Inferences about small scale core surface flow and secular variation from scaling laws

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Here we attempt to estimate the geomagnetic secular variation related to the interactions of large scale core surface flow with the small scale core field and the action of small scale flow onto the core field. The estimation divides into two problems. First, the derivation of the small scale core field; this field cannot be known by direct observation from the Earth's surface as it masked by the crustal field. Several studies (Eymin et al. 2005, Gillet et al. 2009) assumed random expansions of the core field to un-observable small scales in their core flow inversion schemes to benchmark the secular variation related to those interactions. In this study, the core flow inversion is made up by using a prospection of the small scale core field and its variation based on scaling laws which have been deduced from geodetic observation and numerical dynamo solutions. The second problem comprises the computation of the small scale flow which acts onto the core field. This computation requires a separate treatment. We suggest a constraint that penalizes the flow energy as a function of the flow length scale, such constraint is inferred from the analyzes of the flow-energy scaling behavior of numerical dynamo solutions.