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Forecasting geomagnetic time series for global field modelling

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The secular variation (SV) of the geomagnetic field is difficult to accurately predict with our current incomplete knowledge of its governing physics. Many academic and applied studies rely on the extrapolation of global field models beyond their most reliable, data constrained, period. Often, predictions of the field are made based on simple extrapolations of the modelled approximation to the observations. Where these models are parameterised by temporal B-splines, a linear extrapolation of the field is often heavily dependent on the damping chosen for the model, specifically at the model ends.

Here we investigate using time series forecasting methods to pre-process predictions of observations, with a view to including these predictions within the constraints of a field model inversion. In doing so, we can use the most recent data to govern our predictions, without the impact of temporal damping effects from the field modelling process. We can also choose to apply any spatial and physical constraints of our model to these predictions as part of the model inversion. We look at the application of forecasting to ground observatories and satellite “virtual observatories” from the CHAMP and Swarm missions