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Atmospheric Chemistry and Physics Discussions

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

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This paper reports on 25-30 day periodic signals in the OLR (outgoing longwave radiation) in regions of the Indian ocean and West Pacific Warm Pool (WPWP), the latter a region with high tropospheric convective activities and highest sea-surface temperatures. They investigated how this periodic signal is related to solar variations on similar time scales, i.e 27 day solar rotation. For solar activity, the F10.7 cm flux was used as a proxy and their power spectrum compared to that of the OLR, a proxy for (bright/high) cloud occurences. They found strong peaks in the 24-30 day period range from a Fourier analysis of OLR data from years 1980 to 2002 during solar maximum in the 11-year solar cycle, but none during solar minimum phases. These results are interesting, but some important questions remains, which needs to be resolved.

1.) The detailed frequency analysis separating solar maximum and minimum phases was only done for OLR data in the WPWP, but Fig. 1 shows also strong signals in the Indian ocean region. Do the results for WPWP also hold for the Indian ocean region? The Madden-Julian-Oscillation is connected to the Asian monsoon, so I guess, the investigation of the Indian Ocean region could put some additional light into relations between the 24-30 day signal and MJO frequencies. I would like to see a repeat of Figs. 3 and 4 for the Indian Ocean region.

2.) As another reviewer already stated,the 24-30 day signal could be related to MJO frequencies (50-80 days). If you have two strong signals, one can expect signals in the beat frequencies (sum of and difference between dominant frequencies). So 80 minus 50 yields 30 and could therefore explain peaks in the 24-30 day range. The MJO frequencies are apparently stronger during solar maximum years (see Fig. 3).

3.) The abstract should be rewritten to bring out more concisely the results of this paper. The first two sentences in the abstract are a repeat of the start of the Introduction section. The abstract should contain what has been done (frequency analysis of OLR and F10.8 cm), what are the major results (solar activity phases, MJO), and possible explanations for the solar link and/or a statement that exact causes/mechanism for this connection is not known.

Minor details (language issues):

p. 15328, l. 5: "stratospheric atmosphere" –> "upper atmosphere" (see also l. 20)

p. 15328, l. 12-15 (abstract): last sentence of abstract is hard for me to comprehend, I think this phrase could be safely dropped without loosing any information.

p. 15328, l. 21-23: "Synchronisation between galactic cosmic ray flux and cloud amount" –> "Correlation between ...", omit "in terms of the solar cycle", and "in the longer time scale" –> "on longer time scales"

p. 15329, l. 1: "focus on cloud amount variation" (add "on")

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p. 15329, l. 10: "day" –> "days"

p. 15329, l. 25: "at the solar maximum" –> "at solar maximum"

p. 15329, l. 25-27: "If 27 day fluctuations ..., we would expect ... to vary with the phase of the 11-year solar cycle as well." Add "as well" at the end of sentence.

p. 15330, l. 1: "as a proxy for the degree of solar activity". Omit "for the degree"

p. 15330, l. 15: "spectrum feature" –> "spectral feature"

p. 15331, l. 11: "is not easy work′" –> "is not an easy task"

p. 15331, l. 13: "and modulated" –> "and are modulated"

p. 15332, l. 1: "named electroscavenging". Omit "as".

p. 15332, l. 3: "meaning the most sensitive to the electroscavenging" –> "it is very sensitive to electroscavenging"

p. 15332, l. 6-7: "Note again ...". drop this sentence.

p. 15332, l. 24: "However, the detail and careful" –> "However, detailed and careful analyses"

Fig. 1 caption: better: "Map of spectral power of OLR with periods of 25-29 days"

Fig. 2 caption: "running average values" –> "running averages". "are labeled as Max 1 and so on" (add "and so on")

Fig. 3 caption: "period" –> "periods"

Fig. 4 caption: "for the maximum" –> "for all maximum". "represents the period between"–> "represents periods between"

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