
Reanalysis of time-dependent core flows using a stochastic Ensemble Kalman Filter

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Résumé

We perform a re-analysis of transient core motions under spatial constraints derived from geodynamo simulations. The model is advected in time using stochastic equations coherent with the occurrence of geomagnetic jerks.

The use of an Ensemble Kalman filter allows to estimate uncertainties on core flows as a function of length and time-scales. From synthetic experiments, we find crucial to account for subgrid errors to obtain an unbiased reconstruction. This is achieved through an augmented state approach.

We show that a non-negligible contribution from diffusion should be considered, even on short periods. We apply our algorithm to the COV-OBS.x1 model over the period 1940-2015. We estimate the reliability of the retrieved velocities, present probability densities for the several contributions to the dipole decay, and revisit decadal LOD fluctuations and the westward gyre.

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