1. SAVANT/UIUCAerosolLidar/Final data

2. Dataset Author(s)

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3. Time of Interest

1	09/23/2018 23:02:49 – 09/24/2018 00:33:47
2	09/29/2018 22:06:50 – 09/30/2018 01:24:46
3	10/12/2018 01:29:27 – 10/12/2018 06:57:19
4	10/15/2018 23:49:12 – 10/16/2018 06:28:06
5	10/18/2018 00:48:38 – 10/18/2018 07:58:5
6	10/23/2018 23:21:42 – 10/24/2018 07:16:37
7	10/27/2018 18:18:36 – 10/27/2018 23:23:19
8	10/29/2018 18:53:32 – 10/30/2018 00:46:14
9	11/02/2018 16:58:03 – 11/03/2018 06:56:15
10	11/07/2018 21:24:25 – 11/07/2018 23:38:54
11	11/10/2018 17:20:01 – 11/10/2018 20:20:57
12	11/11/2018 19:01:09 – 11/11/2018 23:18:20
13	11/14/2018 01:05:55 – 11/14/2018 07:41:01

4. Area of Interest

The experiment location is on Crowley Rd, Mahomet Township, IL 61853.
The lidar location from September 15th to October 14th was 40° 12’ 34” N 88° 24’ 21” W (Figures 1 and 2).
The laser head was pointed in the NEE direction (pointing to 40° 12’ 37.23” N 88° 24’ 14.27” W, the intersection of the main and feeder gullies when the azimuth angle of the laser head was 0 degrees).

The woodboard supporting the lidar is 31 cm tall from the ground surface; lidar is 1.8 m tall from the woodboard.

Figure 1. Lidar setup from September 15th to October 14th, 2018

From October 15 2018:
The UIUC aerosol lidar was moved to 40°12'35.97"N, 88°24'16.03"W. The laser head was pointed in the NEE direction, pointing to 40° 12’ 37.23” N 88° 24’ 14.27” W (the intersection of the main and feeder gullies) when the azimuth angle of the laser head was 110 degrees; When the azimuth angle was110 degrees and the zenith angle was -0.6 degrees, the laser touched the ground at 40° 12’ 37.23” N 88° 24’ 14.27” W.

Figure 2. Lidar locations before and from October 15th , 2018. Blue arrow: pointing to the intersection of the main and feeder gullies when the azimuth angle of the laser head was 110 degrees (intersection: 40° 12’ 37.23” N 88° 24’ 14.27” W) on or after October 15th.

The woodboard supporting the lidar was 7.4 degrees down from horizontal toward the main gully direction (blue arrow direction), and 0.2 degrees down in the west direction (Figures 2, 3 and 4).

Figure 3. Lidar setup from October 15, 2018 and onwards. Blue arrow: pointing to the intersection of the main and feeder gullies when the azimuth angle of the laser head was 110 degrees(intersection: 40° 12’ 37.23” N 88° 24’ 14.27” W).

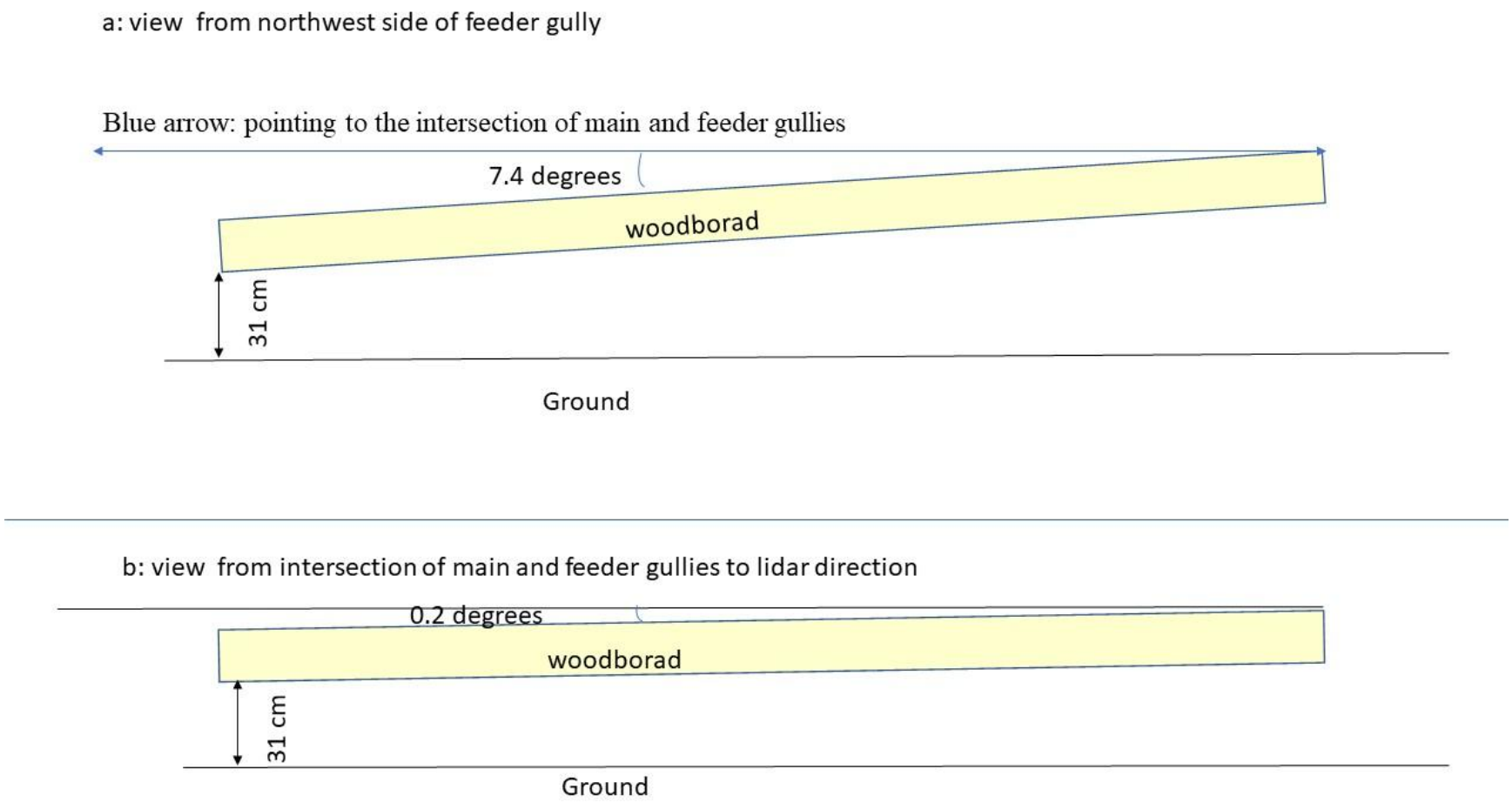

Figure 4, Woodboard setup.

5. Data Frequency

Log Interval (mm:ss): 00:04

6. Data Spatial Type
Each backscatter file represents 2-D raw scanning backscatter value.
Binary Data Files
Scalar data.

7. General Dataset Description
Lidar model: LR111-ESS-D200 Raman Depolarization LIDAR From Raymetrics company in Greece

The lidar measured a backscatter of aerosol in the air.
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The dataset includes the binary data on the experiment date of 09/23/2018-09/24/2018, 09/29/2018-09/30/2018, 10/11/2018-10/12/2018, 10/15/2018-10/16/2018, 10/17/2018-10/18/2018, 10/23/2018-10/24/2018, 10/27/2018, 10/29/2018-10/30/2018, 11/02/2018-11/03/2018, 11/07/2018-11/08/2018, 11/10/2018, 11/11/2018-11/12/2018, and 11/13/2018-11/14/2018.

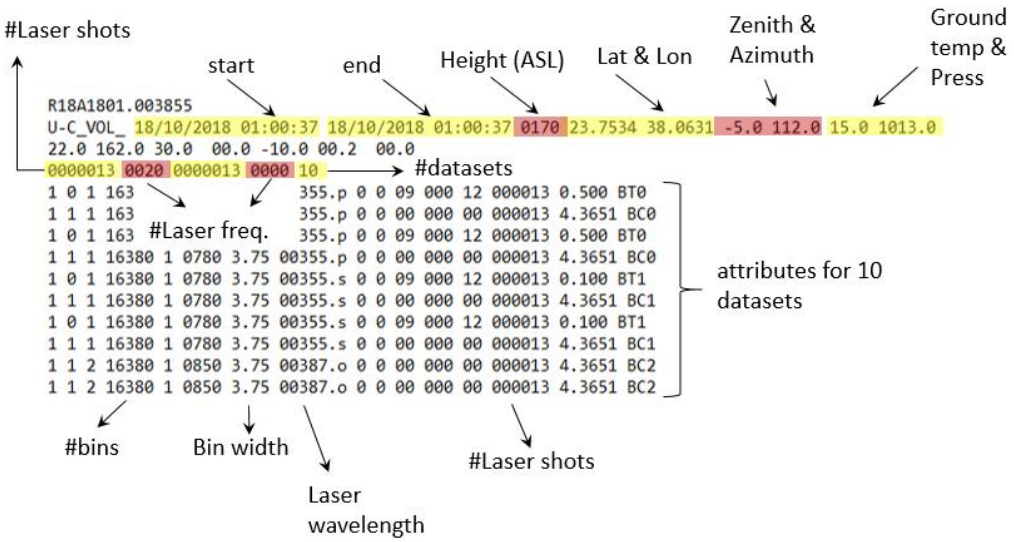
There are two types of scanning modes. The main scanning mode is RHI(Range-Height Indicator), and the other scanning mode is PPI(Plan Position Indicator).

Example data file name:
R1892323.091335

File name explanation: R: Raymetrics (lidar company name), ##:year (18:2018 in this example file name), #: month (9: September; if it is a letter, A represents October and B November), ##:date (23 in this example),##:hour (23 in this example), ##: minute (09 in this example), ####:seconds (1335 is 13.35” in this example)

Scanning Data structure:

The data file format is a mixed ASCII-binary format where the first lines describe the measurement situation; below follows the dataset description and then the raw data itself as 32-bit integer values. Sample header information of RAW datafile (can be opened with any text editor) from LiDAR is shown below:



The first line contains the measurement's name which is exactly the same as the file name, as explained above.

The second line contains more information about the location, start and stop time and the external conditions.

- Location String with 8 Letters
- Start Time dd/mm/yyyy hh:mm:ss
- Stop Time dd/mm/yyyy hh:mm:ss
- Height asl. four digits (meter)
- Longitude four digits (including - sign). One digit for decimal grades.
- Latitude four digits (including - sign). One digit for decimal grades.
- Zenith angle two digits in degrees of this scan
- Azimuth angle two digits in degrees of this scan
- Ground Temperature (Celsius)
- Ground Pressure (hPa)

The third line contains the information of scanning scheme for all the scanned files:

- Start scanning azimuth angle (22.0° in this example)
- End scanning azimuth angle (162.0°)
- Scanning azimuth angle interval (30.0°)
- Start scanning zenith angle (00.0°)
- End scanning azimuth angle (-10.0°)
- Scanning azimuth angle interval (00.2°)

The fourth line contains information about the laser.

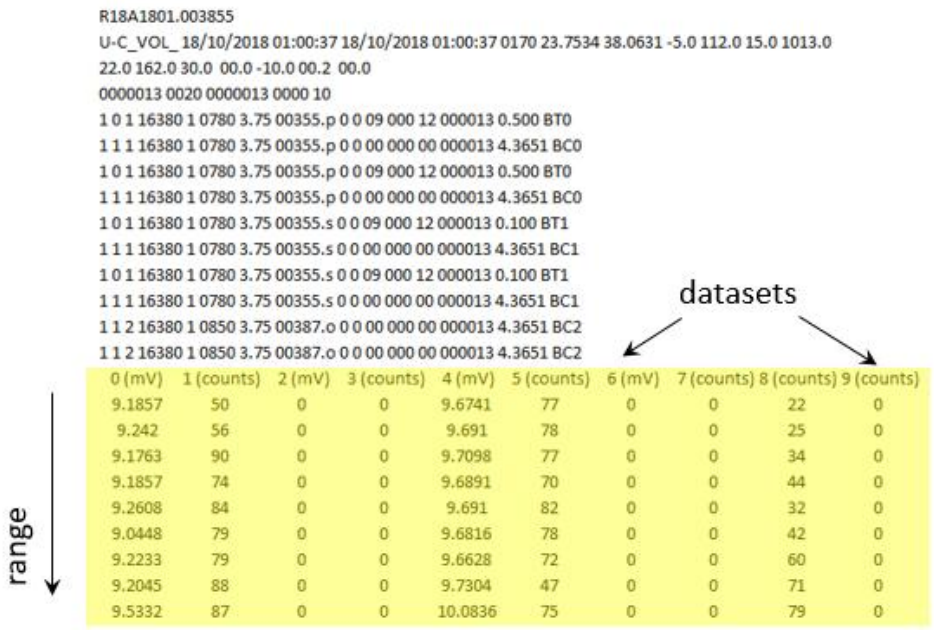
- Laser 1 number of shots integer 7 digits (how many laser shots were averaged in one profile)
- Pulse repetition frequency for Laser 1 integer 4 digits (Usually 10 or 20)
- Laser 2 Number of shots integer 7 digits
- Pulse repetition frequency for Laser 2 integer 4 digits
- number of datasets in the file integer 2 digits

The next lines that are in ASCII format are the dataset description. The parameters are divided by a space.

- 1 digit integer: 1 if dataset is present, 0 otherwise
- 1 digit integer: 0 for Analogue / Photon counting, 1 for Photon counting
- 1 digit integer: 1 for Laser source 1, 2 for Laser source 2.
- 5 digits integer: Number of bins (example 16,300 x 3.75m each bin = 61,125m)
- 1 digit integer: N/A
- 4 digits integer: PMT High Voltage in volts
- 2 digit real with 2 decimal: Bin width in meters
- String with 5 digits: Laser wavelength in nm
- dot and letter: Polarization, o _ no polarization, s _ perpendicular, p _ parallel
- 0 0 00 000 backward compatibility
- 2 digits integer: number of ADC bits in case of an analogue dataset, otherwise 0
- 6 digits integer: number of shots
- 1 digit real with 3 decimal: input range in mVolt in case of analogue dataset,
- discriminator level in case of photon counting.
- String with 2 letters: Dataset descriptor BT=analogue dataset, BC=photon counting
- And one hexadecimal number: the Transient Recorder number.

The dataset description is followed by an extra CRLF. The datasets are 32bit integer values. Datasets are separated by CRLF. The last dataset is followed by a CRLF. These CRLF are used as markers and can be used as check points for file integrity.

The RAW data files can be converted to ASCII format. A sample data after converting RAW files to ASCII is shown below. Each column corresponds to each line of above mentioned description.
For example, 0 (mv) column corresponds to the first line of description: 1 0 1 163…..BT0.



0 (mV)	1 (counts)	2 (mV)	3 (counts)	4 (mV)	5 (counts)	6 (mV)	7 (counts)	8 (counts)	9 (counts)
9.1857	50	0	0	9.6741	77	0	0	22	0
9.242	56	0	0	9.691	78	0	0	25	0
9.1763	90	0	0	9.7098	77	0	0	34	0
9.1857	74	0	0	9.6891	70	0	0	44	0
9.2608	84	0	0	9.691	82	0	0	32	0
9.0448	79	0	0	9.6816	78	0	0	42	0
9.2233	79	0	0	9.6628	72	0	0	60	0
9.2045	88	0	0	9.7304	47	0	0	71	0
9.5332	87	0	0	10.0836	75	0	0	79	0

3D_1.ini file structure (ASCII): scanning scheme file

[Scanning] comment: scanning scheme
Shots = 5 comment: 5 shots per profile
Type of Grouping = 0 comment: type of grouping
Azimuth Offset = 0.000000
AIA = 17.900000 comment: start azimuth scanning angle
AFA = 17.900000 comment: end azimuth angle
AS = 0.000000 comment: azimuth scanning increment interval
AE = "" comment: excluded azimuth range
ZIA = 0.000000 comment: zenith start angle
ZFA = -10.000000 comment: zenith end angle
ZS = 0.100000 comment: zenith scanning increment interval
ZE = "" comment: excluded zenith range

[MulitScanns] comment: multiple scans
Multi = 0 comment: multiple scanning type
#Scanns = 1 comment: number of scanning repetition

Temp.dat

This file contains scanning information for data processing software packages from Raymetrics company.

8. File Names

List names of files transferred:

See details in file folders.

9. Data Restrictions

None

10. Digital Object Identifier (DOI)

The DOI for this dataset is **https://doi.org/10.26023/K47H-XYE9-JJ0N** .

11. GCMD Keywords

AEROSOL BACKSCATTER