finding of the present paper is that only WPWP “always” shows that clear peak within ± 27 -day in solar maximum years and no clear

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peak in solar minimum years. This doesn't mean that other places don't show 27-day periodicity. Such peaks are sometimes found at other locations but the "solar activity rule without exceptional year" is found only in WPWP. Important and very unique point of the present paper is that we focus on the periodicity not on the amplitude of (OLR) variations. Therefore, it may deserve to examine the periodicity around 27-day of the vertical velocity.

I also have a few very minor questions to add to the above: 3) Could the "27" day peak be an alias of the MJO signal? That is, a spectral peak artifact, rather than a real signal.

Reply: The peaks around 27-day show rather spiky feature than enhancement in the MJO period range. And in the MAX2 in Figure 3, the 27-day peak is more powerful than other maximum season but no strong enhancement in the MJO period. Therefore, we think the 27-day is not a result of aliasing of MJO.

4) If the 1991 spectrum is not omitted, will the conclusions of the paper change?

Effect of one year out of eight years is not significant. No serious change can be come up with.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 15327, 2009.