1. INTRODUCTION

- Seismic reflection surveys useful for imaging subsurface.
- Surface waves (ground-roll) dominate the reflection data and mask the reflection events, when source and receivers are at ground.
- Seismic interferometry is a data-driven method that can remove the surface waves from this data.
- Signals at two receivers are cross-correlated and summed over sources to obtain the “virtual” (interferometric) signal between the receivers.
- The interferometric signal is composed almost entirely of surface waves and can be “subtracted” from the original reflection data.

2. METHODOLOGY

Synthetic data of complex 2-D anelastic medium considered, comprising vertical velocities at 101 receivers (R₁, R₂, ..., R₁₀₁) due to 17 sources (S₁, S₂, ..., S₁₇).

Procedure to remove ground-roll from source S₅ reflection data at receiver R₅₀:

1. Obtain interferometric signals \(x_{1,50}, x_{2,50}, \ldots, x_{101,50}\) between receiver pairs (\(R₁,R₅₀\), \(R₂,R₅₀\), ..., \(R₁₀₁,R₅₀\)), respectively.
2. De-cross-correlate signals recorded at \(R₁, R₂, \ldots, R₁₀₁\) (due to source \(S₅\)) from interferometric signals \(x_{1,50}, x_{2,50}, \ldots, x_{101,50}\), respectively, to obtain 101 estimates of ground-roll at receiver \(R₅₀\) (due to source \(S₅\)): \(h_{1,50}, h_{2,50}, \ldots, h_{101,50}\).
3. Proposed estimate of ground-roll at \(R₅₀\) = Average of \(h_{1,50}, h_{2,50}, \ldots, h_{101,50}\).
4. Algebraically subtract estimated ground-roll from the original data at \(R₅₀\).

Similar procedure applicable to other source-receiver pairs.

3. RESULTS

- Raw signal is dominated by surface wave.
- Amplitude of surface wave is an order of magnitude higher than that of reflected waves.
- The direct and reflected waves are well-preserved in the filtered signal.

4. CONCLUSIONS AND FURTHER WORK

For the considered 2-D medium:

- Proposed interferometric technique removes surface waves effectively.
- Reflection data of multiple receivers used in an unbiased manner.
- Technique is completely data-driven.

Proposed technique needs to be tested against real land-seismic data.