Gravity and magnetic prospecting for massive sulphide deposits

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Sulphide bodies have physical properties that generally contrast sharply with those of host rocks. Thus, they have considerable potential to generate significant anomalies, which are prime targets for exploration. In favourable circumstances, for example, where the bodies are close to the surface, of moderate dimensions and in a relatively homogeneous geological setting, such anomalies will be easily recognizable. Unfavourable conditions can make recognition difficult. Aside from outlining possible ore-related anomalies, gravity and magnetic data play two other important roles in mineral exploration: (1) they can be processed in a variety of ways to produce map images that assist lithological and struc-

tural mapping, and (2) they can be analyzed quantitatively to yield size and shape information in the third dimension. The short course will include an overview of the gravity and magnetic techniques in general, and a more specific examination of their roles in massive sulphide exploration. The following topics will be touched upon: map presentation of data, effects of data distribution and contouring interval, Bouguer and isostatic gravity maps, horizontal and vertical gradient maps, shaded relief maps, reduction to the magnetic pole, geological contact mapping, separation of regional and local anomalies, maximum depth formulae, mineralogical controls on gravity and magnetic anomalies, rock densities, magnetic susceptibilities, susceptibility and density mapping, induced and natural remanent magnetizations, gravity-magnetic signatures of ore bodies, estimation of ore reserves, development of magnetite in the ore-forming (massive sulphide) environment, magnetic properties of pyrrhotite, magnetic expression of alteration zones, magnetic signatures of subvolcanic sills. The course will present also an interactive demonstration of a 2½-dimensional gravity-magnetic modelling program, executable on a desktop computer. Gravity and magnetic anomalies will be modelled in real time to outline fundamental steps in developing a crustal section using available constraints, such as surface geology, borehole intersections and rock properties. Aspects of modelling relating to ambiguity and depth of burial will be examined.