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R-SCHA modeling of Antarctic magnetic anomaly near-surface data

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Remote sensing is fundamental to get knowledge of the geology of those regions like Antarctica where it is difficult, almost impossible to get direct access to the undersurface. Among other techniques, the study of the near-surface magnetic field provides information on magnetization contrasts that can be used to infer the location and dimension of underlying bodies responsible for the magnetic anomalies. The study of the vertical and horizontal derivatives of these anomalies provides information about the depth and limits of these sources, by applying techniques like the Euler deconvolution or the study of the analytical signal. In this paper we present an alternative to the traditional methods employed to compute these derivatives. We developed a regional Revised Spherical Cap Harmonic Model (R-SCHA) on near-surface magnetic data over the Antarctic Peninsula to obtain a set of spherical cap harmonic coefficients from which to compute the values of the magnetic field. The main dataset used is composed of total intensity magnetic anomaly data from the Antarctic Digital Magnetic Anomaly Map project, an international effort aimed at the compilation of all magnetic surveys (ground, marine, and aeromagnetic) conducted below 60º South. The vector field is constrained by using repeat station data and observatory annual means. The resulting model is able to reproduce fields of 25 km wavelength, and it reproduces the main geological patterns that can be found in the region of the Antarctic Peninsula, Bransfield Strait, and Western Weddell Sea.