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An adaptive resolution FWI using a mesh-free finite-difference method

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We developed an adaptive resolution full-waveform inversion (FWI) using a mesh-free finite-difference method (MF-FDM). The conventional finite-different methods (FDMs) have been widely used to calculate full-waveform synthetic traces in FWI. Most of FDMs are based on the assumption of the regular alignment of computational grids. This causes the computational burdens if the analysis model includes large velocity contrast, e.g. salt dome model. We propose a strategy to use MF-FDM for reducing computational cost in simple and seamless manners. Since MF-FDM calculates full-waveform synthetic trace with irregular distribution of nodes, our strategy can arranges adaptive resolution nodes depend on the velocity structure, i.e. fine nodes are used only around low velocity zones. We investigate the effectiveness of the method using some numerical experiments. Our results indicate that the method can successfully reduce the computational cost in simple and seamless manners.

Keywords: full-waveform inversion, mesh-free finite-difference method, numerical simulation