# Comparison of 2D and 3D inversion of CSEM data acquired along a profile

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## SUMMARY

Marine controlled-source electromagnetic (CSEM) data acquisition along a profile is undertaken routinely, particularly in research-related studies. Furthermore, CSEM data acquisition procedures such as towed-streamer measure data along a profile. Since CSEM data show significant sensitivity to the subsurface below the profile; consequently, many researchers opt for 2-dimensional (2D) inversion. However, imaging the 3-dimensional (3D) conductivity variation demands a 3D inversion, which may be necessary for the complex subsurface. However, the 3D inversion causes over-parametrization of the inverse problem as the data is acquired along profile only. This study presents a comprehensive analysis of 2D and 3D inversion performance executed on data acquired along a profile. For example, the field condition may force a deviation of a profile from the straight line, therefore, the study investigates and compares how it impacts the performance of 2D and 3D inversion. Another important issue that is examined is how the off-profile resistive and conductive anomalies are mapped to the model space in both inversion algorithms. The analysis is done based on misfit convergence, inverted model and data fit, etc. To minimize the impact of the optimization method, both the 2D and 3D inversion algorithms employ a Gauss-Newton method where the regularised Hessian is solved iteratively using the conjugate gradient method. Furthermore, the same cooling-based approach is used for selecting the regularization parameter. Several synthetic and real field data inversion experiments are utilized for this comparative study.