

Variation of Schumann Resonance during the intense solar activity from October to November, 2003

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Solar flare is the extraordinary activity of the sun. At the time of solar flares, the solar X-ray flux increases and are often followed by solar proton events (SPEs). The activities affect on a wide sphere of the Earth's ionosphere. The electron density and altitude profile of its vary in the ionospheric D region up to the F region.

The Schumann resonance (SR) is the global resonance of electromagnetic waves generated by global lightning activity. SR parameters, which are amplitude and frequency, reflect the properties of both global lightning activity and the state of the Earth-ionosphere cavity. Recently, it is revealed that the SR is also affected by the solar activities. We newly aim to utilize SR for monitoring of the variation of the ionosphere caused by solar activities (e.g., solar flare and solar proton event). For the first step, we investigated relationship between SR parameters and intense solar activities on Oct.-Nov., 2003.

We examined the fundamental mode of SR (SR1) at Kuju, Japan (KUJ, M.Lat. = 23.4 degree, M. Lon. = 201.0 degree) by comparing with solar X-ray (0.05-0.3 nm) and Proton flux (40-80 MeV). The data of X-ray and Proton flux were obtained by the GOES series of the satellites on a geostationary orbit.

The enhancement of solar X-ray flux occurred on 18 Oct., 2003. This enhancement lasted for 19 days before it recovered to a previous level. During the period, the SR1 frequency in H followed the variation of the X-ray flux. Thus, the variation of the SR1 frequency seems to reflect the electron density in the ionospheric D-region during the solar flare.

During the enhancement of the X-ray on 18 Oct to 06 Nov, 2003, the prominent SPEs occurred several times as the enhancement of the Proton flux in 40-80 MeV. They started on 26 Oct., 28 Oct., 02 Nov, and 05 Nov. These SPEs were accompanied with the decrease of the SR1 frequency in D (horizontal eastward component). This tendency is more clearly in D component than H component. It is assumed that the SR1 frequency in D component relates to the polar ionosphere which is strongly affected by solar proton events.