

## **Autofocusing of wave fields**

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Imaging problems are of a "chicken and egg nature" because one must know the medium to propagate the waves back to reflection points, but it is exactly the medium that one hopes to retrieve from the imaging experiment. We show how ideas from inverse scattering theory can be modified to focus multiple reflected waves onto an imaging point without knowing the intervening medium. The iterative procedure we have developed requires (1) the reflected waves that are recorded at the boundary of the medium, and (2) the direct wave that propagates from the imaging point to all receivers. The algorithm, which collapses all multiply reflected waves onto the imaging point, is purely data driven. This means that the imaging process involves neither a model, nor modeling of waves through a model. It is possible to focus the wave field point-by-point, which makes it possible to carry out target-oriented imaging where one constructs the image only in the part of the model one is really interested in. The theoretical justification for this focusing method is rooted in representation theorems as used in seismic interferometry.