

A 2D full-waveform inversion using trench-deployed surface and VSP DAS data acquired at the CMC Newell County Facility

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- Multi-step multiscale surface-wave FWI
- VSP FWI
- Application to DAS data at CaMI FRS

#### Multi-step multiscale surface-wave FWI

#### Features of surface wave



**Snapshots** 

Seismic record

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## Wulti-step multiscale surface-wave FWI



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## VSP FWI

True Vp Initial Vp Inverted Vp - 3500 - 3500 (m) 100 Debth (m) 150 200 (m) 100 (m) 150 200 (j) 100 (j) 150 200 - 3000 - 3000 - 2500 '⊡ 2000 m/s .\_\_ 2000 m/s Distance (m) Distance (m) Distance (m) m/s **Initial Vs Inverted Vs** True Vs - 2000 - 1800 - 1800 (E) 100 the 150 200 (m) 100 -150 -200 -(m) 100 the 150 200 - 1600 200 -- 1400 250 -250 -300 · - 1200 m/s Distance (m) m/s Distance (m) Distance (m) m/s



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# Contraction to DAS data at CaMI FRS

### Geometry





### 3 Application to DAS data at CaMI FRS



## Application to DAS data at CaMI FRS

#### Linear-sweep DAS data



## Contemporation to DAS data at CaMI FRS

#### Low-dwell-sweep DAS data



## **V** Application to DAS data at CaMI FRS

## Linear sweep wavelet $\sum_{20} \times 10^{30}$



## **V** Application to DAS data at CaMI FRS



### 3 Application to DAS data at CaMI FRS

#### Data conversion

$$v_{x} = \frac{du_{x}}{dt} = U(-i\omega) \exp\left[-i\omega\left(t - \frac{x}{c}\right)\right],$$
$$\varepsilon_{xx} = \frac{\partial u_{x}}{\partial x} = \frac{\dot{u}_{x}dt}{dx} = \pm \frac{\dot{u}_{x}}{c}, \quad \text{Daley et al. (2016)}$$

Trace No.



Original data



Converted data



Trace comparison

### Contemporation to DAS data at CaMI FRS

### Filtering and denoising



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- We conducted surface-wave FWI using multistep multiscale strategy to invert Vs and provide initial Vs model for VSP FWI.
- We conducted VSP FWI to invert Vp and improved the imaging resolution.
- We applied these on DAS data collected from trenchdeployed and well-deployed fiber. Both the Vs and Vp profiles of the near surface were obtained.



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