Spatial structure and motions of flickering auroras

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To investigate the dynamical processes of flickering auroras, we operated two multi-anode fast photometer (MFPs) at Syowa station simultaneously. We analyzed these data and obtained characteristics of flickering patches. From these results and the assumption that flickering aurora is produced by electromagnetic ion cyclotron waves, we estimated wave parameters. We will propose a mechanism which can produce the spatial and temporal structures of of flickering auroras based on our optical observations.

Flickering aurora is a typical auroral feature seen in bright auroral arcs and surges. Recent observations and models have suggested that periodic fluctuations in the intensity and mortino of flickering aurora are produced by variations of field-aligned electron flux. It is proposed that these electrons are accelerated by electromagnetic ion cyclotron waves that occur below the auroral acceleration region, resulting in the periodic modulation of precipitating electron flux. However some important characteristics of flickering aurora are not yet explained. To investigate the dynamical processes of flickering auroras, we operated two multi-anode fast photometer (MFPs) at Syowa station simultaneously. The two MFPs measured auroral emissions at 427.8nm (N2+ 1NG band) and around 660nm (N2 1PG band), respectively.

We analyzed these data and obtained following results. The dynamic spectra of the intensities of individual MFP channels show spectral peaks of typical flickering aurora with frequencies from 6 to 12 Hz. These spectral peaks are identified for all channels of the two MFPs. In an event on April 24, 1998, the size of flickering patches is 2.5 to 7.5 km and the horizontal velocity of patches is 20 to 50 km/sec. From these results and the assumption that flickering aurora is produced by electromagnetic ion cyclotron waves, we estimated wave parameters with the formulas by Temerin et al.[1986]. The calculated values of wave parameters and resonant electron energy is consistent with those obtained from other observations and models.

In the model described above, the patch structure of flickering aurora can not be explained. We will propose a mechanism which can produce the spatial and temporal structures of of flickering auroras based on our optical observations.