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Data Assimilation Techniques Applied to Inner Magnetosphere Modeling: An Overview

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We will present an overview of current data assimilation techniques applied to inner magnetosphere modeling. Especially the space science program at Los Alamos National Laboratory has devoted considerable effort to a recent program called DREAM: Dynamic Radiation Environment Assimilative Model. This is an innovative program to develop a next-generation space radiation model using extensive satellite measurements, new theoretical insights, global physics-based magnetospheric models, and the powerful techniques of data assimilation. We will present results from studying the radiation belt enhancements using our data assimilation framework that combines phase space density data from several satellites with predictions from a radiation belt diffusion code. This quantitative comparison of data and model output enables us to calculate where forecast and observations drift apart. In addition, our framework can automatically determine the location of active acceleration regions and the overall efficiency of wave-particle interactions.