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Seismic Reverse Time Migration Using A New Wave-Field Extrapolator and a New Imaging Condition

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Abstract

Prestack reverse time migration (RTM), as a two way wave-field extrapolation method, can image steeply dipping structures without any dip limitation at the expense of potential increase in imaging artifacts. In this paper, an efficient symplectic scheme, called Leapfrog-Rapid Expansion Method (L-REM), is first introduced to extrapolate the wave-field and its derivative in the same time step with high accuracy and free numerical dispersion using a Ricker wavelet of a maximum frequency of 25 Hz. Afterwards, in order to suppress the artifacts as a characteristic of RTM, a new imaging condition based on Poynting vector and a type of weighting function is presented. The capability of the proposed new imaging condition is then tested on synthetic data. The obtained results indicate that the proposed imaging condition is able to suppress the RTM artifacts effectively. They also show the ability of the proposed approach for improving the amplitude and compensate for illumination.

Key words: RTM, Leapfrog-Rapid Expansion Method, Poynting vector, Imaging condition, artifacts.