Statistical study of auroral intensities using an aurora spectrograph: determination of sensitivity of aurora camera onboard INDEX

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We have been developing a multi-spectral auroral camera (MAC) onboard INDEX-1 which will be launched by an H2A rocket as a piggyback satellite into a polar orbit in the altitude of 680 km. Auroral image data of OI 557.7 nm, OI 630 nm, and N2 1st positive band are independently obtained by three channels of MAC. 14-bit sampled CCD image data are compressed to 8-bit data using a simple bit-shift method by the science handling unit onboard the satellite. Thus, we have to determine an appropriate bit-shift level for each channel since auroral intensities are different with each other. To estimate the bit-shift level, we make statistical analysis of aurora spectral intensities obtained by an auroral spectrograph installed at Longyearbyen in Spitzbergen from October 2000 to March 2001.

The field-aligned acceleration region existing in the altitude range of several thousands kilometers plays an essential role for the magnetosphere-ionosphere coupling system. To clarify the mechanism of formation of small-scale auroral structure, the simultaneous measurements between auroral electrons/ions and optical aurora imaging are planned by INDEX-1 which will be launched by an H2A rocket as a piggyback satellite into a polar orbit in the altitude of 680 km.

We have been developing a multi-spectral auroral camera (MAC) onboard the INDEX-1 satellite. Auroral image data of OI 557.7 nm, OI 630 nm, and N2 1st positive band emissions are independently obtained by three channels of MAC. 14-bit sampled CCD image data are compressed to 8-bit data using a simple bit-shift method by the science handling unit onboard the satellite. Thus, we have to determine an appropriate bit-shift level for each channel since auroral intensities are different with each other.

To estimate the best bit-shift level, we make statistical analysis of aurora spectral intensities obtained by an aurora spectrograph installed at Longyearbyen in Spitzbergen. The aurora spectrograph is an imaging spectroscopic instrument, using a grism as a dispersive element. It can obtain auroral spectra along a magnetic meridian with a field of view of 180 degree on a CCD chip of 512 x 512 pixels over 450nm-760nm spectral range with a wavelength resolution of 1.5nm. Using auroral spectral data obtained from October 2000 to March 2001, we report the intensity distribution of above mentioned three auroral emissions, and also determine the bit-shift level for each channel of MAC.