Evaluation of Electromagnetic Induction Sensor Noise Sources

B. Barrow, J.T. Miller, SAIC, Arlington, VA 22202
D.A. Steinhurst, Nova Research, Alexandria, VA 22308

INTRODUCTION
A number of commercial electromagnetic induction sensors (EM61 and GEM) have been used to evaluate the accuracy of static test bed and in-motion test sites in the collection, detection, and inversion of GEM3 signals.

The noise sources considered were external, inherent, static, and dynamic. The largest source of noise was determined to be due to field equipment vibrations and electromagnetic induction from currents. The data set was analyzed for trends in noise levels, and the noise was grouped into the four categories of noise sources.

Test Platforms

Sensors

Demonstration at Blossem Point Test Facility

Geolocation Error

EMI Response to Ground

Gem:

EM61 MkII:

Inherent Noise

Motion Induced Noise from OE6MX

Blossom Point Noise Budget

Monte Carlo Event Simulation Tool

Platform Characteristics - Lever Arm to GPS, Wheel Base

Man portable EM61 MkII Simulation Comparison to Field Results

Man portable EM61 MkII simulation comparison to platform design parameters

Man portable EM61 MkII simulation comparison of survey lane spacing

Man portable EM61 MkII simulation with field data, that does and does not account for sensor time response

• GPS coherence on not known
• Consistent track repeat
• Limited electromagnetic induction sensors
• Man portable EM61 MkII

• Large range varies
• Man portable EM61 MkII
• Man portable EM61 MkII

• GPS coherence on not known
• Consistent track repeat
• Limited electromagnetic induction sensors
• Man portable EM61 MkII

GEM: Convolves
- Changes in coil orientation relative to soil: magnetic field varies significantly in space (2D)
- Earth model: non-linear (3D)
- Far Field: 20 km (4D)
- Near Field: 1 km (5D)

EM61 MkII:

Motion Induced Noise from OE6MX

- Changes in coil orientation relative to soil: magnetic field varies significantly in space (2D)
- Earth model: non-linear (3D)
- Far Field: 20 km (4D)
- Near Field: 1 km (5D)

Monte Carlo Event Simulation Tool

- Sensor's motion can be predicted.
- The second limiting factor was location electromagnetic induction sensors (EM61 MkII and GEM-3) to evaluate
- Changes in coil orientation relative to soil: magnetic field varies significantly in space (2D)
- Earth model: non-linear (3D)
- Far Field: 20 km (4D)
- Near Field: 1 km (5D)