# 3次元比抵抗構造インバージョンコードの開発

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# Numerical solver for inverse problems on the EM induction equations to infer the three-dimensional resistivity structure

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We developed a new numerical inverse solver to infer the three-dimensional (3-D) resistivity structure on EM induction equations.

There exists some inversion schemes to estimate three-dimensional resistivity structure. It, however, is still hard tasks to conduct the numerical calculations of 3-D inversions. In this study, we aim to develop a parallelized code to take much less CPU times.

In the forward parts, the contracting integral equation (CIE) schemes are adapted, which decreases drastically the condition number of the matrix of discrete EM induction equations and make much quicker for numerical results to converge enough.

To make faster and reduce the required computational memories, the spectral method on the horizontal direction and the variable separations on the vertical direction are adapted.

In the inverse parts, (non-linear) quasi-Newton method is adapted to avoid to calculate the huge Hessian matrix.

To realize the parallelized calculations, the EM induction problem is solved in each frequency or in each hyper-parameter on each parallelized thread.

In this presentation, the performance of our code will be shown in the detail and discussed carefully.