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Identifying the space-time structure of episodic processes at the CMB by rapid geomagnetic field changes

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It is well-known that the 1991 jerk is observed in the phi-component of d/dt{B} (B geomagnetic field) in the data of many, but not all of the globally distributed stations. This event, being an example for an episodic process, is studied by different global model data sets (Wardinski and Holme, Sabaka et al).

We investigate the details of the spatial (scale) and temporal-spectral structure for the field components at the Earth surface and the core-mantle boundary (CMB), comparatively, also under the aspect of approximation and correlation.

For the determination of the magnetic field components at the CMB from the model data (Gauss coefficients) given at the Earth surface a rigorous inversion procedure (non-harmonic downward continuation) is used allowing for any radially-dependent conductivity distribution. It consists here of a weakly conducting mantle completed at the bottom by a high-conductive layer.

In addition, we calculate the CMB fluid flow in tangential geostrophic approximation by a standard frozen-flux inversion procedure for given low-dimensional field parts to find some hints for the scales of the causing episodic processes in the fluid outer core.