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Global electromagnetic induction: combined inversion of satellite and observatory magnetic data using non-zonal source models

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Global electromagnetic induction studies have usually assumed that long period external magnetic variations are due to a symmetric magnetospheric ring current, and are hence describable on the Earth's surface by an external geomagnetic axial dipole Y_1^0 . Balasis et al. (2004) show that satellite estimates of electromagnetic induction transfer functions under the traditional source assumption depend systematically on local time, suggesting that source fields contain also a coherent non-axisymmetric quadrupole component (Y_2^1). Recently, Balasis and Egbert (2006) by applying empirical orthogonal function methods to mid-latitude night-side hourly mean geomagnetic observatory data found evidence of non-zonal low-frequency source fields. The dominant spatial mode of variability in residuals, obtained by subtracting symmetric ring current and ionospheric fields of the CM4 comprehensive model, had also a substantial Y_2^1 term and was highly correlated with D_{st}. The time-domain, spherical harmonic-finite element method developed by Velimsky and Martinec (2005) has recently been applied to 1-D inverse modeling of CHAMP satellite data assuming only storm-time, axially symmetric ring-current excitation (Velimsky et al., 2006). Here we present the first results of application of the method to model the electromagnetic response of the Earth to the source field incorporating higher degree non-zonal (Y_2^1 and Y_4^1) terms. Three-

year long time series of vector magnetic field measurements from CHAMP, Oersted and selected surface observatory data are jointly inverted in terms of 1-D deep conductivity structure. *Acknowledgment:* G. B. and K. E. acknowledge support from the Greek General Secretariat for Research and Technology project 210-c, in the frame of the bilateral Science and Technology Cooperation between the Hellenic Republic and Czech Republic.