Time domain wave equation imaging

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Abstract

Imaging with the wave equation has applications in seismics, medical ultrasound, nondestructive testing, and radar. We describe numerical methods based on the Kaczmarz procedure of computerized tomography. Rather than using linearizations such as Born we solve the fully nonlinear problem. It turns out that the decisive fact for the success or the method is the frequency content (signature) of the source wavelet. If frequencies close to zero are availabe, the process is always convergent. Otherwise, one needs transmission measurements or reflectors. We suggest highly efficient implementations by plane wave stacking.