

Analyses of time series of auroral images for deducing properties of diffuse and pulsating aurorae

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Auroral images provide much information on the motion and variation of aurorae which are attributed to physical processes in the magnetosphere-ionosphere system. We are developing a technique for quantifying various auroral properties by analyzing time series of auroral images. In our technique, the translational motion of diffuse aurorae is described by a state space model. In principle, estimation for a state space model can be achieved by using the Kalman filter algorithm. However, since a high dimensional vector is required to represent each auroral image, the use of the Kalman filter is computationally expensive. In order to reduce the computational cost, we introduce a reduced-rank approximation of the Kalman filter and apply it to the estimation of the translational motion. Properties of pulsating aurora are also analyzed by using a sparse analysis technique, which enables us to extract structures varying differently from ambient aurorae. Some results of pilot analyses will be demonstrated.