AVO Modeling of Monochromatic Spherical Waves: Comparison to Band-Limited Waves

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Abstract/Excerpt

Monochromatic and band-limited spherical waves have differing reflection coefficient curves. To facilitate comparison, a new expression for monochromatic reflectivity is given in terms of a weighting function. The weighting function approach, developed previously for a specific class of band-limited spherical waves (Rayleigh filtered waves), shows explicitly how different plane waves contribute to a spherical-wave reflection coefficient. Direct comparison shows that monochromatic waves have oscillatory, non-decaying weighting functions, and thus sample a wide range of plane waves. In contrast, typical Rayleigh wavelets produce localized weighting functions. These two behaviors lead to reflection coefficient curves which differ beyond the critical angle. A bridge between these two behaviors is constructed by considering unusually narrow Rayleigh wavelets. These show intermediate properties. This study shows 1) a simple and convenient method for calculating monochromatic spherical-wave reflection coefficients, and 2) a clearer understanding of how spherical-wave reflection coefficients are created from constituent plane-waves.