Interferometric interpolation of missing seismic data

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SUMMARY

We present an interferometric interpolation method for filling in trace gaps in common shot gathers. There are two steps for implementation: first, virtual traces are created in the trace gaps by cross-correlation of recorded traces in a shot gather followed by summation of correlated trace pairs over all shot positions; secondly, a 1-D matching filter is applied to the predicted events to correct for the wavelet and amplitude distortions. By using a 1-D assumption (assuming a layered medium around the midpoint in a common midpoint gather), the interferometric interpolation method can be applied to common midpoint gathers.

It is a fully data driven method that does not require any other information except the original data. Results with both synthetic and field data empirically show that the near-offset traces can be interpolated, but due to the approximations introduced by a limited recording aperture, there are still some artifacts.

Based on this method, we also introduce water-layer model based Green functions, which enable us to interpolate arbitrary traces in a 2D acquisition line.