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Imaging steep-dips by prestack reverse time migration

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Prestack depth migration such as reverse time migration (RTM) and Kirchhoff migration is widely used for imaging the complex subsurface structures. RTM is a method for imaging the subsurface using inner product of source wavefield extrapolation in forward and receiver wave-field extrapolation in backward. It is well known that RTM is better for preserving amplitudes and handling very steep-dips than Kirchhoff migration, though RTM needs heavy computational resources. In this study we applied the prestack RTM in order to image steep-dips structures from a seismic field data set which had acquired in offshore. Since preprocessed shot gathers and a velocity model are input data for RTM, we performed conventional data processing for enhancing S/N ratio and estimated a interval velocity model which were calculated from stack velocities. When we applied the prestack RTM, we use inner product of back-propagated wavefields and virtual sources. The backpropagated wavefields means receiver domain extrapolated wavefields in backward and the virtual sources are shot domain extrapolated wave fields in forward. For the receiver domain wavefield extrapolation, the observed wavefields were extrapolated backward to the subsurface in order to calculate back-propagated wave fields. For the shot domain wave field extrapolation, we used the virtual sources instead of partial derivative wavefields because of the heavy computing hours and disk storage problem. These two wavefields were calculated simultaneously after distributing tasks to every computing node. The size of estimated geological model is 40 km x 5 km with a grid size 25 m x 25 m. The results of prestack depth migration for each shot gather are sent to a master node and then we get a subsurface depth image in depth domain after summation of each single image gather. The result shows that clear steep-dips image in the lower part of right hand side which is not seen in stack image. Since the results of migration depend on the velocity model, the more we get correct velocity models, the more we can get correct subsurface images.