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High accuracy modelling of the crustal magnetic field using satellite data

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Uneven magnetic data distribution around the Earth and the slow rate of convergence of spherical harmonics are both limiting factors for producing high resolution maps of the geomagnetic field. In practice, we lack a mathematical tool in order to combine all the wavelengths of the magnetic field and describe the lithospheric field accurately. A possible alternative is to consider the magnetic field over some portion of the Earth only and build up a specific basis of functions. The Revised Spherical Cap Harmonic Analysis (R-SCHA) is a regional modeling technique that aims to provide basis functions with which the magnetic field can be represented at a regional scale from ground to satellite altitudes.

The properties of R-SCHA will be illustrated. Then, using four years of CHAMP satellite data, a lithospheric model is computed at 400 km altitude over the entire sphere by stitching together a dense coverage of regional models. The resolution and accuracy of this model will be discussed.