Seasonal and long-term variations in the Schumann Resonance observed at Kuju Japan

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Seasonal and long-term variations in the Schumann Resonance observed at Kuju Japan

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The Schumann resonance (SR) is the global resonance of electromagnetic waves generated by global lightning activity. The resonance is formed by the Earth-ionosphere cavity and the specific resonance frequency appears in ground magnetic field variation. Thus, the SR reflects both global lightning activity and ionospheric conditions and varies considerably with location.

In order to use the SR parameters for studying earth's climate and so on, we need a better understanding of SR parameters at a specific observatory. For the first step, we examine power and frequency of first-mode and second-mode of SR observed at Kuju, Japan (KUJ; M.Lat. = 23.4 degree, M. Lon. = 201.0 degree) during 10-years from 2003 to 2012.

The first mode and second mode of the Schumann resonance (SR1 and SR2) well reflected global lightning activity. The variation in the amplitude of SR in a day showed peaks which correspond with the three major thunderstorm centers, namely, African, Asian, and American. Also amplitudes of these peaks depended on season.

The long-term variation of SR frequency depended on the solar EUV flux. Especially SR1 frequency in H (horizontal northward component) well correlated with EUV flux. This suggests that the SR frequency is controlled by the electron density in the ionospheric D region. From the variation of SR frequency, we estimated that the density in the ionospheric D region changes by about 15% from the solar minimum to the solar maximum.