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Effects of irregular topography in waveform inversion

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Seismic waveform modeling with irregular free surface topography is computationally very expensive, and topography usually cannot be included in seismic waveform inversion.

We investigate the impact of neglecting P scattering and conversions from topography on visco-acoustic waveform inversion using real and fully elastic synthetic data. Acoustic waveform kernels computed for a real survey with a RMS slope variation of 7.5% between receivers show predominant scattering effects, and they bear little resemblance to kernels without topography. The differences between these kernels vanish at long wavelengths, or when strong near-surface attenuation (Q <= 10) is taken into account. We expect to gain further insights on the effects of scattering and conversions at the surface comparing inversions of fully elastic synthetic data computed with and without topography. The quantification of such effects will help to constrain inversion strategies or experimental design for waveform tomography.