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Forecasting the solar photospheric magnetic field using solar flux transport model and local ensemble Kalman filtering

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Accurate forecasting the solar photospheric magnetic field distribution play an important role in the estimates of the inner boundary conditions of the coronal and solar wind model. Forecasting solar photospheric magnetic field using the solar flux transport (SFT) model can achieve an acceptable match to the actual field. The observations from ground-based or spacecraft instruments can be assimilated to update the modeled flux. The local ensemble Kalman filtering (LEnKF) method is utilized to improve forecasts and characterize their uncertainty by propagating the SFT model with different model parameters forward in time to control the evolution of the solar photospheric magnetic field. Optimal assimilation of measured data into the ensemble produces an improvement in the fit of the forecast to the actual field. Our approach offers a method to improve operational forecasting of the solar photospheric magnetic field. The LEnKF method also allows sensitivity analysis of the SFT model to noise and uncertainty within the physical representation.