



A parade of regional modelling techniques and their applications to geomagnetism

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In the recent years, a large amount of magnetic vector and scalar data have been measured or made available to scientists. They cover different range of altitudes from ground to satellite levels and sometimes have high horizontal densities depending on the considered geographical area. Processing these heterogeneous potential field data requires some alternative to the widely used Spherical Harmonics representation that needs, in order to preserve the details, to estimate an enormous number of Gauss coefficients. During the past decades, new regional modelling techniques have been proposed to address this drawback. They complement the set of older approaches that were revived and sometimes revised in the meantime. The current number of available techniques is thus intimidating and one often wonders which method is the most appropriate for his specific purpose. In this presentation, we review several potential field modelling strategies. Starting from the Spherical Harmonics, we discuss methods with global support (wavelets, slepian functions, spherical splines. . .) and then bring the focus on regional methods with local support (Rectangular Harmonic Analysis, Cylindrical Harmonic Analysis, Spherical Caps, . . .). We briefly examine the theoretical aspects and properties of each approach. We finally compare them with the help of a unique set of synthetic data that mimic a standard real data distribution. This helps us to emphasize better their pros and cons and discuss possible future improvements useful for practical applications.