



From 3D to 2D, the Revised Spherical Cap Harmonic Analysis can be powerful for modelling the different contributions of the geomagnetic field at various spatial and temporal scales

E. Thébault

Institut de Physique du Globe de Paris, CNRS UMR 7154

Modelling the magnetic field at a regional scale has always been challenging and several techniques were proposed in the past. The Spherical Cap Harmonic Analysis (SCHA, Haines, 1985) was initially devoted to the processing of data available within a limited area. Even though it may give interesting results, it suffers from various drawbacks and approximations that will be identified and illustrated.

An alternative to SCHA is here presented and two different cases are considered. The 3D case, involving data measured at different altitudes is named Revised-SCHA (Thébault et al., 2006). Revised-SCHA will be employed to illustrate the modelling of the main field and the lithospheric field from the joint processing of ground, aeromagnetic and satellite data over different areas. It will be shown that the patchwork of regional models can be reliably carried out if the data are of homogeneous quality. The 2D case, involving data measured at one level only, is somewhat different from the 3D case and requires a new strategy named R-SCHA2D (Thébault, 2007 submitted). This second formalism is used to process the repeat station data over France between 1965 to 2007.5 using 29 repeat stations and 1 observatory data. It is shown how the geomagnetic jerks over France are detected in the regional parameters and how it is possible to estimate the crustal bias. Compared to the CM4 comprehensive model (Sabaka et al., 2004), no secular variation anomaly is detected over France. This study will be extended to a larger area of the European continent to seek for a possible regional secular variation anomaly. In a general situation, provided the resolution is compatible

with the data distribution, R-SCHA and R-SCHA2D do not require additional synthetic data or detrending to be stable and the methods seem to be powerful. However, these approaches raise the theoretical problem of internal/external field separation, an issue that will finally be discussed together with various other applications of regional modelling.