

27-day variation in lightning activity and OLR and their dependence on phase of solar cycle

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From the standpoint of the relationship between the effect of solar activity to the climate of the earth, lightning activity estimated from the ELF measurement in the frequency range f 1-100 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. The ELF Schumann resonance (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-day in solar minimum years. The average spectrum of OLR in solar maximum years also shows an enhancement in the range of 50-60 days corresponding to the main MJO period. Long-term variations in the tropospheric phenomena, including the 11-year cycle, are generally investigated from monthly or even yearly averaged data, but the present results suggest an alternative possibility: short-period variations could modulate longer periodic phenomena. It is also found that the day-to-day SR power variations at different UT, which nearly represent activities of lightning at different longitude, are synchronized for about one-month periodicity. The key to understand the mechanism of the 27-day periodicity in OLR will be obtained by detailed analysis about the relationship between OLR and thunderstorm activity.

Keywords: lightning, OLR, 27-day, solar, 11-year