Improving solar wind forecasts using data assimilation

Matthew Lang, Mathew Owens, and Amos Lawless
University of Reading, Meteorology, Reading, United Kingdom of Great Britain and Northern Ireland
(matthew.lang@reading.ac.uk)

Data assimilation has been used in Numerical Weather Prediction models with great success, and it can be seen that the improvement of data assimilation methods has gone hand-in-hand with improvements in weather forecasting skill. The implementation of data assimilation for solar wind forecasting is still in its infancy and is still underused in the field. Hence, it is important to investigate the optimal implementation of these methods to improve our understanding of the solar wind.

To do this, we have generated a variational data assimilation scheme for use with a steady-state solar wind speed model based upon the Burger equation. This relatively simple scheme has the advantage of updating the inner-boundary conditions of the solar wind model allowing the updates to persist and improve the solar wind estimates throughout the whole domain.

To this effect, we present numerical experiments using our data assimilation scheme with STEREO and ACE data to improve estimates and forecasts of the solar wind in near-Earth space. Particular focus will be applied to assimilating data when the satellites are 60 degrees apart, such that they simulate Earth-L5 forecasting scenarios.