Application of Reverse Time Migration to Electromagnetic Data in the Fictitious Wave Domain

*Sajjad Amani[1], Hitoshi Mikada[1], Junichi Takekawa[1]

1. Kyoto University

Recently, deep reservoirs under gas clouds become possible targets in the oil industry. Since one of the main obstacles to develop them is strong attenuation of wave energy inside the gas clouds, it is important to extract signals come from target reservoir. In recent years, analytical transformation of the diffusive Maxwell’ s equation to the wave domain one could be a powerful tool to obtain seismic-like data in CSEM. Proposed advantages like higher sensitivity to the changes and lower CPU time, could make the solutions of Maxwell’ s equations in the fictitious domain more powerful for discovering the earth structures compared to the diffusive domain ones. So, it would be possible to monitor the deeper structures using the data set in the fictitious wave domain even under strong attenuating media assumption. In this study, we apply the Reverse Time Migration (RTM) imaging algorithm in the fictitious domain to investigate a deep reservoir in a conductive (attenuating) media. RTM exhibits a great ability in handling of the steeply dipping structures and complicated velocity models. We demonstrate the effectiveness of our approach using numerical experiments. Synthetic data set of CSEM is prepared by the finite-difference method. We use three types of received components for RTM; i) Ex (electric field in x-direction), ii) Ey (electric field in y-direction), iii) Hz (magnetic field in z-direction). The vertical and horizontal electric field of marine CSEM method are important because they respond to the edges of structure. The horizontal magnetic field response presents an additional and useful measurement for the marine CSEM method (Li and Constable, 2007). Each component has a distinctive characteristic. So, the effect of each component on the migration image is investigated and compared with each other.

Keywords: Maxwell’ s Equations, Reverse Time Migration, Diffusive Domain, Fictitious Wave Domain

