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Estimation of the spatial structure of the plasmasphere using a data assimilation technique

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The plasmasphere is the region of cold dense plasma in the inner magnetosphere. The spatial structure of the plasmasphere is significantly controlled by the electric field in the inner magnetosphere. Therefore, in order to discuss the dynamics of the plasmasphere, it is important to understand the spatial distribution of the electric field in the inner magnetosphere. However, in the magnetosphere, it is basically difficult to observe the static electric field. We are developing a data assimilation technique which incorporates the imaging data of extreme ultra-violet (EUV) from the IMAGE satellite into a two-dimensional fluid model of the plasmasphere using an ensemble Kalman filter. By combining a sequence of EUV images and the dynamic model the plasmasphere, we can estimate the spatial distribution of the electric potential as well as the plasmaspheric plasma. We will overview our approach and demonstrate some examples of the estimates obtained by this approach.

Keywords: plasmasphere, data assimilation, magnetospheric electric field