



## **Jerks and the velocity field at the CMB recovered using gufm1 model**

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There is an increasing consent that the jerk phenomenon is related with abrupt changes in the patterns of the small scale-flow at the core-mantle boundary, CMB. Therefore the recovery of this velocity field is essential to provide insights on the jerk's mechanism. The fluid flow in the outer core is considered to be under the frozen-flux approximation and the simplified induction equation for the radial component ( $B_r$ ) is employed. The two-dimensional velocity field at the CMB is separated into toroidal and poloidal ingredients.

Both components of the velocity field as well as the radial geomagnetic field and the respective secular variation are expanded in spherical harmonics series. The substitution of these series into the  $B_r$  equation, the multiplication with the respective complex conjugated spherical harmonics and integration over the CMB yield a system of algebraic equations with respect to the spherical coefficients of the velocity involving the Elsasser and Gaunt integrals. We have obtained the coefficients of the geomagnetic field (Gauss's coefficients) and of its secular variation from the gufm1 model (1850-1986). The magnetic field and secular variation are expanded up to degree 6, while the toroidal and poloidal fields are expanded up to degree 4. The number of unknown harmonic coefficients of the velocity field coincides with the number of algebraic equations ensuring its uniqueness. The system of equations is then inverted by a standard matrix inversion procedure. The maps of the recovered velocity field (for the period under study) show clear changes of the patterns of the flow that generally occur on a time-scale greater than a year accounting for the typical secular variation of the geomagnetic field. There are observed also sharp changes of the features of the velocity field that occur on time periods less than a year. Generally these changes are observed in the epochs when jerks are reported to have occurred although there are exceptions. Also westward drift motion of the features of the velocity field is observed as well as two pronounced features under the South Atlantic and West Pacific.