Depth-to-the-bottom optimization for potential field inversion

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We present an algorithm for the linear inversion of 2D surface magnetic data to obtain 3D models of the susceptibility of the source. The forward model is discretized by a mesh of prismatic cells with constant magnetization that allows the recovery of a complete 3D generating source.
As the number of cells are normally greater than the amount of available data, we have to solve an under-determined linear inverse problem. A Tikhonov regularization of the solution is introduced as a depth-weighting function adapted from Li and Oldenburg [1996] to close the source towards the bottom. The main novelty of this method is a first-stage optimization that gives information about the depth-to-the-bottom (dtb) of the generating source. This parameter permits both the evaluation of the appropriate vertical extension of the mesh, and the definition of the shape of the regularizing depth-weighting distribution. A similar algorithm has been tested also for gravity data, provided the appropriate changes of parameters. After discussing the performance of this method by showing the results of various synthetic tests, we invert some real magnetic anomalies to define their 3D source distribution.