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A multi-scale approach to evolution equations with applications in wave-equation imaging and reflection tomography

Downward continuation based imaging and wave-equation reflection tomography can essentially be expressed in terms of solving particular evolution equations. The underlying model describes the single scattering of waves in a background medium. Here, we are concerned with developing a method that admits background media of limited smoothness, which leads to evolution equations generated by certain paradifferential operators. We develop a multi-scale approach derived from the construction of H. Smith (1998) to solving such evolution equations, while making use of solution representations based on wavepackets or the tight frame of curvelets and their interaction. We discuss results concerning the 'concentration' of curvelets. We also discuss computational aspects of the method that lead us to depart from the use of tight frames and their associated transforms.

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