

# Ground Roll Removal and Signal Preservation by Cascading SVD Polarization Filters with Localized Fk-Filters

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## Abstract/Excerpt

The attenuation of surface wave energy, ground roll or Rayleigh waves in particular, is a challenging problem on many land datasets. Moreover, the current drive within the industry towards single sensor data acquisition, systems be it single component (1C) or multi component (3C), obviates the traditional benefit of receiver arrays for surface wave reduction. Single sensor acquisition systems are preferred over receiver array systems in areas where higher frequency content of the signal is demanded. 3C systems require single sensor acquisitions to avoid problems with array misalignments and S-wave statics.

Ground roll can be attenuated using a range of tools like f-k filters, fx deconvolution, slant stacking, polarization filtering and even band pass filtering. The reality is that many of these techniques often fail to sufficiently improve the data quality within the ground roll bandwidth ( $\approx 0$ -25 Hz.). This can happen due to a variety of reasons like inadequate geometries, aliasing, or backscattered and 'badly behaving' ground roll. Many processing flows in which true amplitude recovery is secondary to obtaining a good image therefore include one or more passes of a bandlimited and time-dependant amplitude scaling to downscale 'bursts' of high-energy noise. The downscaled residual ground roll noise will typically reappear after deconvolution, thus requiring a second pass of noise attenuation and/or spectral balancing. The end result is that not much usable low-frequency signal remains within the ground roll cone and that the amplitude properties of the remaining signal are unreliable.

This work presents the successful implementation of a cascaded processing flow that removes ground roll energy whilst preserving the underlying low frequency reflected signal. This flow combines polarization filtering and localized fk-filtering to remove the ground roll from the vertical component of a 2D 3C line. The flow excludes any form of adaptive amplitude scaling and aims to preserve true signal amplitudes.