Use of data assimilation to estimate physical parameters in a ring current model

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Data assimilation techniques are successfully applied to atmospheric physics, physical oceanography, and ionospheric physics. There have been few attempts to apply data assimilation techniques to magnetospheric physics mainly because of poor observational coverage. However, recent progress of observation system enables us to obtain global data of the magnetosphere with sufficient spatial coverage and with sufficient time resolution. In particular, the IMAGE satellite obtains global images of the energetic neutral atom (ENA), which should work as a meaningful constraint on magnetospheric models. In this study, we developed a method to assimilate the series of the IMAGE/HENA data into a kinetic ring current model by using the particle filter technique. In this method, we assumed the magnetospheric electric field distribution to be unknown, and estimated the distribution in the course of the assimilation process. In order to test the method, we tried to assimilate a test data generated by a test simulation into another rather simple model, and we confirmed that this method produced a reasonable result.