



Modelling the magnetic field with spherical caps: the pros and cons

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Modelling the Earth's magnetic field regionally at spatial scales from tens to thousands of kilometres using Spherical Cap basis functions has been performed for more than two decades in a large variety of situations. While this approach represents a powerful tool for mapping the field (as long as the correct basis functions are used), it does not allow, so far, spectral analysis unless very specific conditions are met. This presentation aims at reviewing the different competing approaches based on spherical caps. In a first part, different results will be presented to demonstrate the efficiency of the regional approach to merge ground, airborne and satellite data and to test their consistency, or to simply represent the magnetic field over a chosen region where the density of magnetic data is comparatively higher at the Earth's surface. Then, a list of current drawbacks will be more specifically drawn up and some important questions that should be addressed in the near future will be asked. For instance, what are the mathematical prerequisites for separating the magnetic field into its constituent sources at regional scales? Is it reasonable to plan developing a complete spectral tool in Spherical Cap Harmonics to estimate source depth? These questions would find a satisfying answer if we were able to correctly estimate and then eliminate the aliasing inherent to regional methods. It is hoped that some solutions, or clues, will emerge by merging the experience of the two communities in magnetic and gravity fields modelling.