Information:

The CUSSO Dataset is an experimental surface wave dataset collected near seismic station CUSSO located approximately 11 km southwest of Hickman, Kentucky. Figure 1 includes the general layout of the array positions. Table 1 and Table 2 include the coordinates for all geophone and broadband seismometers, respectively. The dataset contains the following information:

(a) **P-wave Refraction linear-array data**:

Data Format – Time histories in Seg2 (.dat) format
Receivers – 24 vertical 4.5-Hz geophones (Geospace Technologies GS-11D installed in PC21 land case) coupled to the ground surface (grass) with a 7.6-cm spike. All sensors were spaced at an equal interval of 2 m (total array length of 46 m). The coordinates for the beginning and ending of this array can be found in Table 1 in the "Active Array" rows.
Source – Sledgehammer (5.5 kg) blows were made on a square aluminum strike-plate (20 x 20 cm) with overlying rubber damping pad. The source was positioned at a source-offset distances of -2-m. The source was not "reversed" by striking at the opposite end of the array. For each source-offset location, 10 distinct blows with the sledgehammer were recorded and stacked/averaged.
Acquisition System – A 24-channel Geode seismographs manufactured by Geometrics (24 bit ADC, 144 dB dynamic range, zero hardware gain and 90 dB anti-alias filters). Output units are in seismograph units.
Acquisition Parameters – 8000 Hz sampling rate with 2-second long records (block-size of 16000 points). A contact-trigger on the sledgehammer was used to initiate recording. A pre-trigger delay of 0.25 sec was used.
Data Description – Files are organized by shot location. Save 1 = -2 m offset. For the Seg2 files, all data is formatted in accordance with the standard Seg2 data format.

(b) **Active-source Rayleigh linear-array data**:

Data Format – Time histories in Seg2 (.dat) format
Receivers – 24 vertical 4.5-Hz geophones (Geospace Technologies GS-11D installed in PC21 land case) coupled to the ground surface (grass) with a 7.6-cm spike. All sensors were spaced at an equal interval of 2 m (total array length of 46 m). The coordinates for the beginning and ending of this array can be found in Table 1 in the "Active Array" rows.
Source – Sledgehammer (5.5 kg) blows were made on a square aluminum strike-plate (20 x 20 cm) with overlying rubber damping pad. The source was positioned at four different "shot" locations relative to the first geophone in the array; namely, source-offset distances of -5-m, -10-m, -20-m and -40-m. The source was not "reversed" by striking at the opposite end of the array. For each source-offset location, 10 distinct blows with the sledgehammer were recorded and stacked/averaged.
Acquisition System – A 24-channel Geode seismographs manufactured by Geometrics (24 bit ADC, 144 dB dynamic range, zero hardware gain and 90 dB anti-alias filters). Output units are in seismograph units.
Acquisition Parameters – 250 Hz sampling rate with 4-second long records (block-size of 1000 points). A contact-trigger on the sledgehammer was used to initiate recording. No pre-trigger delay was used.

Data Description – Files are organized by shot location. Save 2 = -5 m offset, Save 3 = -10 m offset, Save 4 = -20 m offset, and Save 5 = -40 m offset. For the Seg2 files, all data is formatted in accordance with the standard Seg2 data format.

(c) **Active-source Love linear-array data**:

Data Format – Time histories in Seg2 (.dat) format

Receivers – 24 Horizontal 4.5-Hz geophones (Geospace Technologies GS-11D installed in PC804 land case) coupled to the ground surface (grass) with a 7.6-cm spike. All sensors were spaced at an equal interval of 2 m (total array length of 46 m). The coordinates for the beginning and ending of this array can be found in Table 1 in the "Active Array" rows.

Source – Sledgehammer (5.5 kg) blows were made on a square aluminum strike-plate (20 x 20 cm) with overlying rubber damping pad. The source was positioned at four different "shot" locations relative to the first geophone in the array; namely, source-offset distances of -5-m, -10-m, -20-m and -40-m. The source was not "reversed" by striking at the opposite end of the array. For each source-offset location, 10 distinct blows with the sledgehammer were recorded and stacked/averaged.

Acquisition System – A 24-channel Geode seismographs manufactured by Geometrics (24 bit ADC, 144 dB dynamic range, zero hardware gain and 90 dB anti-alias filters). Output units are in seismograph units.

Acquisition Parameters – 250 Hz sampling rate with 4-second long records (block-size of 1000 points). A contact-trigger on the sledgehammer was used to initiate recording. No pre-trigger delay was used.

Data Description – Files are organized by shot location. Save 6 = -5 m offset, Save 7 = -10 m offset, Save 8 = -20 m offset, and Save 9 = -40 m offset. For the Seg2 files, all data is formatted in accordance with the standard Seg2 data format.

(d) **Ambient-wavefield (microtremor) L-array data**:

Data Format – Time histories are in Seg2 (.seg2) format

Receivers – 24 vertical 4.5-Hz geophones (Geospace Technologies GS-11D installed in PC21 land case) coupled to the ground surface (grass) with a 7.6-cm spike. All sensors were spaced at an equal interval of 5 m to create a near equal length L-array (size 60 m x 55 m). The coordinates for the beginning and ending of this array can be found in Table 1 in the "Passive L-Array" rows.

Source – Ambient-wavefield (microtremors).

Acquisition System – A 24-channel Geode seismographs manufactured by Geometrics (24 bit ADC, 144 dB dynamic range, zero hardware gain and 90 dB anti-alias filters). Output units are in seismograph units.

Acquisition Parameters – 125 Hz sampling rate with 60-second long records (block-size of 7500 points). 60 individual 60-second time histories are provided.

Data Description – For Seg2 files, results are organized based on incremental save number (10-69). For the Seg2 files, all data is formatted in accordance with the standard Seg2 data format.

(e) **Ambient-wavefield (microtremor) circular-array data**:

Data Format – Time histories in Miniseed format

Receivers – 9 three-component broadband (100 Hz – 20 seconds) seismometers (Nanometrics Inc. Trillium Compacts) oriented to magnetic north, placed on a leveling cradle and careful leveled. The sensors were placed in three concentric circular arrays with approximate diameters of 50 m, 200 m and 500 m. The data for each circular array was recorded separately using eight receivers on the perimeter of the circle and one receiver at the center. Receiver coordinates are provided for each sensor in each array in Table 2.

Source – Ambient-wavefield (microtremors).

Acquisition Systems –Nanometrics Inc. Centaur digitizers (24 bit ADC, 141 dB dynamic range and internal clock and GPS receiver accurate to <100 μsec). Outputs units are in counts.

Acquisition Parameters – 200 Hz sampling rate with approximately 4-hour long time records for the 500-m diameter array, approximately 1-hour long time records for the 200-m diameter array, and approximately 1-hour 20-minute long time records for the 50-m diameter array. All sensors were allowed to "settle" for at least 5 minutes prior to acquisition of the data provided for analysis.

Data Description –For the Miniseed data, files are named based on Station name, Array, component, and year and day of recording (i.e., AR.STN01.A1.HNE.2018.298 is Station 1, Array A (500-m diameter), East component, and recorded in 2018 on the 298th day of the year). Files are formatted in standard Miniseed format.
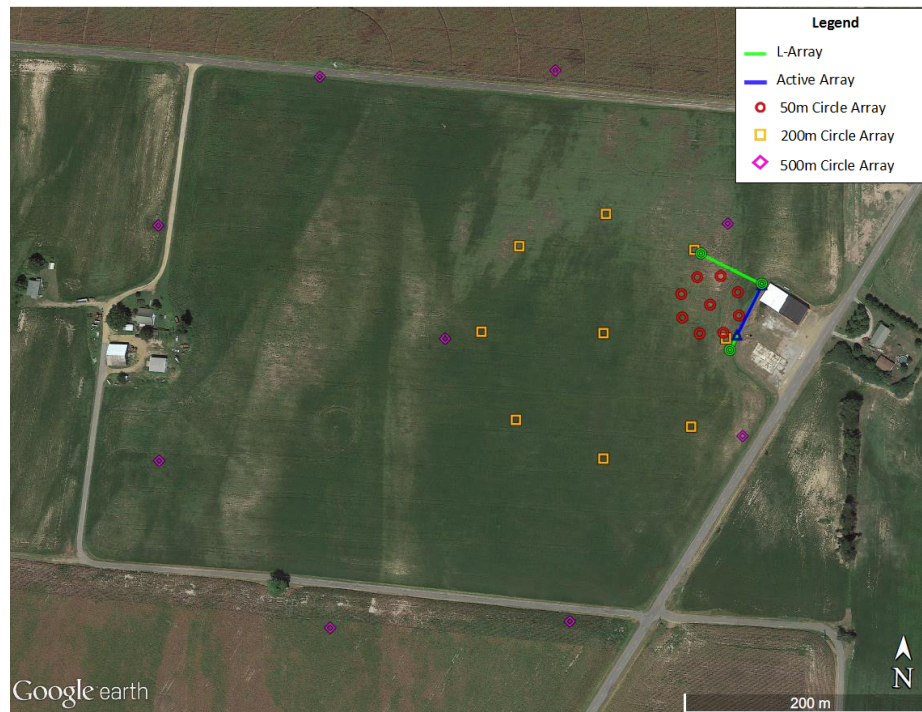

Figure 1: Site plan for CUSSO showing active linear array for MASW, and passive 2D L-array and circular arrays for Microtremor Array Measurements (MAM). 24, 4.5 Hz geophones were used for the active MASW and L-array, whereas the circular MAM used nine broadband three component seismometers.

Table 1: Coordinates for active array and L-array.

Array Type	Point Name	Latitude (⁰)	Longitude (⁰)
Active	Live End	36.552200	-89.329852
	Dead End	36.552571	-89.329632
Passive L-Array	Live End	36.552087	-89.329916
	Corner	36.552576	-89.329634
	Dead end	36.552790	-89.330187

Table 2: Coordinates for seismometers used in 50 m, 200 m, and 500 m circular array.

Array Size	Sensor Number	Latitude (⁰)	Longitude (⁰)
50 m	Center/A9	36.552414	-89.330099
	A1	36.552511	-89.329848
	A2	36.552340	-89.329836
	A3	36.552212	-89.329977
	A4	36.552201	-89.330191
	A5	36.552315	-89.330350
	A6	36.552488	-89.330362
	A7	36.552615	-89.330218
	A8	36.552626	-89.330005
200 m	Center / B9	36.552189	-89.331064
	B1	36.552815	-89.330249
	B2	36.552171	-89.329952
	B3	36.551525	-89.330260
	B4	36.551280	-89.331048
	B5	36.551544	-89.331844
	B6	36.552179	-89.332173
	B7	36.552813	-89.331846
	B8	36.553066	-89.331060
500 m	Center / C9	36.552121	-89.332499
	C1	36.554120	-89.331547
	C2	36.553013	-89.329944
	C3	36.551466	-89.329792
	C4	36.550113	-89.331323
	C5	36.550028	-89.333460
	C6	36.551189	-89.335039
	C7	36.552902	-89.335133
	C8	36.554036	-89.333712