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Deep-towed marine DC resistivity survey has been developed recently to detect the shallow boundary roof of the electrically resistive gas-hydrate zone, which is not imaged well by seismic reflection surveys. Similar to the land DC resistivity, its response is the apparent resistivity as a function of electrode spacing which needs to be inverted in order to obtain a “true” resistivity structure. Here, we developed a two-dimensional inversion of marine DC resistivity survey based on the model space Occam’s inversion method. The finite-difference (FD) method is applied in the forward modeling calculation to solve potential difference between electrodes, which is later used to generate the apparent resistivity. The accuracy of the forward code was tested with various synthetic models. We found that our forward code produces the results as accurate as the analytical solution for layered Earth case, particularly when the sub-seafloor structure has high conductivity. For complicated structures, it produces the results similar to those from other forward codes.
For the inversion, we first started applying to the synthetic models consisting of layered Earth. The inversion spent about 2 iterations to converge from an initial RMS of around 19 to 1 RMS. The inverted model clearly image the shallower boundary of resistivity anomaly imbedded into the sub-seafloor structure. Our preliminary results imply that our developed inversion code is promising for the real surveys.

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