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Sensitivity of magnetic field gradients over Fennoscandia

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Magnetic fields from forward calculations of global crustal or lithospheric models cannot be compared easily with spherical harmonic (SH) crustal field models derived from the satellite observations. The reason for this is, that the lithospheric field has a significant part in the low-degree spherical harmonics (n<14) that are dominated by the core field. These low-degree harmonics are commonly zeroed out to retrieve the lithospheric magnetic field. In addition, at satellite height far-field effects from sources outside a regional study affect the long-wavelength part of the magnetic field.

Because magnetic field gradients are less sensitive to the long wavelength anomalies, they are also less affected by the far field. However, the gradients still contain information about deep lithospheric structures. We present sensitivity tests based on a synthetic model of the Fennoscandian lithosphere to validate the influence of induced and remanent magnetization in magnetic data at the height of airborne surveys and satellite missions. The use of airborne data and satellite data is complementary because, due to their different height, they are sensitive to different depth domains. To correctly account for global and local aspects of the lithospheric field, our analysis is based on surface discretization by tesseroids (spherical prisms).