THE EGG, NOISE AND INVERSION IN GRAVITY GRADIOMETRY

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An accurate measurement of the gravity field of the earth has long been recognised as a useful way to help develop an understanding of the earth’s subsurface geology and structure. To be useful in developing this understanding, any measurement technique has to exhibit a good signal to noise ratio with respect to the relevant signal generated by the earth. Additionally, the ability to perform such a measurement from the air is considered to be crucial towards the widescale use of any such technique. The Exploration Gravity Gradiometer, the EGG, meets both these criteria, it is an airborne tool with exceptionally low noise. The circuits and principles of the EGG have been presented on an earlier occasion (SEG, San Antonio, 2001) so will be described only briefly here.

The goal of any survey using the EGG is to better understand the subsurface geology. Low noise instrumentation is of great importance but many other factors contribute and measuring one quantity in isolation is usually not enough. The key issue is therefore to understand the limitations set by the measurement and interpretation processes together and what other measurements might be needed in order to better predict the geology.

These issues are investigated by "flying" the EGG in a number of realistic model situations. These models illustrate what information is recoverable using instrumentation with a range of sensitivities. The analysis looks at the interpretation process for noisy data, the importance of the input model, what can be resolved, uniqueness and non uniqueness of the gravity field and how to assess the potential reality or trustworthiness of the "solution".