

Assessing the Accuracy of AEM Soundings

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A number of AEM surveys have been conducted for bathymetry by DSTO in recent years. Differences between the results such as 'maximum depth of investigation' are easy to determine on a qualitative basis by comparison of conductivity sections or layered-earth inversions for example. However, we feel that it is important to provide a quantitative assessment of the accuracy of AEM soundings, using statistical measures.

Three obvious output parameters come to mind on which to base these measures: First the consistency between altitude measurement and the predicted top of the seawater conductor, second the consistency and accuracy of seawater conductivity, and third the consistency between known bathymetry and the predicted depth of seawater from AEM. Two Dighem surveys of Sydney harbour have been used to evaluate this proposed methodology: an analog Dighem V survey conducted in 1998 with 3 horizontal coplanar and 2 vertical coaxial coils, and a recent survey in 2001 with the horizontal coplanar 5 frequency resistivity bird. Airborne laser depth and seaborne echo sounding data, with measured water conductivities provide comprehensive 'ground-truth' for the comparison of the two Dighem surveys.

Accuracy achieved depends on a number of factors including: conductivity and conductivity structure, AEM system signal/noise (temporally variable), system bandwidth, calibration and levelling, altimeter accuracy, system footprint, data processing and modelling. Conclusions drawn as to which system is 'more accurate' are of course a 'snapshot' and not necessarily applicable to other surveys or in other conditions. While this study is bathymetric, the methodology is applicable to other AEM applications, such as assessing calibration for conventional surveys.

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