A TIME-DEPENDENT MODEL OF THE EARTH'S MAGNETIC FIELD AND ITS TEMPORAl CHANGE FOR THE PERIOD 1957 TO 2007

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A spherical harmonic representation of the Earth's magnetic field and its secular variation for the period 1957 to 2007 is derived. In order to have a robust estimate of the secular acceleration, we use order 6
B-splines as basis functions for the temporal evolution of the Gauss coefficients, and constrain the third time derivative of the field to be small. The model, designated C3FM2, combines methodologies used to derive C3FM1 (Wardinski Holme, 2006) and GRIMM (Lesur et al., 2008). As a further constraint, we impose the model to be consistent with the frozen-flux assumption. This is achieved by simultaneously modelling the core field and flow at the core surface applying the radial diffusion-less induction equation. Contrary to previous studies by Constable et al. (1993) and Jackson et al. (2007),
this approach provides a temporally continuous constraint. The frozen-flux constraint can also be understood as an instrument that aids to backward project spatially high resolved core field models in
time. We discuss to what extend the frozen-flux constraint is adhered. First inspections indicate that magnetic diffusion does not contribute evidently to the observed secular variation. Further aims of this
study are I) to verify that the observed rapid secular variation, including geomagnetic jerks can be explained in the framework of the frozen-flux approximation, II) to derive a core field and flow model,
at the CMB, that can help understanding the mechanism that caused these rapid variation.

Geomagnetic field model, geomagnetic jerks, rapid secular variation

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