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Global thunderstorm activities and OLR, and their dependence on solar cycle

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Global ELF observation network, GEON, constructed and operated by Hokkaido University, provides information of each cloud to ground lightning discharge, CG, that is, GPS time, location and energy, as well as Schumann resonance, SR, power, a proxy of global energy proxy of lightning discharge. From the standpoint of the relationship between the effect of solar activity to the climate, lightning activity estimated from the ELF measurement in the frequency range between 1 and 100 Hz and the outgoing longwave Radiation, OLR, an indicator of cloud amount, are examined for their periodicity in the periodic range of about one month. SR power shows about 27 day periodicity in solar maximum years and it becomes elongated toward solar minimum. On the other hand, OLR shows same kind of 27 day periodicity in solar maximum years, but only in the Western Pacific Warm Pool area. Both the spectra of SR and OLR have a peak around 35 days in solar minimum years. The average spectrum of OLR in solar maximum years also shows an enhancement in the range of 50 or 60 days corresponding to the main MJO period. In this paper the relationship between the global lightning distribution based on GEON measurement and OLR are discussed in detail, considering one-month periodicity. Especially synchronization of thunderstorm activity between different longitudes is focused.

Keywords: solar cycle, climate, lightning, thunderstorm, OLR, ELF