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

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The paper presents data supporting an interesting hypothesis, i.e. that the rotation period of the sun of 27 days induces variations in the outgoing longwave radiation. However, I think the presentation and methodology could still be improved in some aspects as listed below:

1. In the introduction, the paper refers to a paper of Svensmark(1998), which reports that cloud cover is modulated by cosmic rays. In a subsequent paper by Marsh and Svensmark (2000), the proposed effect is attributed to low-level clouds. For balance, the authors should probably also refer to papers contesting their conclusions, e.g. Damon and Laut (2004).

2. The paper states that OLR is a proxy of cloud amount, a characterisation which is somewhat imprecise. The OLR is mainly modulated by high clouds (in particular convective clouds, as well as upper tropospheric humidity, see e.g. Schmetz et al., 1990), and is not very sensitive to low clouds. The findings of this paper would thus indicate a response of high-level clouds to solar variability, in contrast to Marsh and Svensmark (2000) who suggest a link with low-level cloud amount.

3. The paper does not consider alternative mechanisms to the proposed link with sun rotation. In particular, the review of the MJO of Madden and Julian(1994) already reports on a 26-day period in the MJO for 1980-1985 (see their fig.4), and stresses the "broadband nature" of the oscillation. They also report on studies which attribute the change in the period of the oscillation to warm water and El Nino. Can the authors rule out this hypothesis? If not, they should mention these alternatives. Could they use other datasets used to study the MJO in the review article to extend the period of their investigation, e.g. the pressure at Truk island?

4. The authors only study the the Fourier power spectrum (thus the amplitude of the Fourier transform). Maxima at the same frequency are not a sufficient condition for a causal link. If the suggested link is real, phase coherence between the 27 day oscillations in F10.7 flux and OLR seems also a necessary condition. Hence, the relation of the phases (i.e. the lag) of the two oscillations should be studied. Is it constant over time? The phase lag between the oscillations could also provide an important hint towards the underlying physical mechanism, and should be reported. Also, as recommended in the first comment, confidence intervals for the power spectrum would be beneficial. A much more detailed spectral analysis of the MJO is given i.e. in Whitcher et al. 2000 (even if it uses the wavelet transform instead of the Fourier transform), and might serve as a good example.

5. a short description of the datasets used and the accuracies and limitations seems appropriate. It should be stressed that the OLR is taken from narrowband radiances and polar-orbiting satellites (as can be learnt from the reference). Can the authors

rule out that the reported 27 day period is an aliasing effect due to orbital sampling of polar-orbiting satelllites (see paper by Tremberth, 2002)?

6. the acronym MJO is used without definition in the abstract

References

Schmetz J, Mhita M, van de Berg L (1990) Meteosat observations of longwave cloud-radiative forcing for April 1985. J Clim 3: 784-791.

Marsh ND, Svensmark, H. (2000), Low cloud properties influenced by cosmic rays, Physical Review Letters.

Madden, R.A., and P.R. Julian, 1994: Observations of the 40–50-Day Tropical OscillationâĂŤA Review. Mon. Wea. Rev., 122, 814–837.

Damon, P. E., and P. Laut (2004), Pattern of Strange Errors Plagues Solar Activity and Terrestrial Climate Data, Eos Trans. AGU, 85(39), doi:10.1029/2004EO390005.

Whitcher, B., P. Guttorp and D. B. Percival (2000). Wavelet analysis of covariance with application to atmospheric time series. Journal of Geophysical Research - Atmospheres 105 (D11), 14,941-14,962.

Tremberth, Changes in Tropical Clouds and Radiation (2002). Science, Vol. 296. no. 5576, p. 2095 DOI:10.1126/science.296.5576.2095a

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