



## **Magnetic Inversion Modelling of Seafloor Massive Sulphides with a Surface Geometry Mesh**

Christopher Galley, Peter Lelievre, Colin Farquharson, and John Jamieson  
Memorial University of Newfoundland, Earth Sciences, Canada

Seafloor massive sulphide (SMS) deposits form on and below the seafloor at sites of high-temperature hydrothermal venting. SMS deposits offer to be a new and viable source for the mining of copper, zinc, lead, gold, and silver, but the remote environment in which they are located creates difficulties for their exploration and tonnage estimates. In particular, the proportion of ore found below the seafloor, versus that found within the sulphide mound, has only been estimated from collected drill cores. These cores are expensive, time consuming to collect, and offer little geometric information of the sub-seafloor components of the deposit unless collected in large numbers. As an alternate method, magnetic surveys are used to locate SMS deposits as magnetic lows, due to the hydrothermal fluids stripping much of the magnetite from the alteration zone, and the data can be inverted to give sub-surface information. The surface geometry inversion method was chosen to model the SMS deposits, as it is an excellent tool for modelling the contact surfaces between the sulphide mound, stockwork, and host rock. This inversion program models targets by inverting for the position of nodes in a wireframe, where there is a constant magnetic susceptibility contrast across the inverted surface. This is in contrast to the conventional inversion programs which invert for the target physical property value in each cell of a mesh, but the geometry of the mesh is held constant. These surfaces can then be used to calculate a volume for the ore located below the seafloor, constructing a better tonnage model for SMS deposits.