Empirical Mode Decomposition (EMD) of Turner Valley Airborne Gravity Data in the Foothills of Alberta, Canada

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Abstract

Growing interest in airborne gravity surveys bring a need for a suitable processing technique to remove the overwhelming noise and to recover useful signals from the data. For this reason, we introduce in this work a newly developed method to process gravity data as an alternative to Fourier and wavelet based techniques. This new method is called the Empirical Mode Decomposition (EMD) and was developed by Dr. Norden E. Huang at the NASA Goddard Space Flight Center (Huang et al. 1998). The EMD method is different from the Fourier and wavelet transforms because it handles nonlinear and non-stationary signals.

The Fourier transform (FFT) is designed to work with linear and stationary signals. The wavelet transform, on the other hand, is well-suited to handle non-stationary data but, it is poor at processing nonlinear data. Additionally, the base functions used in FFT and wavelet methods are fixed, and do not necessarily match varying nature of signals and this will lead to the loss of some useful information in the signal. Since potential field data are in general nonlinear and non-stationary in nature, we expect limitations in processing the data using FFT or wavelet methods. This work applies the EMD technique to process potential field data using airborne gravity over the Turner Valley area in the foothills of Alberta, Canada (Fig.1) in order to improve noise removal and thereby enhance the gravity signal.