Helicopter-Borne Magnetic Gradiometry for Mineral Exploration: Effects of System Movement in Flight

L. Upiter[1], S. Balch[2], C. Samson[1]
[1]Earth Science Department, Carleton University, Ottawa, ON, Canada; [2] Canadian Mining Geophysics Ltd, Rockwood, ON, Canada

Abstract

Magnetic gradiometry is a useful and cost-effective exploration tool for mapping geological structures. This study focuses on a coherent oscillating noise of ~0.3 Hz appearing in helicopter-borne triaxial magnetic gradiometric data, which is most evident when the system is flown over low signal areas. The goal is to characterize this noise, identify its source, and apply a correction so that subtle targets of economic interest are better resolved. Two datasets were examined, from Wawa, Ontario and Custer Ridge, British Columbia, initially flown as part of an exploration program for gold and porphyry deposits, respectively. Sensor noise was eliminated as a potential source as the amplitude was far too low to correlate. Translational movements of the system were also dismissed, as their frequencies did not correlate closely enough to the noise. Rotational movements (yaw, pitch and roll) have a frequency range similar to that of the noise but the source is likely due to vibrations related to the positioning of the tow cable attachment points. This mechanical noise is either affecting the gradiometric data directly or it is affecting the rotational movements, which are in turn influencing the gradients. This hypothesis will be further tested with a physical modification of the system. Regardless of its source, the noise can be attenuated mathematically by de-rotation and notch filtering.