What is the core trying to tell us?

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Spherical harmonic field models from 1690 to present are inspected to determine their quality and whether there exist obvious patterns of variation over the century, which may be related to core generation. One such view is the ``harmonic dial" for plotting the g vs. the h as a function of time for each n and m up to n=6. The IGRF (1900-2000) series shows regularities in the trace of each component, but deviations from smooth traces for some years between 1940 and 1955 exist, which we interpret to be errors in the series. On the scale of these presentations the more accurate recent models are in agreement up to n=6. If there were simple westward drift of the field without changes in amplitude these would all rotate clockwise on such a diagram. Other than the special cases showing large amplitude changes with little rotation, three of the set are moving east. Other than those that show irregular motions, the more consistent pattern is that of a clockwise curl, even for those showing eastward drift. The dipole tesseral term (n=m=1) shows little drift until 1930 after which it shows motion with a clockwise curl, westward drift and accelerated motion in the past two decades. The sequence of coefficients developed at GSFC by Sabaka and others also shows such variations, though more consistently than the IGRF series. The models of Bloxham, dating from to 1690-1840 and 1840-1990, make use of ship declination data. Because no absolute measurements were available prior to 1832, an assumed linear dipole decrease was used for the earlier model.

A second view is to inspect the integrated unsigned flux at the CMB as a function of adding more harmonics to the computation. Plots of these for the models show a pairing whereby the addition of terms for n=2, 4, 6 and 8 add little to the flux, whereas the odd terms, n=3, 5 and 7 add much more flux. Use of terms up to n=4 show a decrease of total flux with time whereas those above, up to n=8, are nearly flat implying that diffusion is not important at this scale and time interval. Higher degrees show more irregularities likely caused by noise in the

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downward continuation.

It is also seen that the difference in energy density at the CMB being lost by the lower terms is transferred to the higher as originally noted by Verosub is a consistent feature of the models.

We conclude that whereas spatial scales represented by terms up to n=6 are adequately determined for most epochs for a least the last century, those higher show apparent increasing noise until the advent of satellite surveys in mid 1960's. Even so, such large time gaps as the decades between COSMOS/POGO, Magsat and the Orsted surveys make it uncertain that smaller scale changes would not have occurred that are not adequately modeled.