Data Format Documentation

Instrument: Two-dimensional video disdrometer (2dvd), MC3E Field Campaign

The 2dvd data set is contained within daily tar archives. The daily archive is named with the following convention,

<p style="text-align:center">2dvd_[sn]_mc3e_[latitude_longitude]_[date].tar</p>

where [sn] = serial number of 2dvd instrument (e.g., sn35)
        [latitude_longitude]=geographic location of instrument
        (e.g., N363442.07_W0972640.90 is North 36°34'42.07 " and West
        97°26'40.90")
        [date] = YYYYmmDD (e.g., 20110422)

and consists of ASCII files containing information on each hydrometeor sampled as well as drop size distribution and integral rainfall parameters (e.g., reflectivity, rain rate, mean diameter, etc.).

The following files are contained within the tar archive:

- *_drops.txt: ASCII file containing information on individual hydrometeors
- *_largeDrops.txt: ASCII file containing information on individual hydrometeors with diameters exceeding 5mm.
- *_dsd.txt: quality-controlled drop size distribution (based on measured fall velocities) for each 0.2 mm diameter bin from 0.0 to10.0mm each minute hydrometeors were detected (see Appendix).
- *_dsd_vT.txt: quality-controlled drop size distribution (based on terminal fall velocities) for each 0.2 mm diameter bin from 0.0 to10.0mm each minute hydrometeors were detected (see Appendix).
- *_rainParams.txt: quality-controlled integrated rainfall parameters (based on measured fall velocities) for each minute hydrometeors were detected
- *_rainParams_vT.txt: quality-controlled integrated rainfall parameters (based on terminal fall velocities) for each minute hydrometeors were detected

An additional 2dvd data set, not contained within a daily tar archive but with a similar file naming convention, provides a summary of the rainfall events for the entire campaign.

- *_raintable.txt: quality-controlled total rainfall measured for a continuous period of precipication (i.e., events separated by ≥ 1 hr of rain-free periods). Events less than 3 minutes in duration or rain totals less than 0.1 mm are excluded.

Format of each file in 2dvd data set:

Level 2: drop-by-drop files (*_drops.txt)

Format: ASCII

Format of each line:
HH:mm:SS.ms, equivalent diameter (mm), volume (mm^3), fallspeed[#] (m/s), oblateness[#], cross-sectional area (mm^2), height in Camera A (mm), height in Camera B (mm) , width in Camera A (mm), width in Camera B (mm), minimum pixel shawdowed in A (pixel location), maximum pixel shadowed in A (pixel location), minimum pixel shawdowed in B (pixel location), maximum pixel shadowed in B (pixel location)

Note: Both A & B Cameras contain 632 pixels.

[#]*Precise measurement of oblatness and fall speed was not achieved due to severe wind conditions and instrument calibration impractically unable to perform after each rainfall event.*

Level 3 data processing methods:

1) Particles larger than 10.0 mm in diameter are classified as non-precipitation and are excluded from this processing
2) Drops exceeding 50% of their terminal fall speed (Gunn and Kinzer 1949) are removed to eliminate spurious measurements (e.g., splash drops, insects, etc.). This is similar to the threshold used by Tokay et al. (2001) and Jaffrain and Berne (2011).
3) Rainy minutes with fewer than 10 drops at a rainfall rate of 0.01 mm/hr are removed to eliminate noise.

Note: The integration period begins at the minute specified in each line

Level 3: drop size distribution (DSD) files (*_dsd.txt, *_dsd_vT.txt)

Format: ASCII

Format of each line:
year, day of year, hour, minute, drop_concentration ($m^{-3}mm^{-1}$) in each of the 0.2 mm evenly-spaced diameter bins from 0.0 to 10.0 mm

Level 3: Integral rain parameters (*_rainParams.txt, *_rainParams_vT.txt)

Format: ASCII

Format of each line:
year, day of year, hour, minute, total number of drops, total drop concentration (m^{-3}), liquid water content (g m^{-3}), rain rate (mm h^{-1}), reflectivity in Rayleigh regime (dBZ), mean mass-weighted diameter (mm), maximum drop diameter (mm), minimum drop diameter (mm), standard devation of the mass-weighted diameter (mm)

Level 3: raintable files

Format: ASCII

Format of each line:
year, day of year precipitation begins, beginning of precipitation (HH:MM), day of year precipitation ends, ending of precipitation (HH:MM), duration of rainfall (minutes), event maximum rainfall rate (mm/hr), event rainfall total (mm)

References:

Beard, K. V., 1976: Terminal velocity and shape of cloud and precipitation drops aloft. *J. Atmos. Sci.*, **33**, 851–864.

Gunn, R. and G. D. Kinzer. 1949. The terminal velocity of fall for water drops in stagnant air. *J. Meteor.*, **6**, 243–248.

Jaffrain, Joël, Alexis Berne, 2011: Experimental quantification of the sampling uncertainty associated with measurements from PARSIVEL Disdrometers. *J. Hydrometeor*, **12**, 352–370.

Tokay, A., A. Kruger, and W. Krajewski, 2001: Comparison of drop size distribution measurements by impact and optical disdrometers. *J. Appl. Meteor.*, **40,** 2083–2097.

APPENDIX

Diameter bin definition and corresponding terminal velocity used in dsd files:

Diameter (mm)	Bin Width (mm)	Terminal Velocity (m/s)
0.1	0.2	0.248
0.3	0.2	1.144
0.5	0.2	2.018
0.7	0.2	2.858
0.9	0.2	3.649
1.1	0.2	4.349
1.3	0.2	4.916
1.5	0.2	5.424
1.7	0.2	5.892
1.9	0.2	6.324
2.1	0.2	6.721
2.3	0.2	7.084
2.5	0.2	7.411
2.7	0.2	7.703
2.9	0.2	7.961
3.1	0.2	8.187
3.3	0.2	8.382
3.5	0.2	8.548
3.7	0.2	8.688
3.9	0.2	8.805
4.1	0.2	8.900
4.3	0.2	8.977
4.5	0.2	9.038
4.7	0.2	9.084
4.9	0.2	9.118
5.1	0.2	9.143
5.3	0.2	9.159
5.5	0.2	9.169
5.7	0.2	9.174
5.9	0.2	9.175
6.1	0.2	9.385
6.3	0.2	9.415
6.5	0.2	9.442
6.7	0.2	9.465
6.9	0.2	9.486
7.1	0.2	9.505
7.3	0.2	9.521
7.5	0.2	9.536
7.7	0.2	9.549
7.9	0.2	9.560
8.1	0.2	9.570

Diameter (mm)	Bin Width (mm)	Terminal Velocity (m/s)
8.3	0.2	9.570
8.5	0.2	9.570
8.7	0.2	9.570
8.9	0.2	9.570
9.1	0.2	9.570
9.3	0.2	9.570
9.5	0.2	9.570
9.7	0.2	9.570
9.9	0.2	9.570