ACTRIS

CCRES

« Hands-on training » on the monitoring of stability of DCR reflectivity using disdrometers

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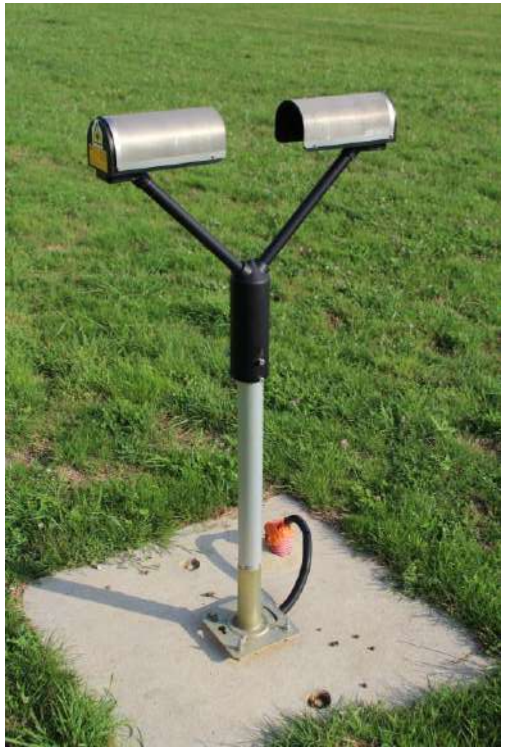
Plan

1. Technical set-up requirement for Doppler Cloud Radar, DisDrometer and Weather Station ;
2. Acquisition / configuration requirement for DCR, DD and WS ;
3. Local storage at NF and transfer to Central CLU Data Center ;
4. Formating and resampling of raw datasets into one netcdf file in CLU DC ;
5. Good event criteria for DCR calibration constant monitoring
6. Examples of NRT QL
7. Examples of long time series
8. Examples of statistics

DisDrometer (DD) set-up.
NF requirement

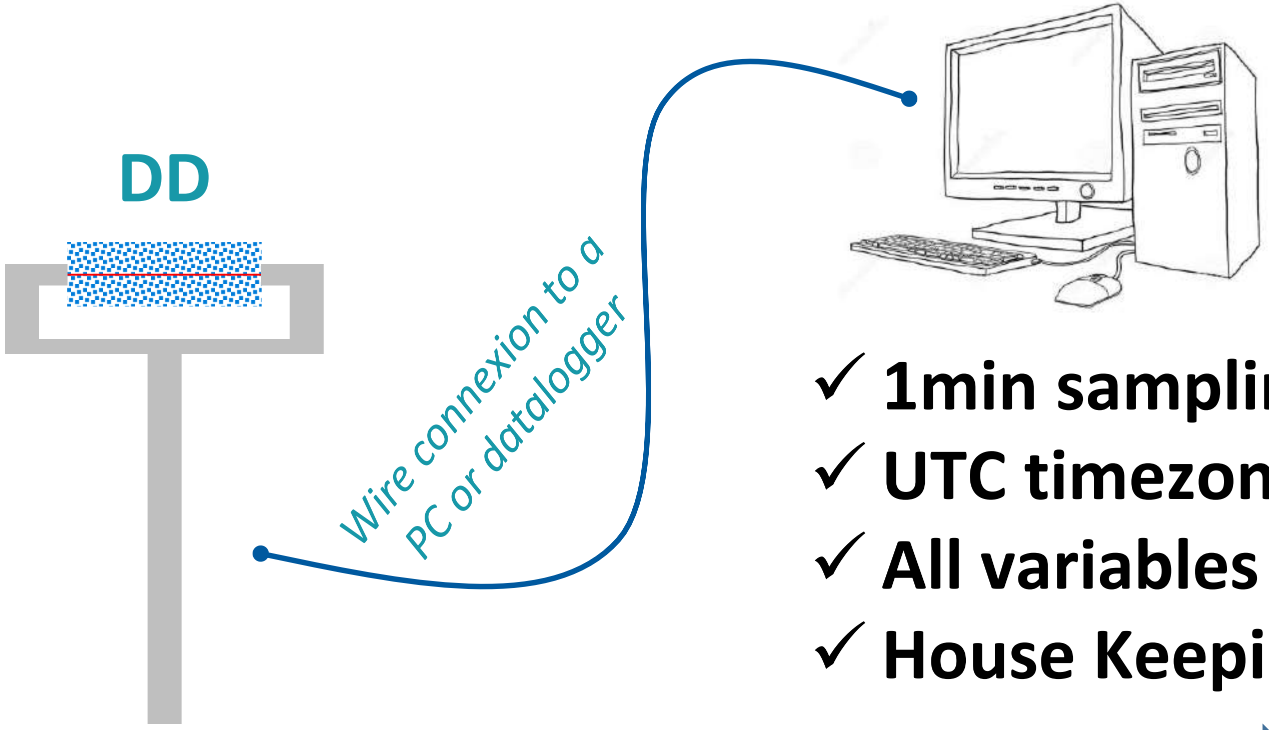
Instrumental set-up



- ✓ Open view without obstacle that can modify drop fall velocity and dynamics (building, trees for ex.)
- ✓ Stable, solid and easily accessible installation area
- ✓ Collocation between each sensor for
  - horizontal distance < 70m
  - altitude difference < 50m
- ✓ Vertical mount to have horizontal laser beam
- ✓ Horizontal laser beam perpendicular to the most frequently wind direction

https://docs.google.com/document/d/1VOidswiZXha-PbaBg2IBRn9zIS1n0grn/edit?usp=sharing&ouid=105609349844014987218&rtpof=true&sd=true

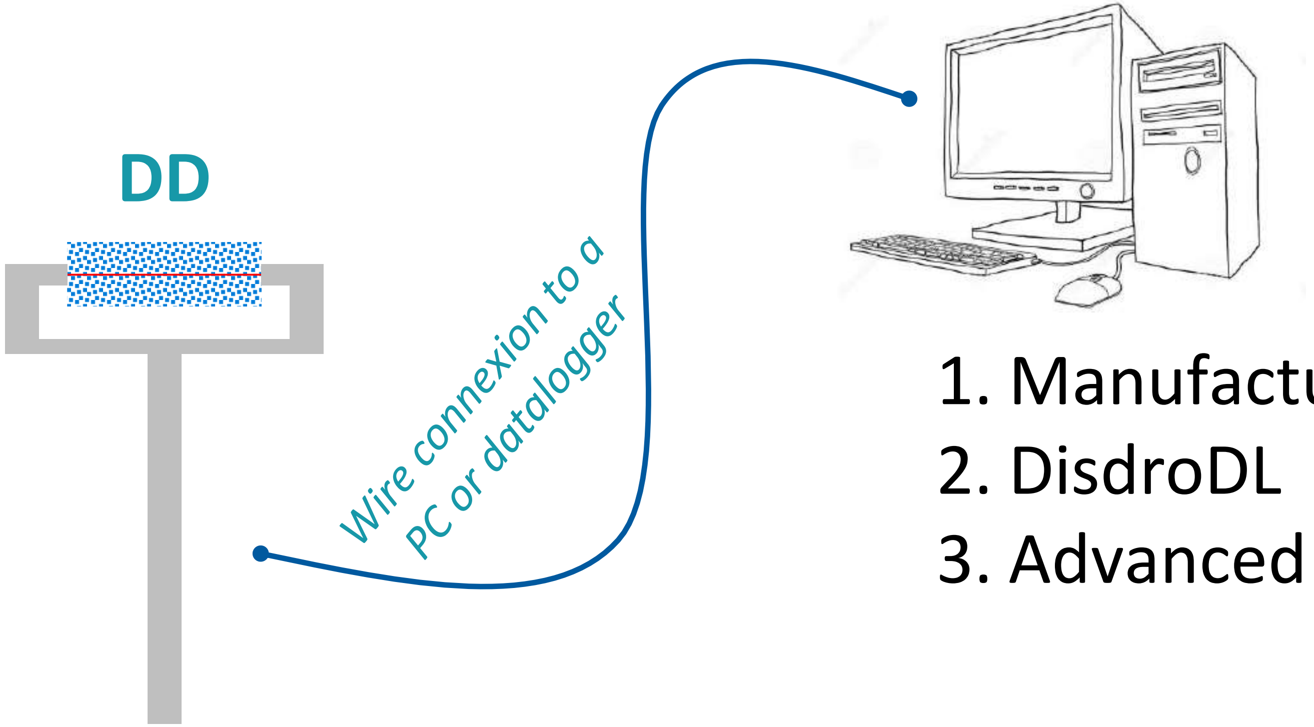
DisDrometer (DD) acquisition / configuration. NF requirement



- ✓ 1min sampling
- ✓ UTC timezone
- ✓ All variables
- ✓ House Keeping Data / Status

3 Acquisition methods

DisDrometer (DD) acquisition / configuration. NF requirement

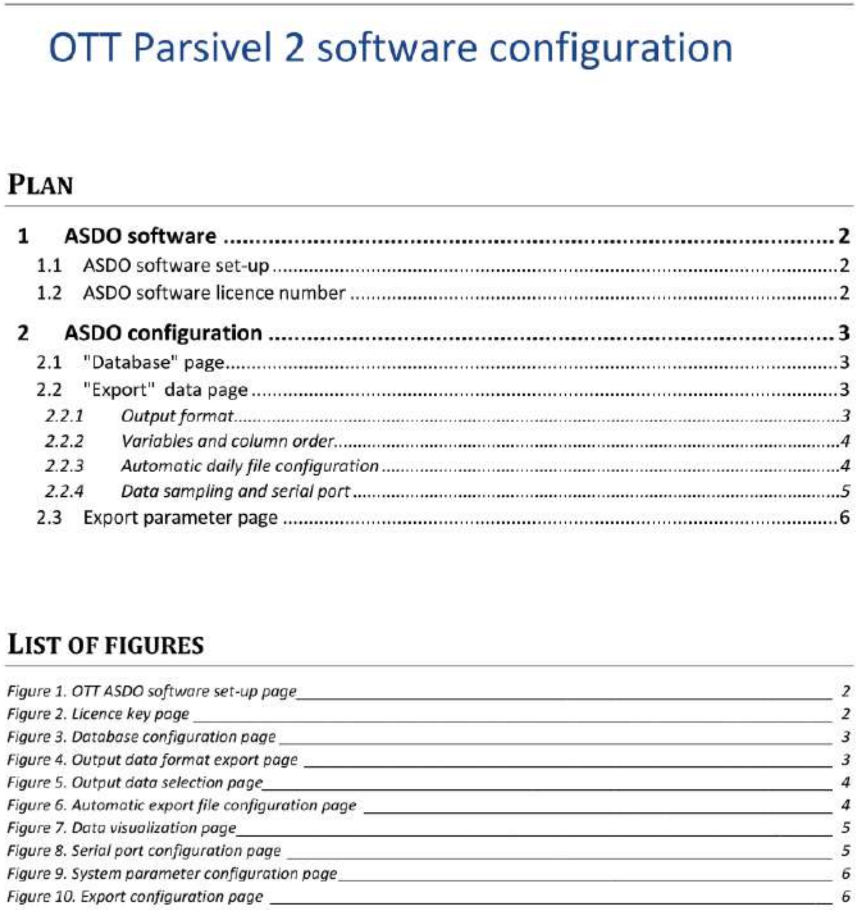


3 Acquisition methods

1. Manufacturer software
2. DisdroDL
3. Advanced Serial Data Software

DisDrometer (DD) acquisition / configuration.
1. Manufacturer software, OTT (Jean-Charles)

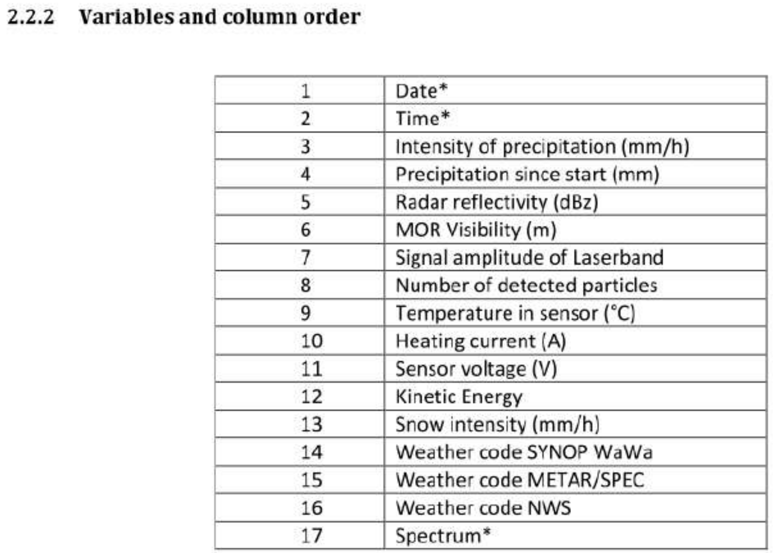
https://intranet.actris.eu/index.php/apps/files/?dir=/CCRES/4.%20Quality%20Assurance/Disdrometer&fileid=55461



OTT Parsivel 2 software configuration

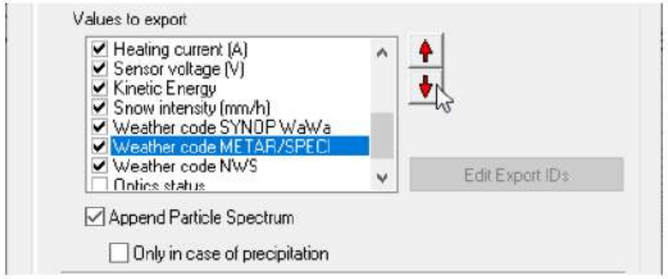
PLAN

LIST OF FIGURES



2.2.2 Variables and column order

1	Date*
2	Time*
3	Intensity of precipitation (mm/h)
4	Precipitation since start (mm)
5	Radar reflectivity (dBz)
6	MOR Visibility (m)
7	Signal amplitude of Laserband
8	Number of detected particles
9	Temperature in sensor (°C)
10	Heating current (A)
11	Sensor voltage (V)
12	Kinetic Energy
13	Snow intensity (mm/h)
14	Weather code SYNOP WaWa
15	Weather code METAR/SPEC
16	Weather code NWS
17	Spectrum*



Values to export

- ☑ Heating current (A)
- ☑ Sensor voltage (V)
- ☑ Kinetic Energy
- ☑ Snow intensity (mm/h)
- ☑ Weather code SYNOP WaWa
- ☑ Weather code METAR/SPECI
- ☑ Weather code NWS
- ☐ Optics status

☑ Append Particle Spectrum

☐ Only in case of precipitation

Figure 5. Output data selection page

DisDrometer (DD) acquisition / configuration.
2. DisdroDL (Marc)

Marc feeling for today concerning DisdrDL

DisdroDL software developed by the students is not really suitable for ACTRIS because

1) it is too complicated,
2) not well-documented enough
3) requires some "middle man" in the form of an Open Balena server which needs to be configured and maintained. We are seriously considering moving away from this in favor of a much simpler Python logging script package.

That being said, DisdroDL is not dead and André has some great ideas for how to develop an open, simple to use tool that we can share with others

DisDrometer (DD) acquisition / configuration.
3. Advanced Serial Data Software (Lukas)

UoC’s low cost version for Disdrometer data recording (Windows)

- Modification of the Disdrometer cable
- USB connection to a PC / separate power plug
- Data recording using the software ‘Advanced Serial Data’ (ASD)
- ASD writes TXT-files that are CLU conform

- **Works for both Disdrometers: OTT Parsival² and Thiess**

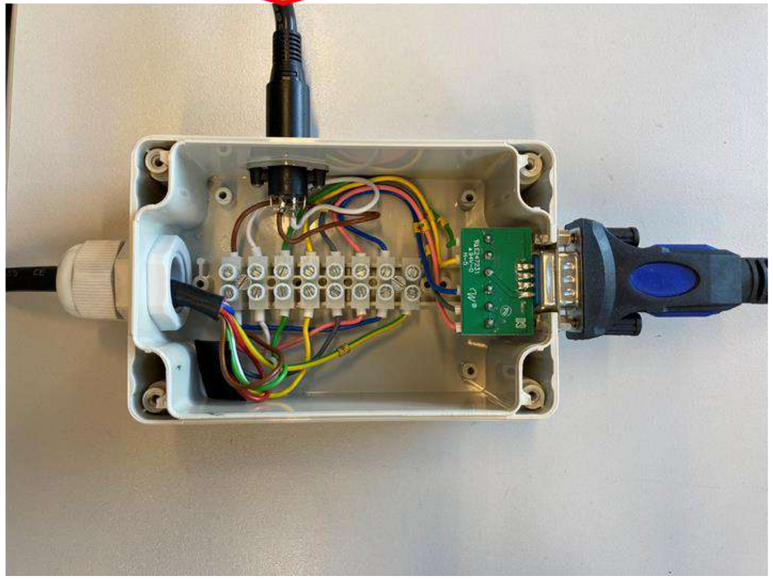
DisDrometer (DD) acquisition / configuration.
3. Advanced Serial Data Software

Modifying the cable connection (∼100 €)

- Split the caballing into power supply and data flow
  - Splitter of Serial cable into USB data flow and power supply
  - Housing for the splitter
  - USB cable
  - Power supply cable > 100W
  - Some hours of work
  - Solution not lighning save

24V power adaptor

Disdrometer Serial 422



USB cable for PC Serial 485

DisDrometer (DD) acquisition / configuration.
3. Advanced Serial Data Software

Communication with the Disdrometer (Win)

- Connection to the Disdrometer, e.g., the hTerm-software
- Disdrometer settings changed to:
  - 60s sampling interval
  - Set a Disdrometer/station name
  - And select right variable set up to be recorded

Example OTT Parsical[2]: (See manual section 11.2 for further explanations)

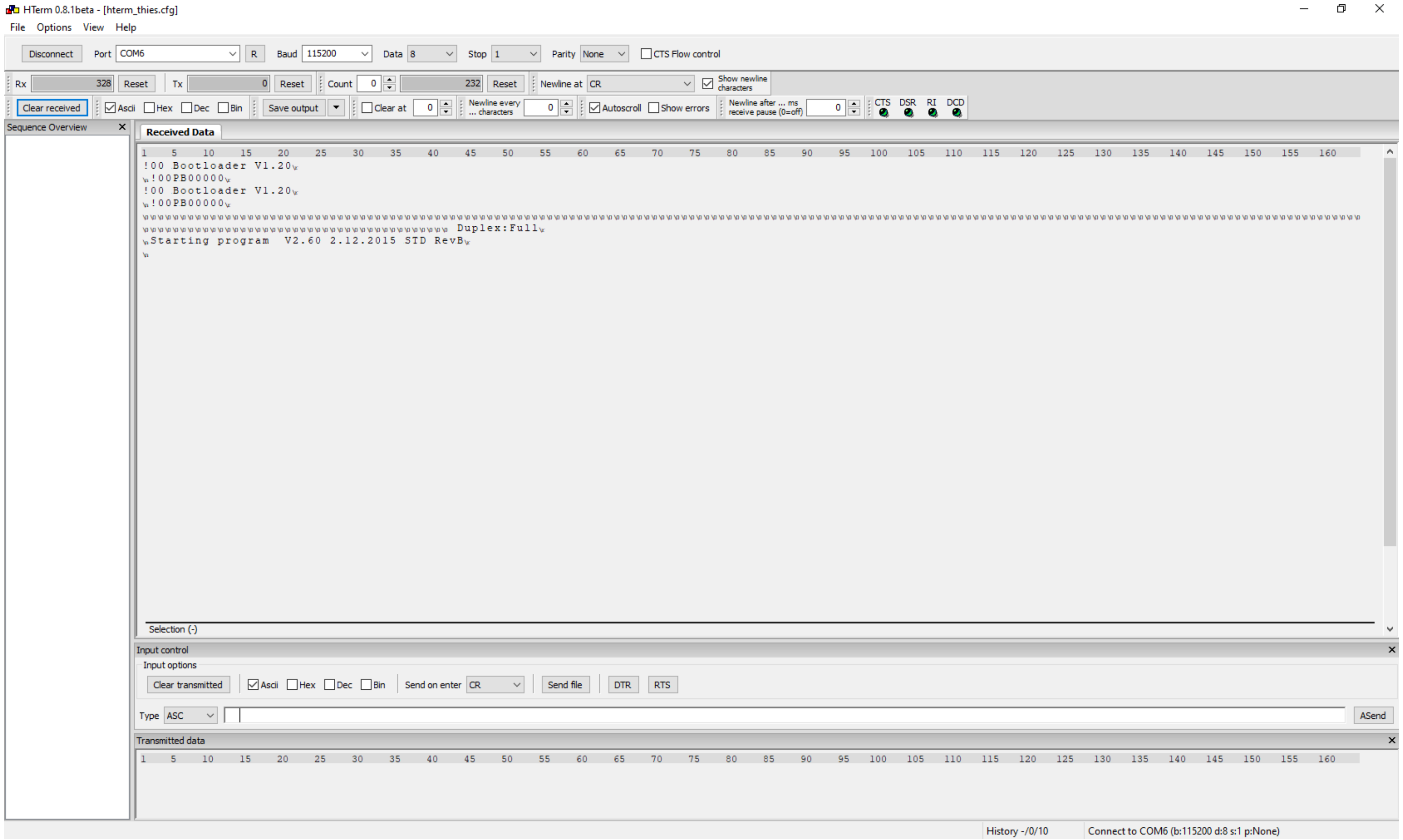
```
cs/m/s/%01;%02;%03;%07;%08;%09;%10;%11;%12;%13;%14;%16;%17;%18;
%22;%24;%25;%90;%91;%93/r/n<CR>
```

- Data recording is done via the ASD-software

-> Recording based on PC-time so the PC time must set to UTC

DisDrometer (DD) acquisition / configuration.
3. Advanced Serial Data Software

Communication with the Disdrometer (Win)



Port COM6 · Baud 115200 · Data 8 · Stop 1 · Parity None · □ CTS Flow control

Rx 328 · Tx 0 · Count 0 · 232 · Newline at CR · ☑ Show newline characters

☑ Ascii □ Hex □ Dec □ Bin · □ Clear at 0 · Newline every … characters 0 · ☑ Autoscroll □ Show errors · Newline after … ms receive pause (0=off) 0

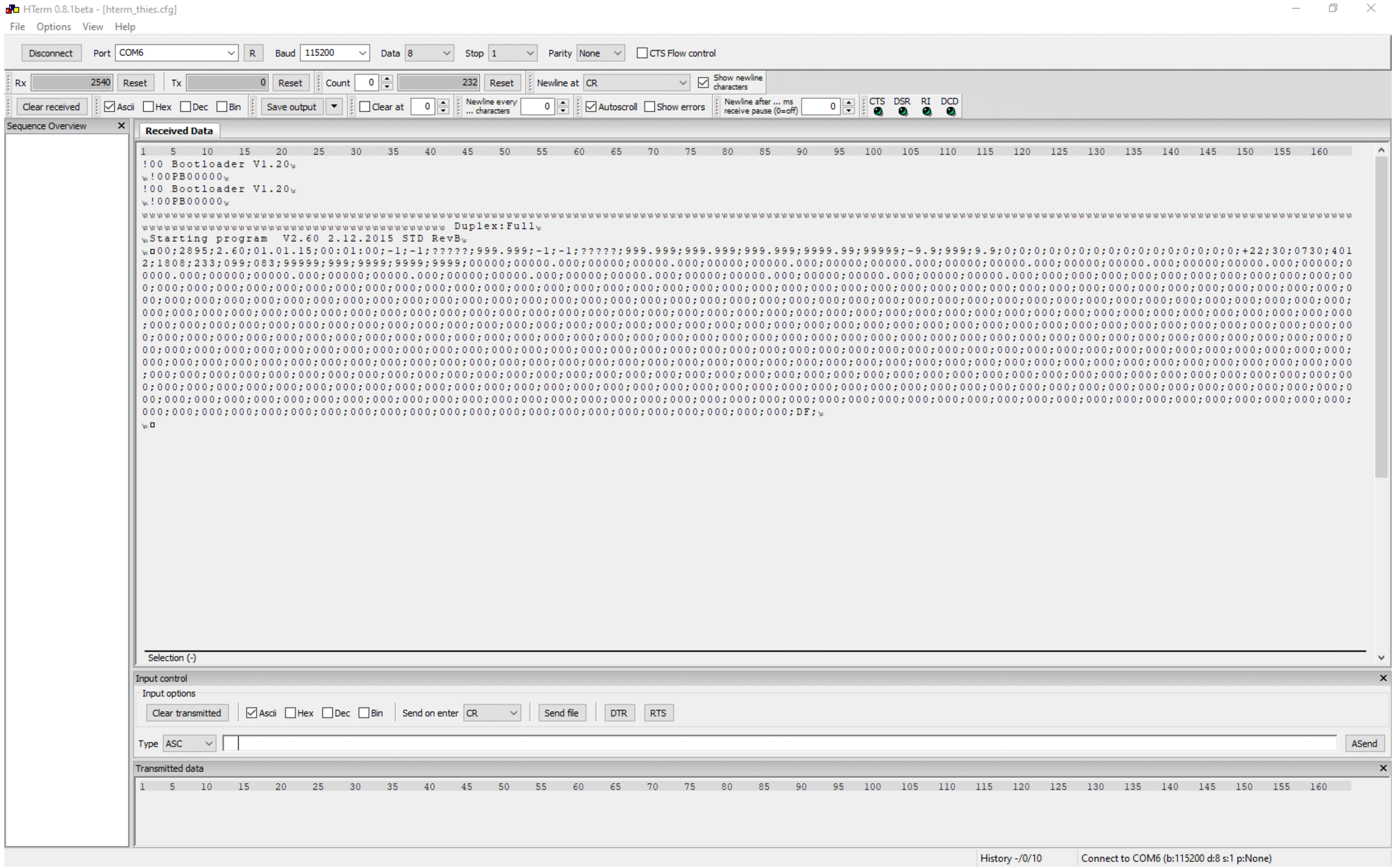
```
!00 Bootloader V1.20
!00PB00000
!00 Bootloader V1.20
!00PB00000

 Duplex:Full
Starting program  V2.60 2.12.2015 STD RevB
```

☑ Ascii □ Hex □ Dec □ Bin · Send on enter CR · Type ASC

History -/0/10 · Connect to COM6 (b:115200 d:8 s:1 p:None)

DisDrometer (DD) acquisition / configuration.
3. Advanced Serial Data Software

Communication with the Disdrometer (Win)



Port COM6 · Baud 115200 · Data 8 · Stop 1 · Parity None · ☐ CTS Flow control

Rx 2540 · Tx 0 · Count 0 · 232 · Newline at CR · ☑ Show newline characters

☑ Ascii ☐ Hex ☐ Dec ☐ Bin · ☐ Clear at 0 · Newline every ... characters 0 · ☑ Autoscroll ☐ Show errors · Newline after ... ms receive pause (0=off) 0

```
!00 Bootloader V1.20\r
\n!00PB00000\r
!00 Bootloader V1.20\r
\n!00PB00000\r
\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n
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\nStarting program  V2.60 2.12.2015 STD RevB\r
\n□00;2895;2.60;01.01.15;00:01:00;-1;-1;?????;999.999;-1;-1;?????;999.999;999.999;999.999;9999.99;99999;-9.9;999;9.9;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;+22;30;0730;401
2;1808;233;099;083;99999;999;9999;9999;9999;00000;00000.000;00000;00000.000;00000;00000.000;00000;00000.000;00000;00000.000;00000;00000.000;00000;00000.000;00000;0
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000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;000;DF;\r
\n□
```

☑ Ascii ☐ Hex ☐ Dec ☐ Bin · Send on enter CR · Type ASC

History -/0/10 · Connect to COM6 (b:115200 d:8 s:1 p:None)

DisDrometer (DD) acquisition / configuration.
3. Advanced Serial Data Software

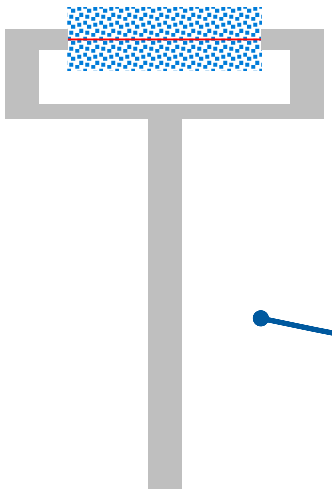
Data writing with ASD-software (~100 €)

- Connection to the Disdrometer, e.g., the hTerm-software
- Disdrometer settings changed

- Data recording is done via the ASD-software
  - Recording based on PC-time so the PC time must set to UTC
  - Configuration of the ASD can be done manually or you use a config-file and adjust the COM port
- ASD writes daily *.TXT files
- Python codes convert the TXT-files to NC-files (done at CLU)
- Using a Laptop secures the operations during power failures in combination with USV!

DisDrometer (DD) set-up and acquisition. NF requirement

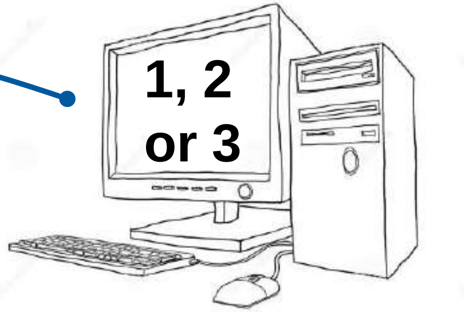
Set-up



Follow the SOP

Wire connexion to a PC or datalogger

Acquisition



Acquisition methods

Three options

1. Manufacturer software
2. DisdroDL
3. Advanced Serial Data Software

Recording

Output data

L0 DD ascii file

- UTC
- 1min
- All technical variables (HKD)
- All geophysical variables (PSD, FV RR)

DisDrometer (DD) calibration

- Work to be done
- First discussions last wednesday with Gionata (EPSL), last Friday with Yves-Alain Roulet (meteoswiss) and yesterday with Renaud Matthey (unibe, here in person)
- European project has just finished with lot of recommandations here : https://www.meteomet.org/incipit/
- Some results are very promising :
  - Drop generator and disdro present very good agreement inside laboratory
  - Outside comparisons present more discrepancies

- Which strategy do we recommend :
  - Have **mobile & reference DD** that we deploy on the NF sites ?
  - Have **fixe & reference DD** installed on a reference site where we deploy the NF DD ?

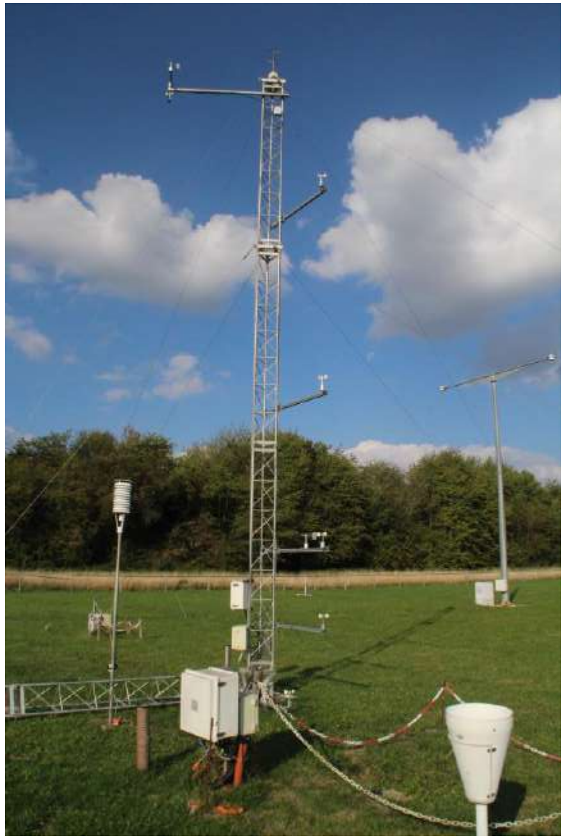
Take home message for disdrometer

- **Instrumental / technical set-up** : follow the SOP requirement available on the CCRES web site (distance, orientation, axe)
- **Main configuration rules** : 1min sampling, UTC time zone, record all the variables + status
- **Acquisition modes** : either manufacturer software or ASD software to record real-time data in ascii file.
- **Calibration** : to be discussed rapidly to give recommandation in some months.

- **Contacts** : Jean-Charles, Lukas, Gionata, Marc.

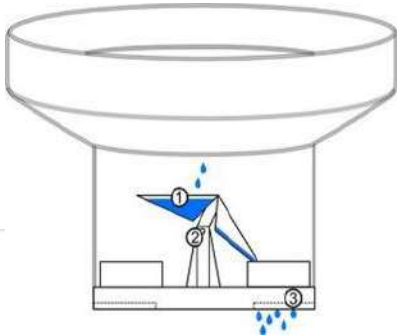
Weather Station (WS) set-up.
NF requirement

Instrumental set-up



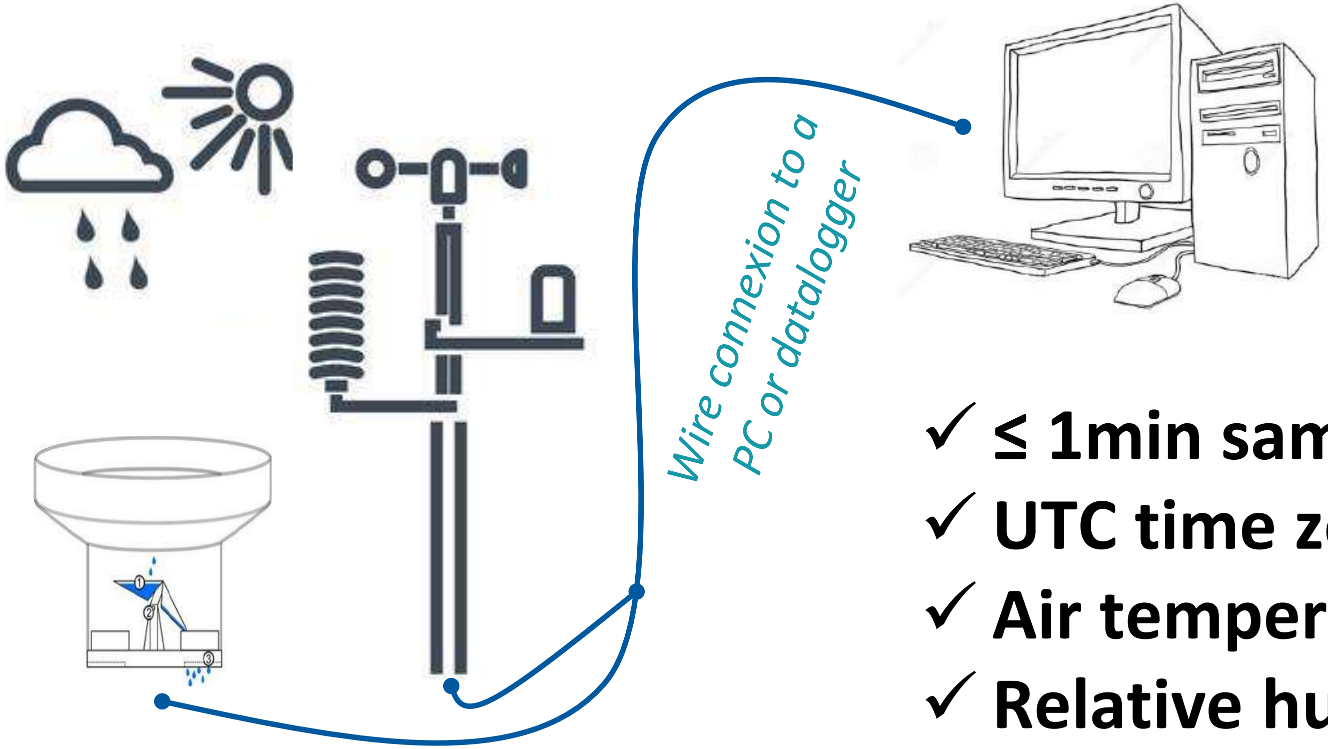
✓ Open view without obstacle (building, trees for ex.)
✓ Stable, solid and easily accessible installation area
✓ Collocation between each sensor for
- horizontal distance < 70m
- altitude difference < 50m

✓ Tipping bucket rain gauge (0.1-0.2mm accuracy) calibrated every 6-month by Met-Office
✓ Temperature sensor installed into a ventilated shelter
✓ Wind sensors installed at >5m agl to be representative of the dynamics



https://docs.google.com/document/d/1Yw-TXNCR3X9Ck4dNjTYJ9wdx2SneG7vd/edit?usp=sharing&ouid=105609349844014987218&rtpof=true&sd=true

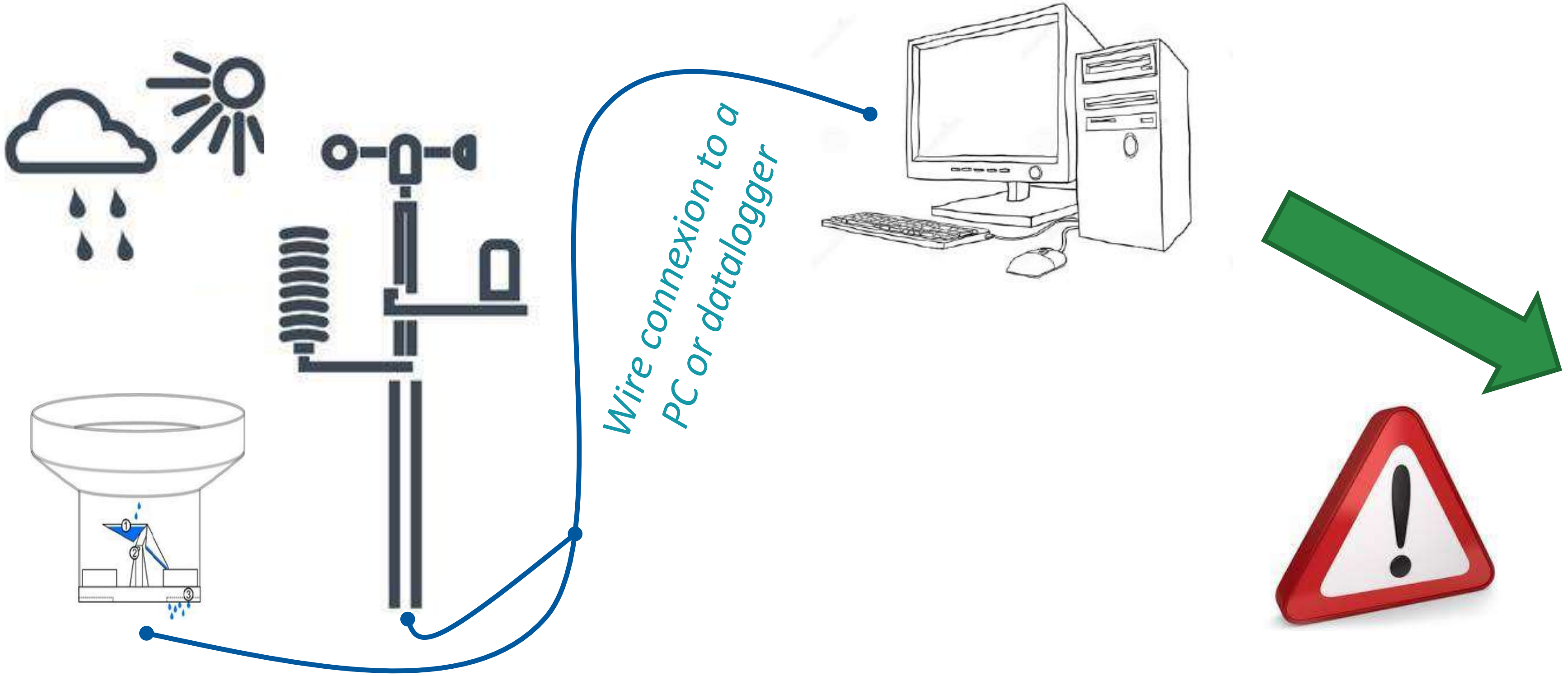
Weather Station (WS) acquisition / configuration.
NF requirement



Acquisition

- ✓ ≤ 1min sampling
- ✓ UTC time zone
- ✓ Air temperature
- ✓ Relative humidity
- ✓ Wind speed and direction
- ✓ Rain rate
- ✓ Status (heater ON/OFF)

Weather Station (WS) set-up and acquisition
NF requirement



Recording

L0 WS ascii file

- UTC
- 1min
- Weather geophysical variables (T, RH, wind, rain)
- Status

Take home message for Weather Station

- **Instrumental / technical set-up** : follow the SOP requirement available on the CCRES web site (distance, orientation, axe, tipping bucket rain gauge)
- **Main configuration rules** : 1min sampling, UTC time zone, record temp, wind and rain rate
- **Acquisition modes :** to record real-time data in ascii file for PC or datalogger
- **Calibration** : every 6 months for tipping bucket rain gauge (detect rain event and follow the stability of the disdrometer in comparing the rain rate)

- **Contacts** : Jean-Charles, met-office

- **PID** : one for each sensor (rain gauge, anemometer, temperature, barometer) ? One for the Weather Station ?

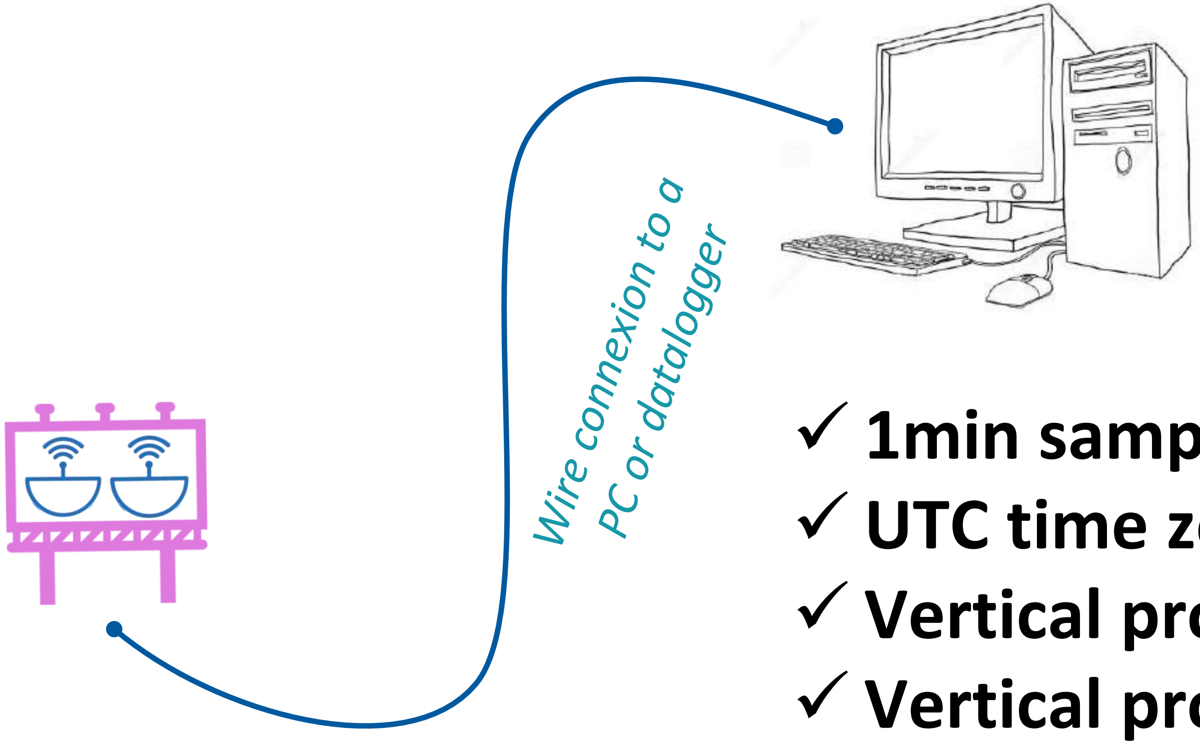
Doppler Cloud Radar (DCR)set-up. NF requirement

Instrumental set-up

- ✓ Open view without obstacle (building, trees for ex.)
- ✓ Stable, solid and easily accessible installation area
- ✓ Collocation between each sensor for
  - horizontal distance < 70m
  - altitude difference < 50m
- ✓ Vertical pointing mode
- ✓ Reflections on nearby objects may damage the radar.
- ✓ Local regulations for the use of the RF spectrum should be reviewed before installing an active instrument (https://www.who.int/news-room/q-a-detail/radiation-radar)

https://docs.google.com/document/d/1C531y9NxsclBVzfj-Ns7Vruy7_l6kCTi/edit#heading=h.gjdgxs

Doppler Cloud Radar (DCR) acquisition / configuration.
NF requirement

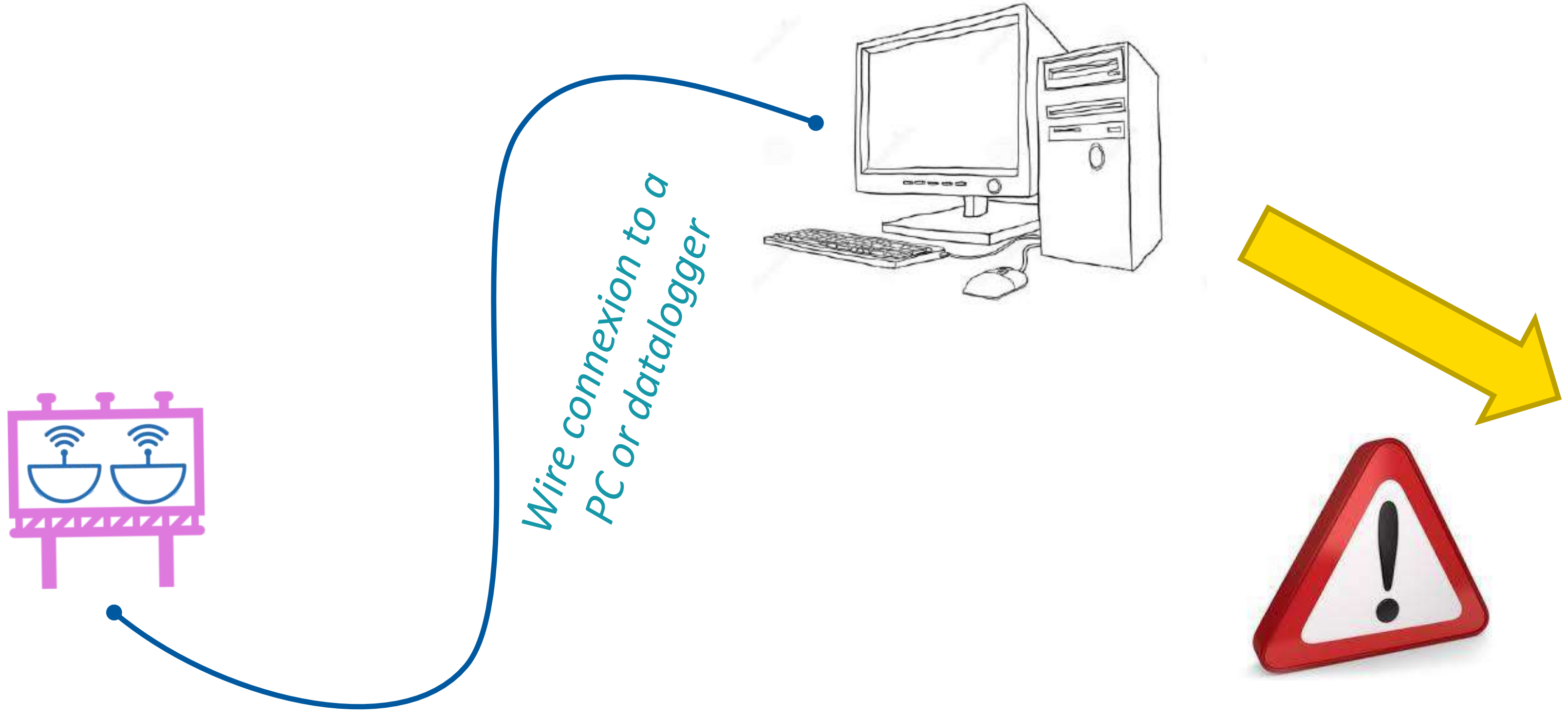


Wire connexion to a PC or datalogger

Acquisition

- ✓ 1min sampling
- ✓ UTC time zone
- ✓ Vertical profile of reflectivity
- ✓ Vertical profile of Doppler velocity
- ✓ Best vertical resolution (<25m)
- ✓ House Keeping Data

Doppler Cloud radar set-up and acquisition
NF requirement



Wire connexion to a PC or datalogger

Recording

L0 DCR netcdf file

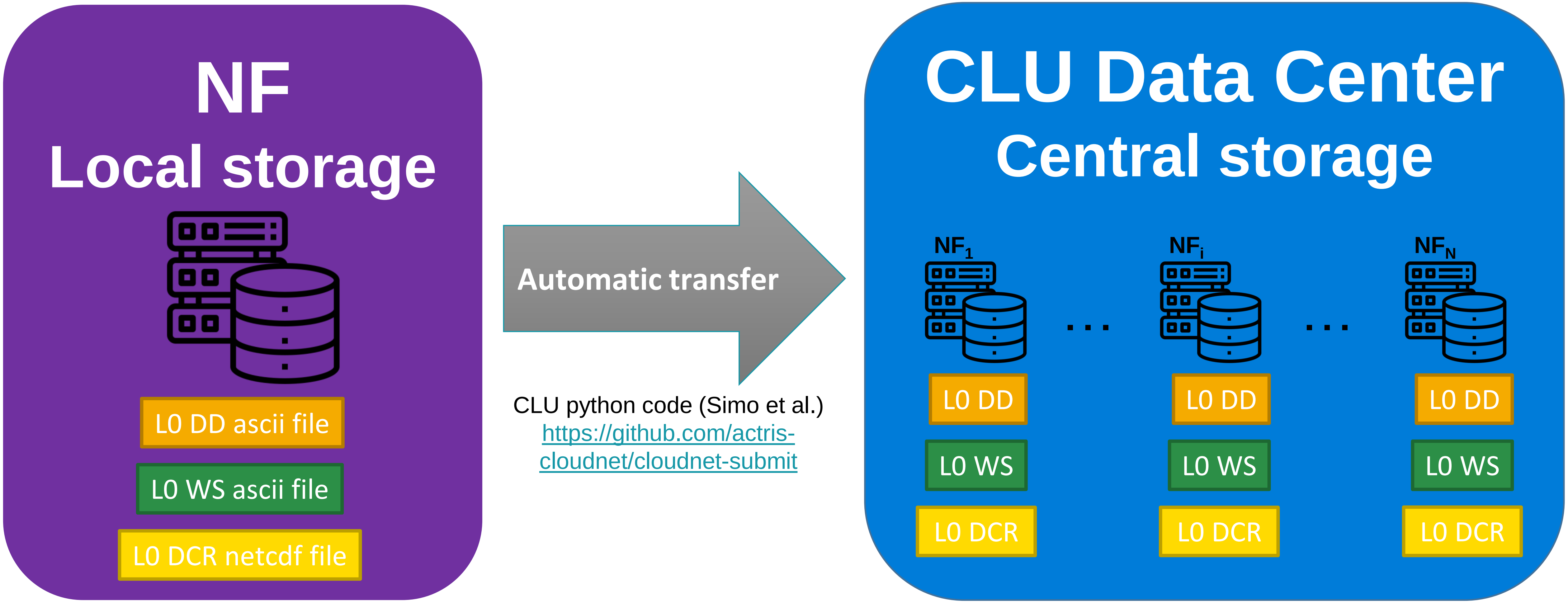
- UTC
- 1min
- Geophysical variables
- HKD

Take home message for Doppler Cloud Radar

- **Instrumental / technical set-up** : follow the SOP requirement available on the CCRES web site (distance, vertical pointing mode, blower on)
- **Main configuration rules** : 1min sampling, UTC time zone, record Z and DV profile, <25m resolution, all HKD
- **Acquisition modes :** manufacturer software to record real time data and HKD
- **Calibration** : to be discussed

- **Contacts** : Jean-Charles, Felipe, Lukas, Julien, etc.

Data NF storage to CLU Data Center storage



NF

Local storage

L0 DD ascii file

L0 WS ascii file

L0 DCR netcdf file

Automatic transfer

CLU python code (Simo et al.)
https://github.com/actris-cloudnet/cloudnet-submit

CLU Data Center

Central storage

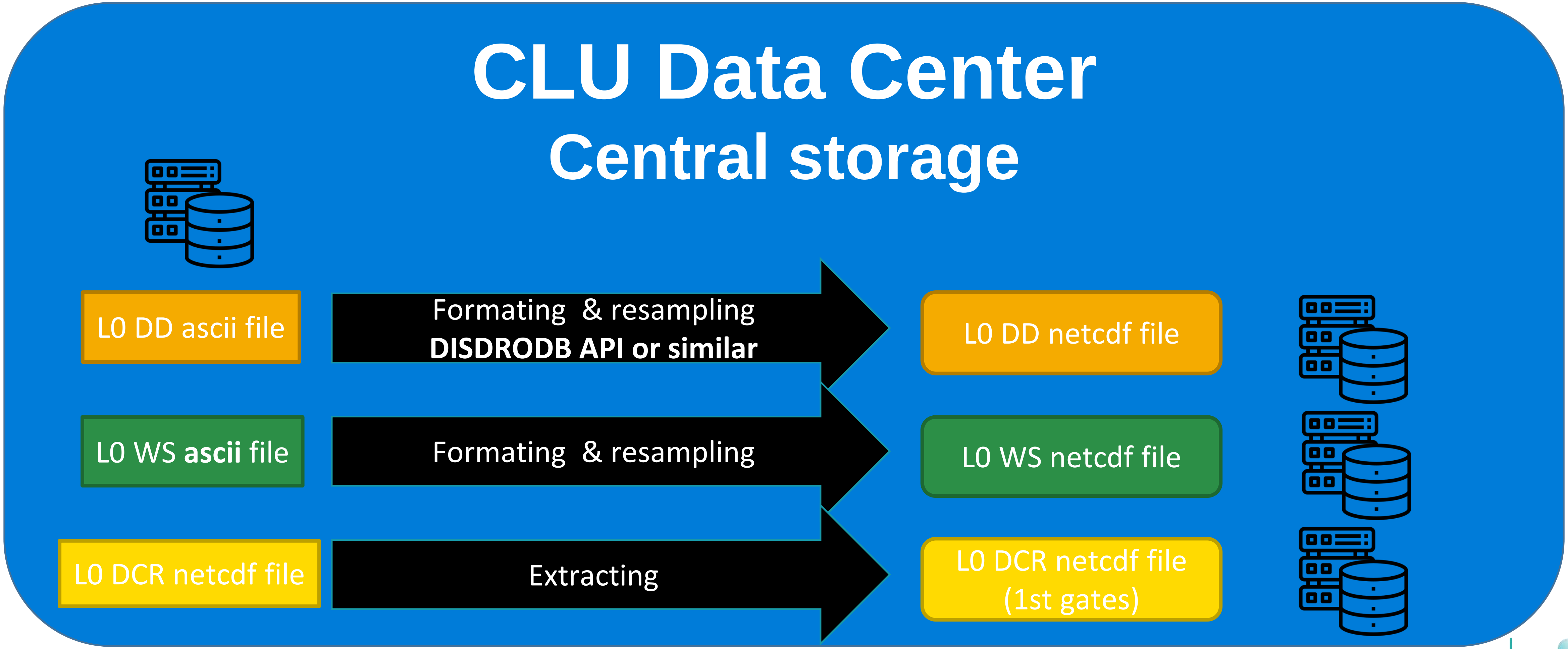
NF_1 … NF_i … NF_N

NF_1	NF_i	NF_N
L0 DD	L0 DD	L0 DD
L0 WS	L0 WS	L0 WS
L0 DCR	L0 DCR	L0 DCR

Take home message for NF to CLU-DC transfer

- **OK : PID to be filled for DisDrometer and Doppler Cloud radar.**
- **KO : which PID for Weather Station ? Each sensor ? Each Weather Station ?**

Formating & resampling at CLU Data Center



CLU Data Center

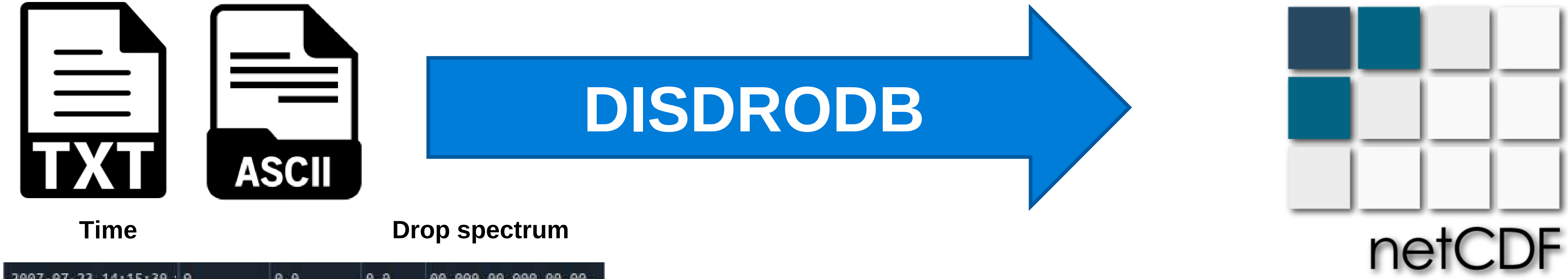
Central storage

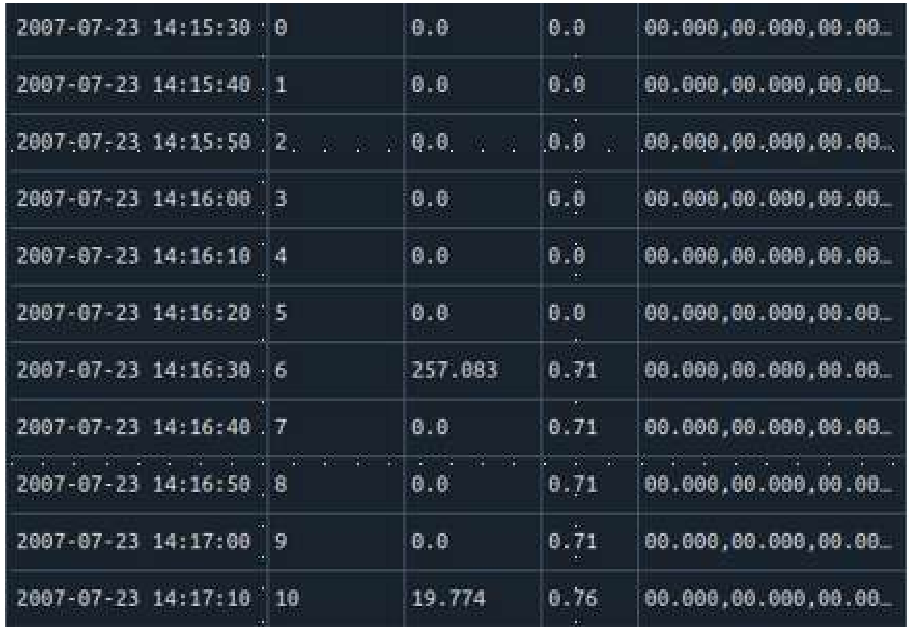
L0 DD ascii file → Formating & resampling **DISDRODB API or similar** → L0 DD netcdf file

L0 WS **ascii** file → Formating & resampling → L0 WS netcdf file

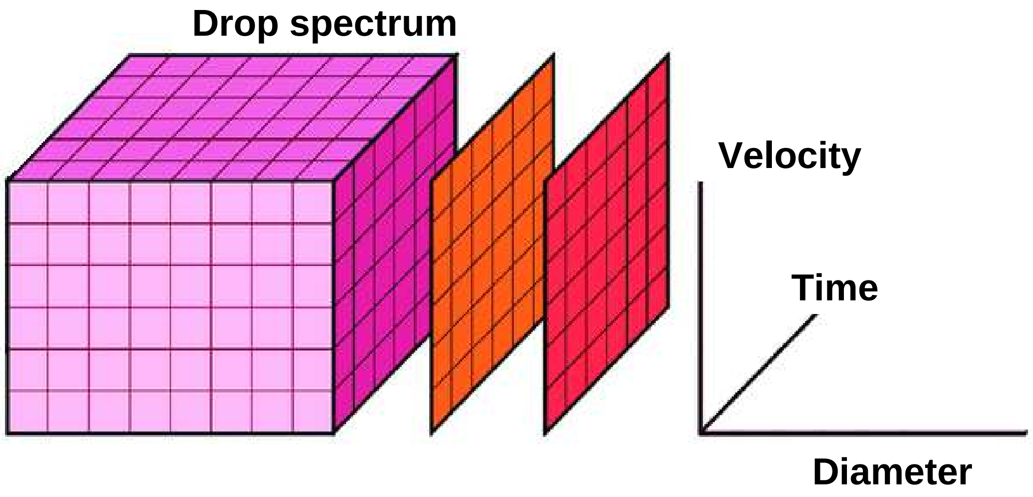
L0 DCR netcdf file → Extracting → L0 DCR netcdf file (1st gates)

DISDRODB L0 – Conversion from ASCII to netCDF (Gionata)



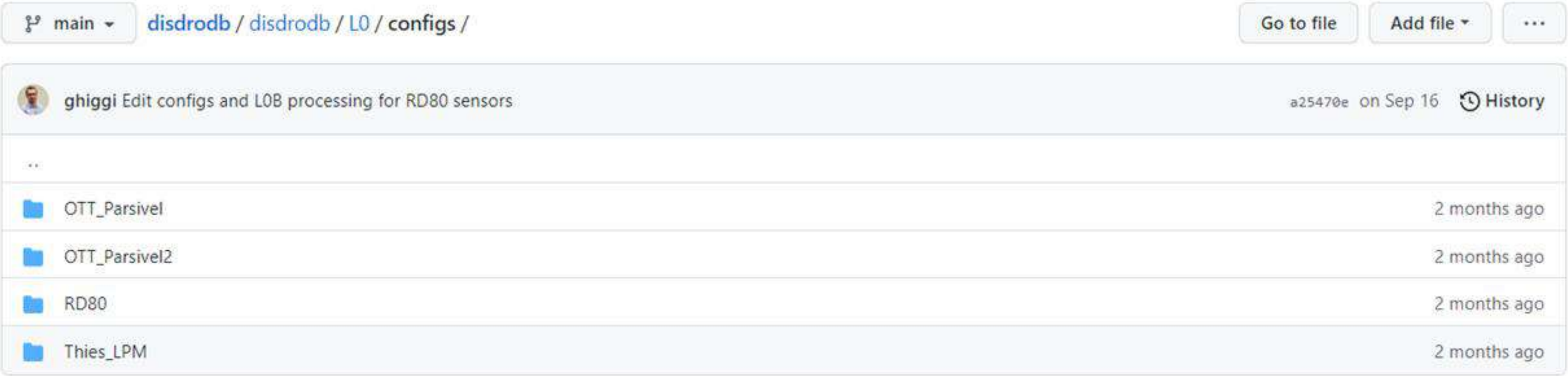


Time				Drop spectrum
2007-07-23 14:15:30	0	0.0	0.0	00.000,00.000,00.00…
2007-07-23 14:15:40	1	0.0	0.0	00.000,00.000,00.00…
2007-07-23 14:15:50	2	0.0	0.0	00.000,00.000,00.00…
2007-07-23 14:16:00	3	0.0	0.0	00.000,00.000,00.00…
2007-07-23 14:16:10	4	0.0	0.0	00.000,00.000,00.00…
2007-07-23 14:16:20	5	0.0	0.0	00.000,00.000,00.00…
2007-07-23 14:16:30	6	257.083	0.71	00.000,00.000,00.00…
2007-07-23 14:16:40	7	0.0	0.71	00.000,00.000,00.00…
2007-07-23 14:16:50	8	0.0	0.71	00.000,00.000,00.00…
2007-07-23 14:17:00	9	0.0	0.71	00.000,00.000,00.00…
2007-07-23 14:17:10	10	19.774	0.76	00.000,00.000,00.00…



DISDRODB L0 – Sensor configurations

- Include sensor-specific specifications
- Enable to **customize the DISDRODB L0 netCDF**:
  - Variable **names**
  - Dimension names and values
  - Dataset **compression** encodings and **data type**
  - Dataset variable **attributes**
- Does not contain settings related to the ascii/text files logged by the instrument



ghiggi Edit configs and L0B processing for RD80 sensors a25470e on Sep 16 History

..

OTT_Parsivel 2 months ago

OTT_Parsivel2 2 months ago

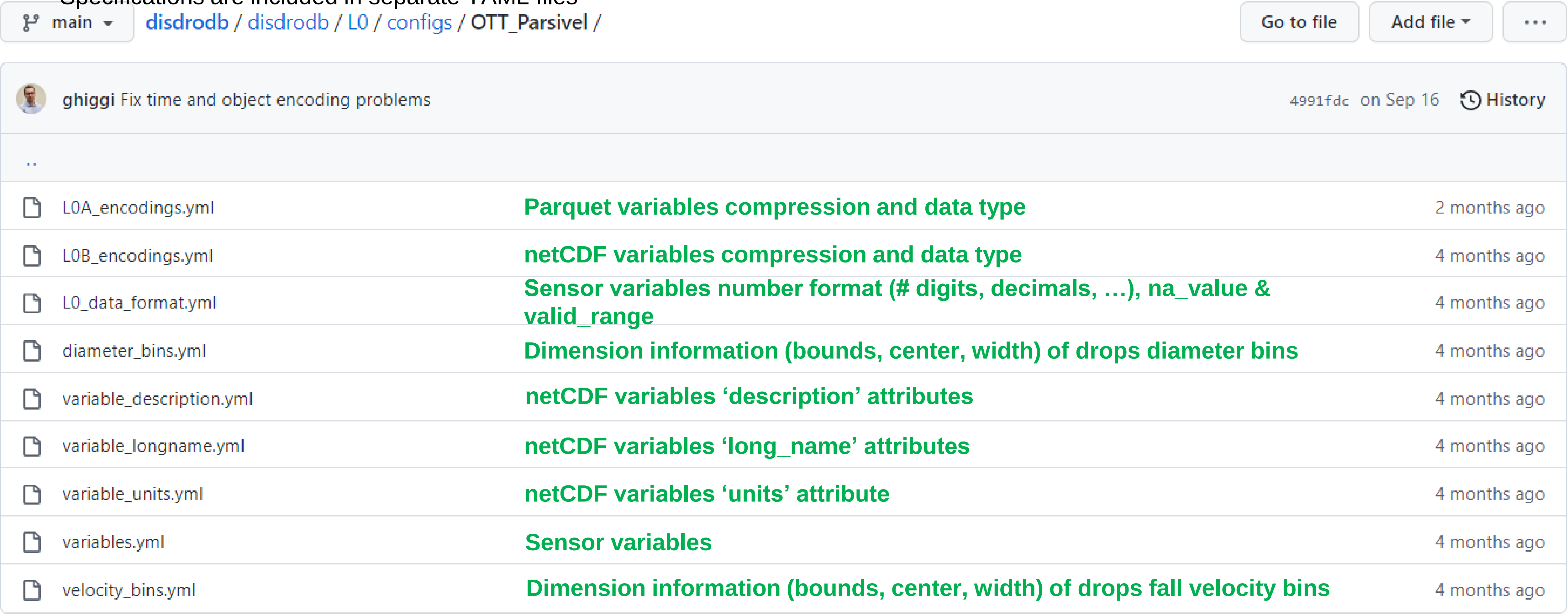
RD80 2 months ago

Thies_LPM 2 months ago

- Ongoing work for Vaisala FD70 and ODM470 configurations

DISDRODB L0 – Sensor configurations

- Specifications are included in separate YAML files



disdrodb / disdrodb / L0 / configs / OTT_Parsivel /

ghiggi Fix time and object encoding problems 4991fdc on Sep 16 History

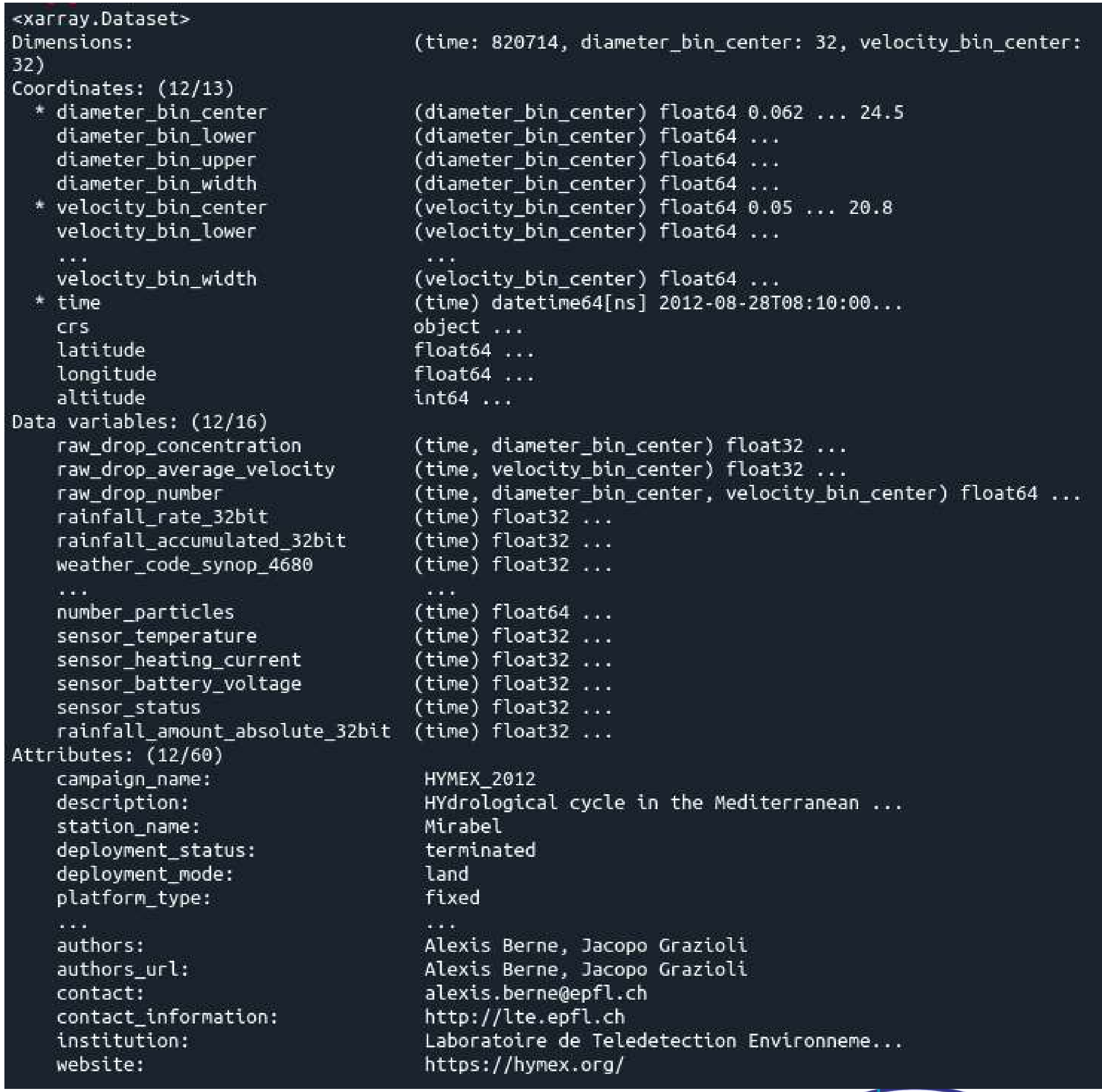
..

L0A_encodings.yml	Parquet variables compression and data type	2 months ago
L0B_encodings.yml	netCDF variables compression and data type	4 months ago
L0_data_format.yml	Sensor variables number format (# digits, decimals, …), na_value & valid_range	4 months ago
diameter_bins.yml	Dimension information (bounds, center, width) of drops diameter bins	4 months ago
variable_description.yml	netCDF variables ‘description’ attributes	4 months ago
variable_longname.yml	netCDF variables ‘long_name’ attributes	4 months ago
variable_units.yml	netCDF variables ‘units’ attribute	4 months ago
variables.yml	Sensor variables	4 months ago
velocity_bins.yml	Dimension information (bounds, center, width) of drops fall velocity bins	4 months ago

DISDRODB L0 netCDF

- Standardized variable names
- Standardized dimension
- Standardized coordinates
- Standardized attributes
- Standardized metadata

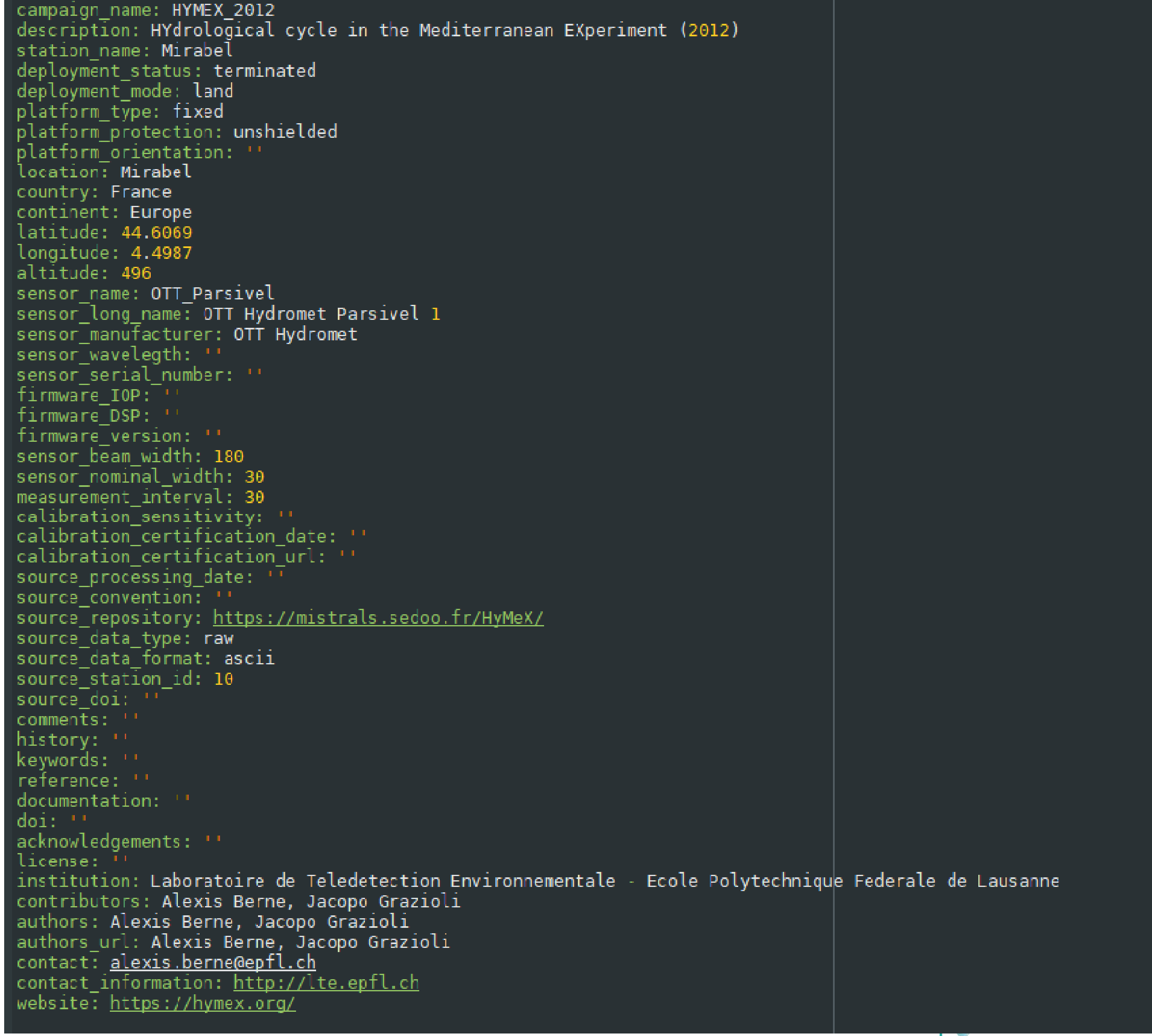
→ **CF-compliant netCDF**



```
<xarray.Dataset>
Dimensions:                  (time: 820714, diameter_bin_center: 32, velocity_bin_center:
32)
Coordinates: (12/13)
  * diameter_bin_center      (diameter_bin_center) float64 0.062 ... 24.5
    diameter_bin_lower       (diameter_bin_center) float64 ...
    diameter_bin_upper       (diameter_bin_center) float64 ...
    diameter_bin_width       (diameter_bin_center) float64 ...
  * velocity_bin_center      (velocity_bin_center) float64 0.05 ... 20.8
    velocity_bin_lower       (velocity_bin_center) float64 ...
    ...                       ...
    velocity_bin_width       (velocity_bin_center) float64 ...
  * time                     (time) datetime64[ns] 2012-08-28T08:10:00...
    crs                      object ...
    latitude                 float64 ...
    longitude                float64 ...
    altitude                 int64 ...
Data variables: (12/16)
    raw_drop_concentration   (time, diameter_bin_center) float32 ...
    raw_drop_average_velocity (time, velocity_bin_center) float32 ...
    raw_drop_number          (time, diameter_bin_center, velocity_bin_center) float64 ...
    rainfall_rate_32bit      (time) float32 ...
    rainfall_accumulated_32bit (time) float32 ...
    weather_code_synop_4680  (time) float32 ...
    ...                       ...
    number_particles         (time) float64 ...
    sensor_temperature       (time) float32 ...
    sensor_heating_current   (time) float32 ...
    sensor_battery_voltage   (time) float32 ...
    sensor_status            (time) float32 ...
    rainfall_amount_absolute_32bit (time) float32 ...
Attributes: (12/60)
    campaign_name:            HYMEX_2012
    description:              HYdrological cycle in the Mediterranean ...
    station_name:             Mirabel
    deployment_status:        terminated
    deployment_mode:          land
    platform_type:            fixed
    ...                       ...
    authors:                  Alexis Berne, Jacopo Grazioli
    authors_url:              Alexis Berne, Jacopo Grazioli
    contact:                  alexis.berne@epfl.ch
    contact_information:      http://lte.epfl.ch
    institution:              Laboratoire de Teledetection Environneme...
    website:                  https://hymex.org/
```

DISDRODB Metadata

- A metadata YAML file for each station
- The metadata are attached as global attribute to the netCDF file



```
campaign_name: HYMEX_2012
description: HYdrological cycle in the Mediterranean EXperiment (2012)
station_name: Mirabel
deployment_status: terminated
deployment_mode: land
platform_type: fixed
platform_protection: unshielded
platform_orientation: ''
location: Mirabel
country: France
continent: Europe
latitude: 44.6069
longitude: 4.4987
altitude: 496
sensor_name: OTT_Parsivel
sensor_long_name: OTT Hydromet Parsivel 1
sensor_manufacturer: OTT Hydromet
sensor_wavelegth: ''
sensor_serial_number: ''
firmware_IOP: ''
firmware_DSP: ''
firmware_version: ''
sensor_beam_width: 180
sensor_nominal_width: 30
measurement_interval: 30
calibration_sensitivity: ''
calibration_certification_date: ''
calibration_certification_url: ''
source_processing_date: ''
source_convention: ''
source_repository: https://mistrals.sedoo.fr/HyMeX/
source_data_type: raw
source_data_format: ascii
source_station_id: 10
source_doi: ''
comments: ''
history: ''
keywords: ''
reference: ''
documentation: ''
doi: ''
acknowledgements: ''
license: ''
institution: Laboratoire de Teledetection Environnementale - Ecole Polytechnique Federale de Lausanne
contributors: Alexis Berne, Jacopo Grazioli
authors: Alexis Berne, Jacopo Grazioli
authors_url: Alexis Berne, Jacopo Grazioli
contact: alexis.berne@epfl.ch
contact_information: http://lte.epfl.ch
website: https://hymex.org/
```

DISDRODB Reader

- Must be designed for each specific ascii/text file format !
- If sensors log data in the same ascii/text file format → Only 1 reader is needed
- A step-by-step tutorial guides into custom reader development.
- The reader requires the specifications of just a few settings and a couple of lines of codes.

column_names : the variable names contained in the ascii/text file logged by the station

file_pattern : a glob pattern enabling the listing of the ascii/text files to process

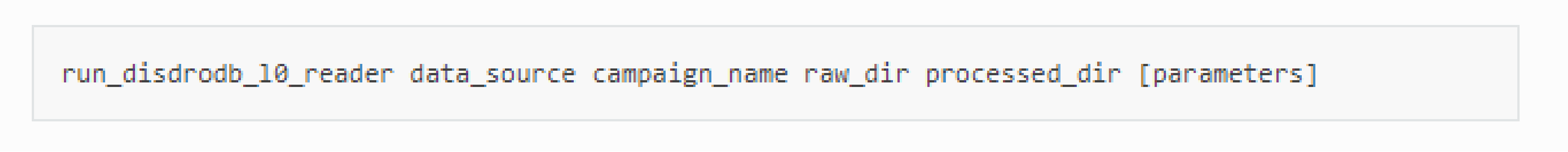
reader_kwargs : a dictionary with the arguments required to read the ascii/text file into a dataframe

df_sanitizer_fun : a function that encapsulate the code required to generate DISDRODB-compliant dataframe

- ➢ Drop dataframe columns that do not meet the DISDRODB standard (i.e. datalogger variables)
- ➢ Ensure the presence of a ‘*time*’ column which contain the UTC measurement time

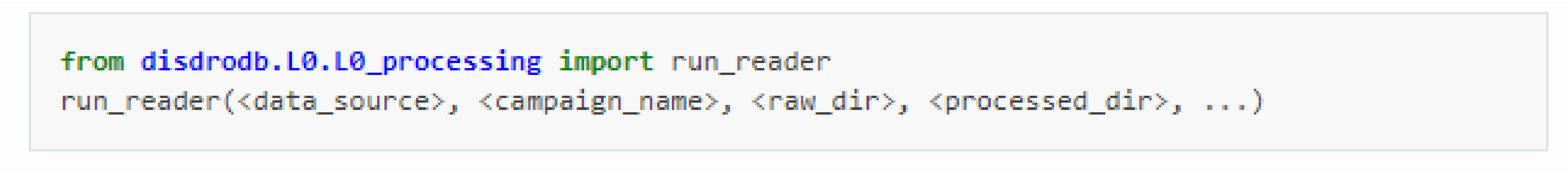
DISDRODB L0 netCDF – Production Modes

Within bash script / by command line



```
run_disdrodb_l0_reader data_source campaign_name raw_dir processed_dir [parameters]
```

Within a python script

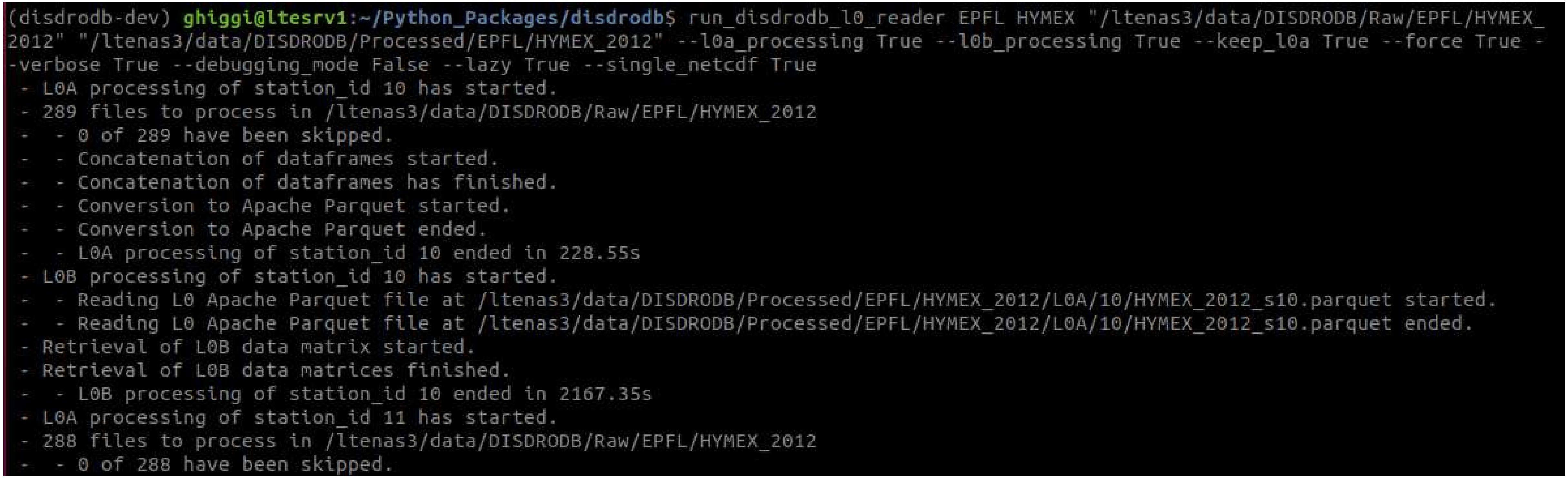


```python
from disdrodb.L0.L0_processing import run_reader
run_reader(<data_source>, <campaign_name>, <raw_dir>, <processed_dir>, ...)
```

Parameters options

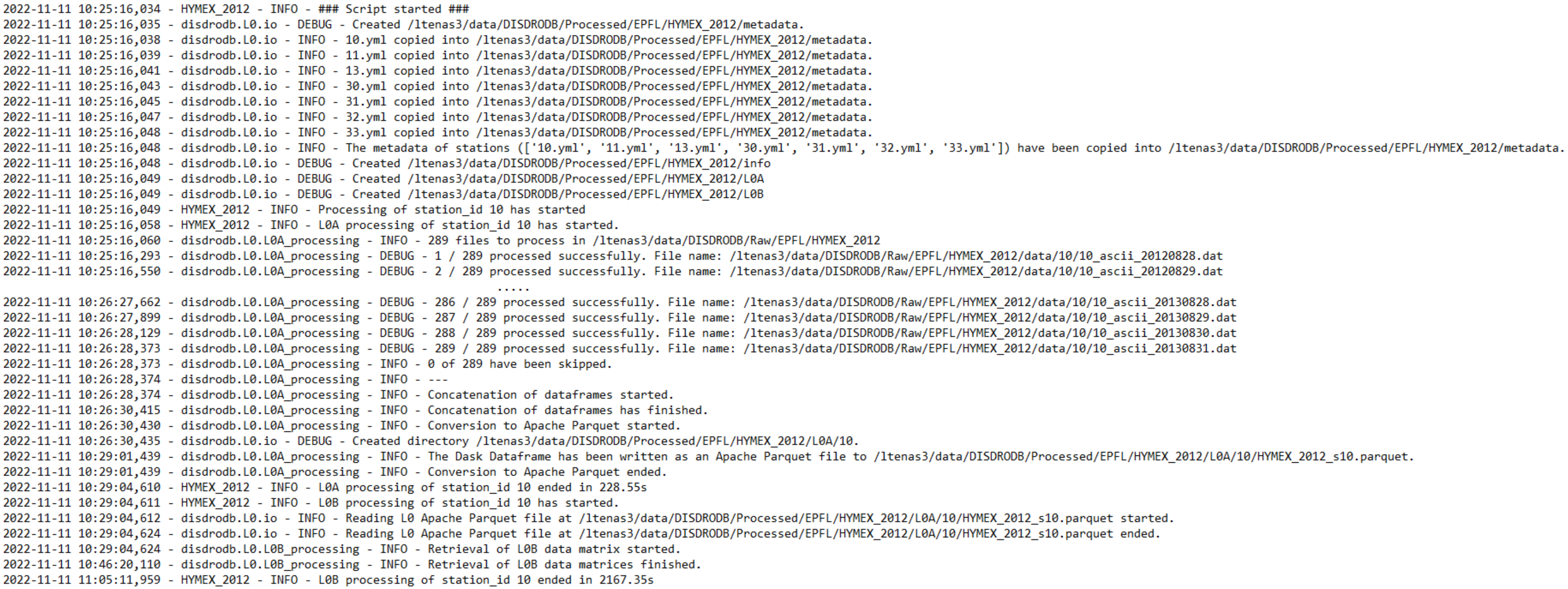
- --force : bool [true| false] - Whether to overwrite existing data.
- --verbose : bool [true| false] - Whether to print detailed processing information into terminal.
- --lazy : bool [true |false] - Whether to perform lazy (on-disk)/ parallel processing.
- --single_netcdf : bool [true | false] - Whether to concatenate all raw files into a single DISDRODB L0B netCDF file.

DISDRODB L0 netCDF – Verbose processing



```
(disdrodb-dev) ghiggi@ltesrv1:~/Python_Packages/disdrodb$ run_disdrodb_l0_reader EPFL HYMEX "/ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_
2012" "/ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012" --l0a_processing True --l0b_processing True --keep_l0a True --force True -
-verbose True --debugging_mode False --lazy True --single_netcdf True
 - L0A processing of station_id 10 has started.
 - 289 files to process in /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012
 -   - 0 of 289 have been skipped.
 -   - Concatenation of dataframes started.
 -   - Concatenation of dataframes has finished.
 -   - Conversion to Apache Parquet started.
 -   - Conversion to Apache Parquet ended.
 -   - L0A processing of station_id 10 ended in 228.55s
 - L0B processing of station_id 10 has started.
 -   - Reading L0 Apache Parquet file at /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A/10/HYMEX_2012_s10.parquet started.
 -   - Reading L0 Apache Parquet file at /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A/10/HYMEX_2012_s10.parquet ended.
 - Retrieval of L0B data matrix started.
 - Retrieval of L0B data matrices finished.
 -   - L0B processing of station_id 10 ended in 2167.35s
 - L0A processing of station_id 11 has started.
 - 288 files to process in /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012
 -   - 0 of 288 have been skipped.
```

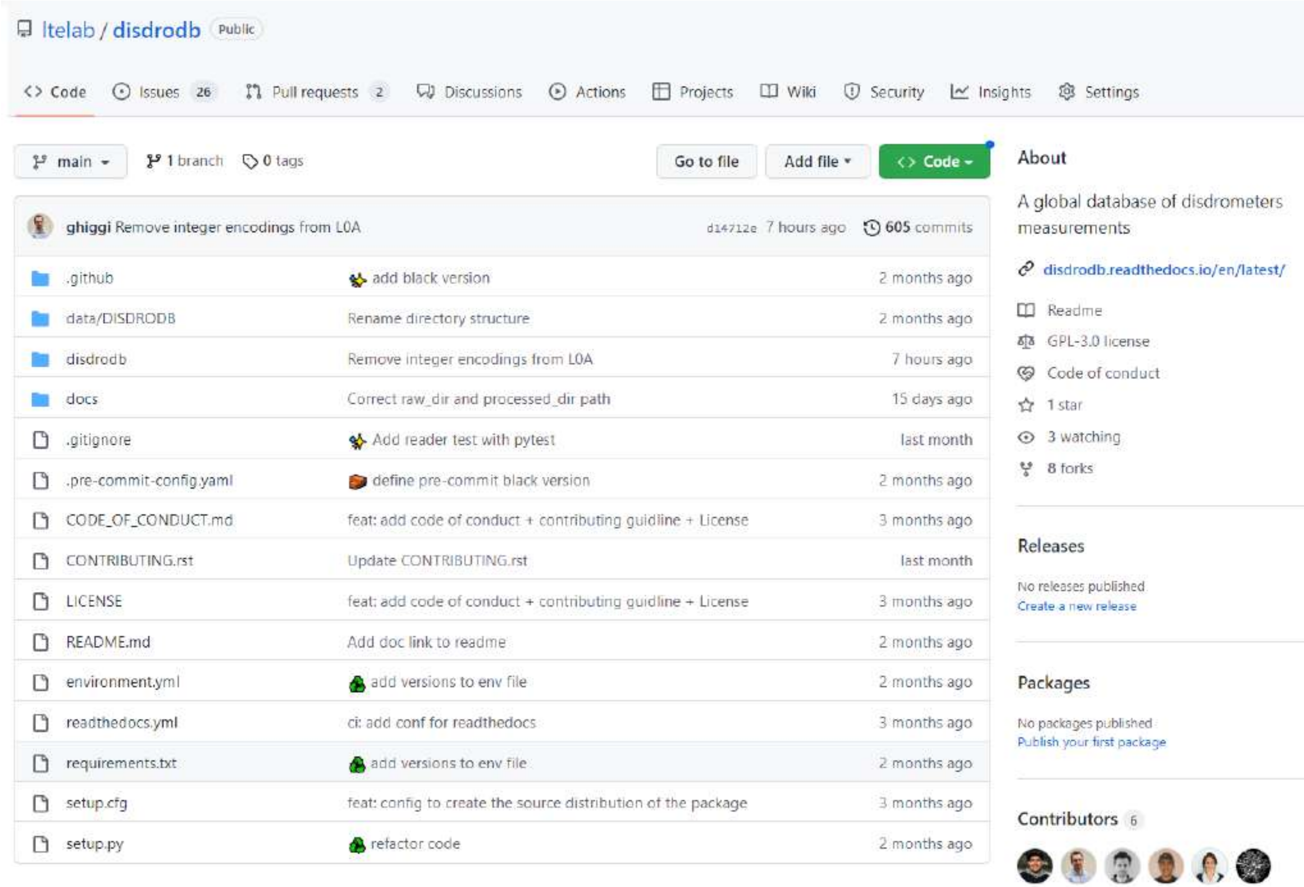
DISDRODB L0 netCDF – Log files



```
2022-11-11 10:25:16,034 - HYMEX_2012 - INFO - ### Script started ###
2022-11-11 10:25:16,035 - disdrodb.L0.io - DEBUG - Created /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,038 - disdrodb.L0.io - INFO - 10.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,039 - disdrodb.L0.io - INFO - 11.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,041 - disdrodb.L0.io - INFO - 13.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,043 - disdrodb.L0.io - INFO - 30.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,045 - disdrodb.L0.io - INFO - 31.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,047 - disdrodb.L0.io - INFO - 32.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,048 - disdrodb.L0.io - INFO - 33.yml copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,048 - disdrodb.L0.io - INFO - The metadata of stations (['10.yml', '11.yml', '13.yml', '30.yml', '31.yml', '32.yml', '33.yml']) have been copied into /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/metadata.
2022-11-11 10:25:16,048 - disdrodb.L0.io - DEBUG - Created /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/info
2022-11-11 10:25:16,049 - disdrodb.L0.io - DEBUG - Created /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A
2022-11-11 10:25:16,049 - disdrodb.L0.io - DEBUG - Created /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0B
2022-11-11 10:25:16,049 - HYMEX_2012 - INFO - Processing of station_id 10 has started
2022-11-11 10:25:16,058 - HYMEX_2012 - INFO - L0A processing of station_id 10 has started.
2022-11-11 10:25:16,060 - disdrodb.L0.L0A_processing - INFO - 289 files to process in /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012
2022-11-11 10:25:16,293 - disdrodb.L0.L0A_processing - DEBUG - 1 / 289 processed successfully. File name: /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012/data/10/10_ascii_20120828.dat
2022-11-11 10:25:16,550 - disdrodb.L0.L0A_processing - DEBUG - 2 / 289 processed successfully. File name: /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012/data/10/10_ascii_20120829.dat
                                                                          .....
2022-11-11 10:26:27,662 - disdrodb.L0.L0A_processing - DEBUG - 286 / 289 processed successfully. File name: /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012/data/10/10_ascii_20130828.dat
2022-11-11 10:26:27,899 - disdrodb.L0.L0A_processing - DEBUG - 287 / 289 processed successfully. File name: /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012/data/10/10_ascii_20130829.dat
2022-11-11 10:26:28,129 - disdrodb.L0.L0A_processing - DEBUG - 288 / 289 processed successfully. File name: /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012/data/10/10_ascii_20130830.dat
2022-11-11 10:26:28,373 - disdrodb.L0.L0A_processing - DEBUG - 289 / 289 processed successfully. File name: /ltenas3/data/DISDRODB/Raw/EPFL/HYMEX_2012/data/10/10_ascii_20130831.dat
2022-11-11 10:26:28,373 - disdrodb.L0.L0A_processing - INFO - 0 of 289 have been skipped.
2022-11-11 10:26:28,374 - disdrodb.L0.L0A_processing - INFO - ---
2022-11-11 10:26:28,374 - disdrodb.L0.L0A_processing - INFO - Concatenation of dataframes started.
2022-11-11 10:26:30,415 - disdrodb.L0.L0A_processing - INFO - Concatenation of dataframes has finished.
2022-11-11 10:26:30,430 - disdrodb.L0.L0A_processing - INFO - Conversion to Apache Parquet started.
2022-11-11 10:26:30,435 - disdrodb.L0.io - DEBUG - Created directory /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A/10.
2022-11-11 10:29:01,439 - disdrodb.L0.L0A_processing - INFO - The Dask Dataframe has been written as an Apache Parquet file to /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A/10/HYMEX_2012_s10.parquet.
2022-11-11 10:29:01,439 - disdrodb.L0.L0A_processing - INFO - Conversion to Apache Parquet ended.
2022-11-11 10:29:04,610 - HYMEX_2012 - INFO - L0A processing of station_id 10 ended in 228.55s
2022-11-11 10:29:04,611 - HYMEX_2012 - INFO - L0B processing of station_id 10 has started.
2022-11-11 10:29:04,612 - disdrodb.L0.io - INFO - Reading L0 Apache Parquet file at /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A/10/HYMEX_2012_s10.parquet started.
2022-11-11 10:29:04,624 - disdrodb.L0.io - INFO - Reading L0 Apache Parquet file at /ltenas3/data/DISDRODB/Processed/EPFL/HYMEX_2012/L0A/10/HYMEX_2012_s10.parquet ended.
2022-11-11 10:29:04,624 - disdrodb.L0.L0B_processing - INFO - Retrieval of L0B data matrix started.
2022-11-11 10:46:20,110 - disdrodb.L0.L0B_processing - INFO - Retrieval of L0B data matrices finished.
2022-11-11 11:05:11,959 - HYMEX_2012 - INFO - L0B processing of station_id 10 ended in 2167.35s
```

DISDRODB

- **Software:** https://github.com/ltelab/disdrodb
- **Documentation:** https://disdrodb.readthedocs.io/en/latest/



ltelab / disdrodb Public

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main · 1 branch · 0 tags · Go to file · Add file · <> Code

ghiggi Remove integer encodings from L0A · d14712e 7 hours ago · 605 commits

.github	add black version	2 months ago
data/DISDRODB	Rename directory structure	2 months ago
disdrodb	Remove integer encodings from L0A	7 hours ago
docs	Correct raw_dir and processed_dir path	15 days ago
.gitignore	Add reader test with pytest	last month
.pre-commit-config.yaml	define pre-commit black version	2 months ago
CODE_OF_CONDUCT.md	feat: add code of conduct + contributing guidline + License	3 months ago
CONTRIBUTING.rst	Update CONTRIBUTING.rst	last month
LICENSE	feat: add code of conduct + contributing guidline + License	3 months ago
README.md	Add doc link to readme	2 months ago
environment.yml	add versions to env file	2 months ago
readthedocs.yml	ci: add conf for readthedocs	3 months ago
requirements.txt	add versions to env file	2 months ago
setup.cfg	feat: config to create the source distribution of the package	3 months ago
setup.py	refactor code	2 months ago

About

A global database of disdrometers measurements

disdrodb.readthedocs.io/en/latest/

Readme
GPL-3.0 license
Code of conduct
1 star
3 watching
8 forks

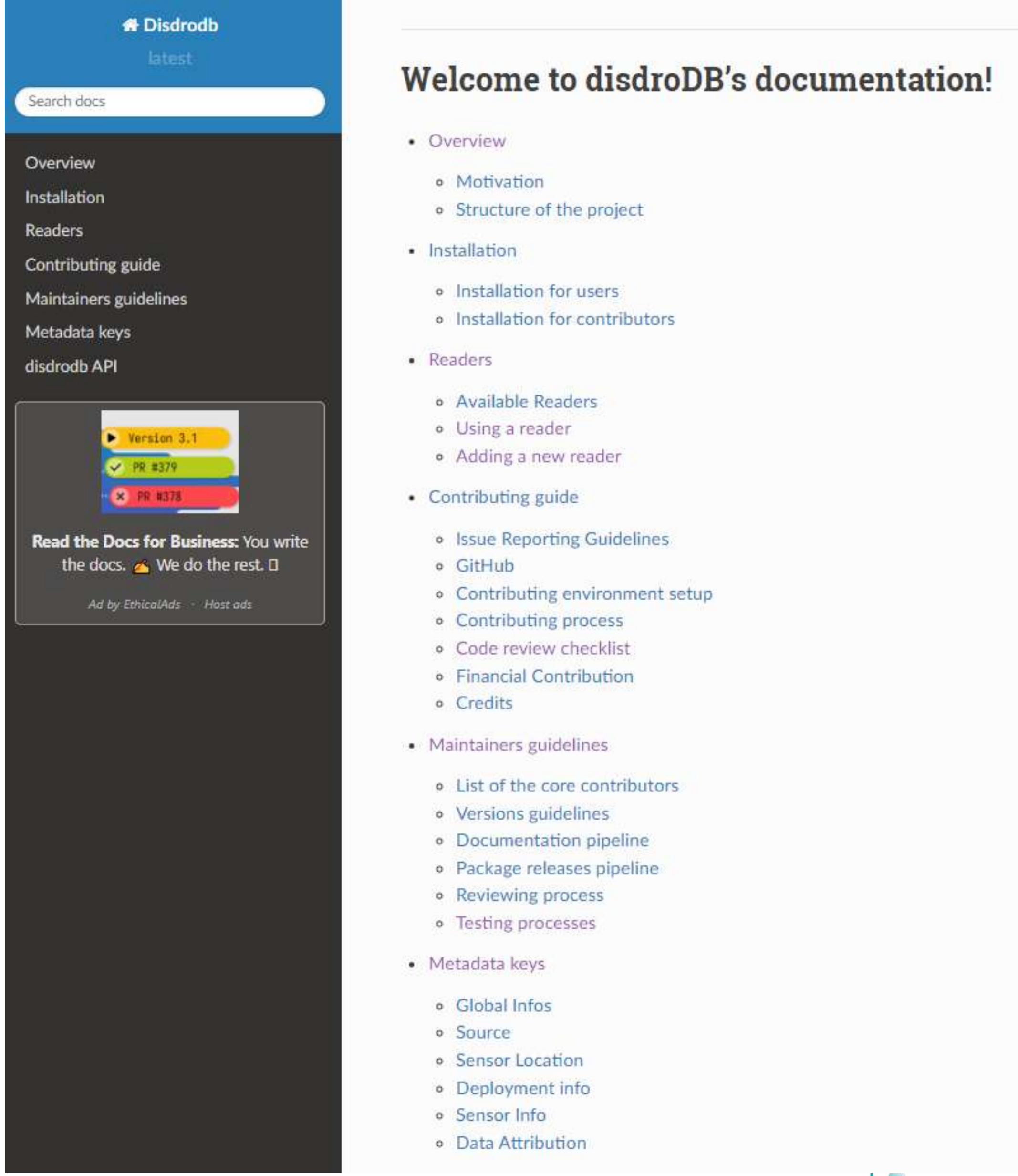
Releases

No releases published
Create a new release

Packages

No packages published
Publish your first package

Contributors 6



Disdrodb
latest
Search docs

Overview
Installation
Readers
Contributing guide
Maintainers guidelines
Metadata keys
disdrodb API

Version 3.1
PR #379
PR #378

Read the Docs for Business: You write the docs. We do the rest.

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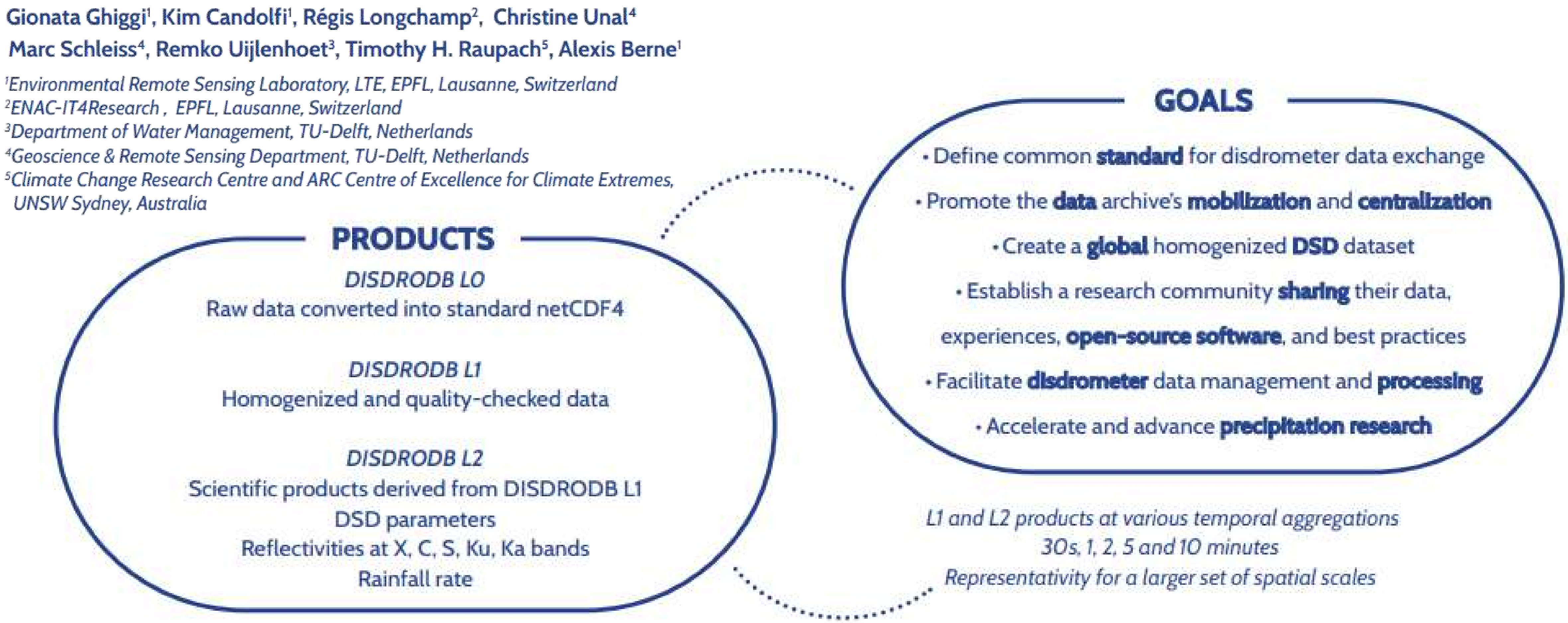
Welcome to disdroDB's documentation!

- Overview
  - Motivation
  - Structure of the project
- Installation
  - Installation for users
  - Installation for contributors
- Readers
  - Available Readers
  - Using a reader
  - Adding a new reader
- Contributing guide
  - Issue Reporting Guidelines
  - GitHub
  - Contributing environment setup
  - Contributing process
  - Code review checklist
  - Financial Contribution
  - Credits
- Maintainers guidelines
  - List of the core contributors
  - Versions guidelines
  - Documentation pipeline
  - Package releases pipeline
  - Reviewing process
  - Testing processes
- Metadata keys
  - Global Infos
  - Source
  - Sensor Location
  - Deployment info
  - Sensor Info
  - Data Attribution

DISDRODB – Goals



Gionata Ghiggi[1], Kim Candolfi[1], Régis Longchamp[2], Christine Unal[4]
Marc Schleiss[4], Remko Uijlenhoet[3], Timothy H. Raupach[5], Alexis Berne[1]

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[2] *ENAC-IT4Research , EPFL, Lausanne, Switzerland*
[3] *Department of Water Management, TU-Delft, Netherlands*
[4] *Geoscience & Remote Sensing Department, TU-Delft, Netherlands*
[5] *Climate Change Research Centre and ARC Centre of Excellence for Climate Extremes, UNSW Sydney, Australia*

PRODUCTS

DISDRODB L0
Raw data converted into standard netCDF4

DISDRODB L1
Homogenized and quality-checked data

DISDRODB L2
Scientific products derived from DISDRODB L1
DSD parameters
Reflectivities at X, C, S, Ku, Ka bands
Rainfall rate

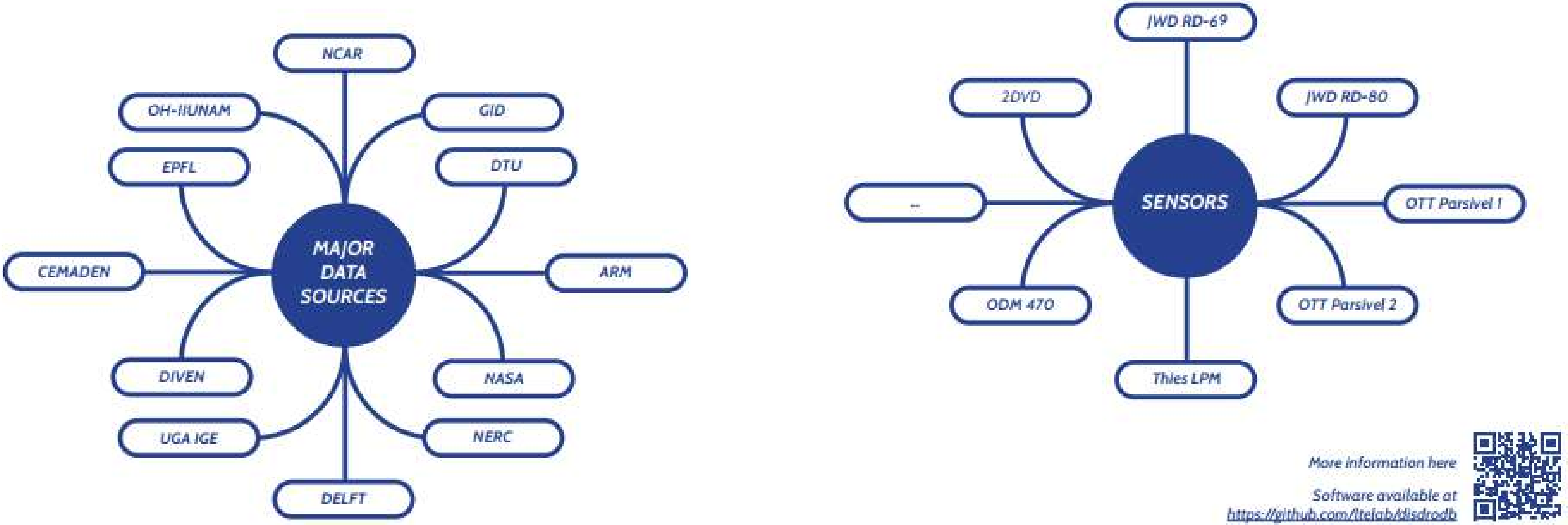
GOALS

- Define common **standard** for disdrometer data exchange
- Promote the **data** archive's **mobilization** and **centralization**
- Create a **global** homogenized **DSD** dataset
- Establish a research community **sharing** their data, experiences, **open-source software**, and best practices
- Facilitate **disdrometer** data management and **processing**
- Accelerate and advance **precipitation research**

L1 and L2 products at various temporal aggregations
30s, 1, 2, 5 and 10 minutes
Representativity for a larger set of spatial scales

We miss the appropriate data infrastructure to properly study the spatial and temporal variability of the raindrop size distribution (DSD) globally

DISDRODB – Data sources & sensors

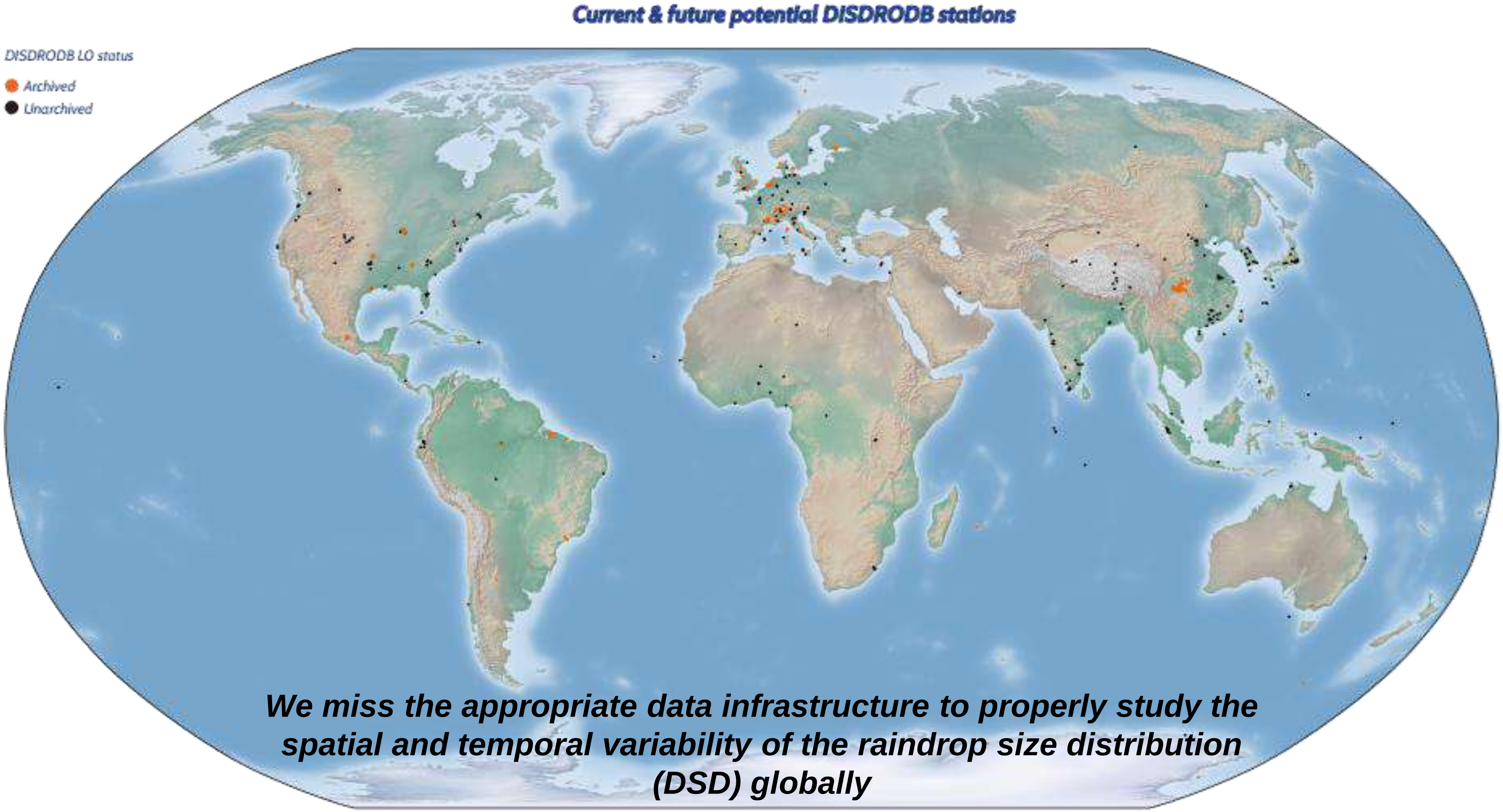


More information here

Software available at https://github.com/ltelab/disdrodb

We miss the appropriate data infrastructure to properly study the spatial and temporal variability of the raindrop size distribution (DSD) globally

DISDRODB - Coverage



We miss the appropriate data infrastructure to properly study the spatial and temporal variability of the raindrop size distribution (DSD) globally

DISDRODB - Outlook

- The launch of the DISDRODB initiative required more than 1 year FTE work
- At LTE, **we are going out of resources to maintain the project properly**
- **WE ARE LOOKING FOR PEOPLE**, interested:
    - **to take over the effort and maintain the DISDRODB project**
    - to test and provide feedback on software & documentation
    - to analyze the preliminary DISDRODB dataset
    - to implement quality checks to generate DISDRODB L1 products
    - to add DSD research codes to generate DISDRODB L2 products

Thanks for your attention and interest in DISDRODB

Weather Station : Conversion from ASCII to netCDF (Antoine)

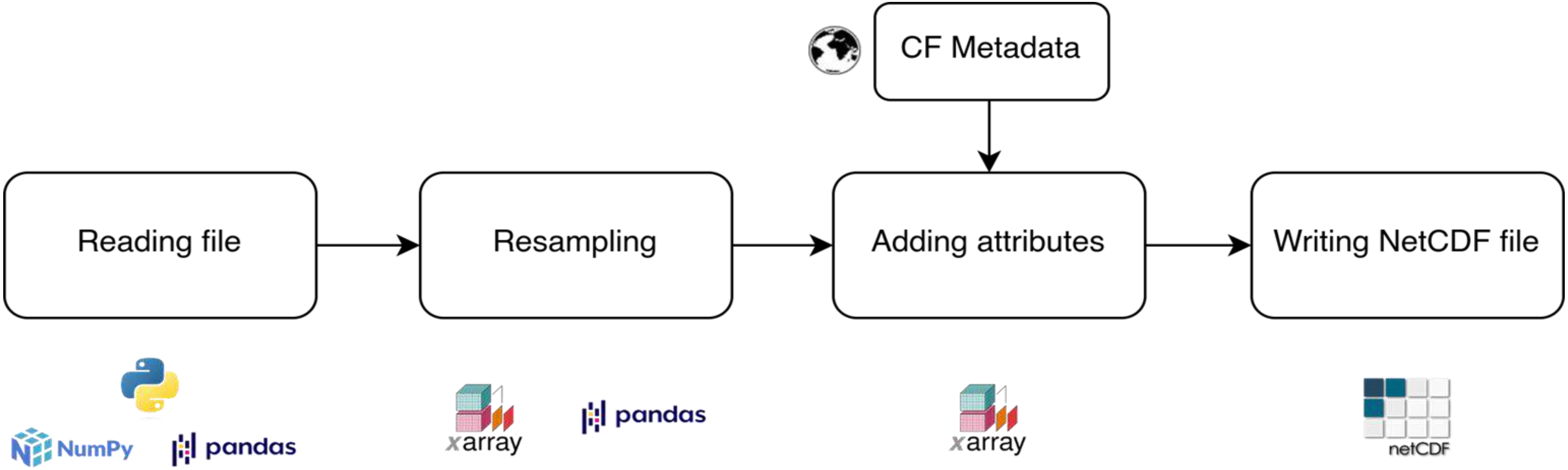
- Formatting and resampling is a known workflow
- The python-pandas-xarray stack will be used to convert weather station data ascii file to NetCDF-CF file
- NetCDF and CF-Conventions will be used to ensure interoperability of variables name, data structure and attributes.
- Since there are many formats for weather files, standardization is important to facilitate further processing of the data.

Weather Station : Conversion from ASCII to netCDF

How will it work ?

- We create a pool of readers for the different weather data ASCII format
- These readers convert the data into an intermediate representation (xarray dataset)
- From there, we can transform the data :
    - Rename variables/dimensions
    - Write attributes per variable like instruments, types, standard_name
    - Write global attributes like the geospatial locations of the instruments, the station informations
    - Resample the dataset to have a common dimension between all stations
- We finally write the NetCDF-4 file

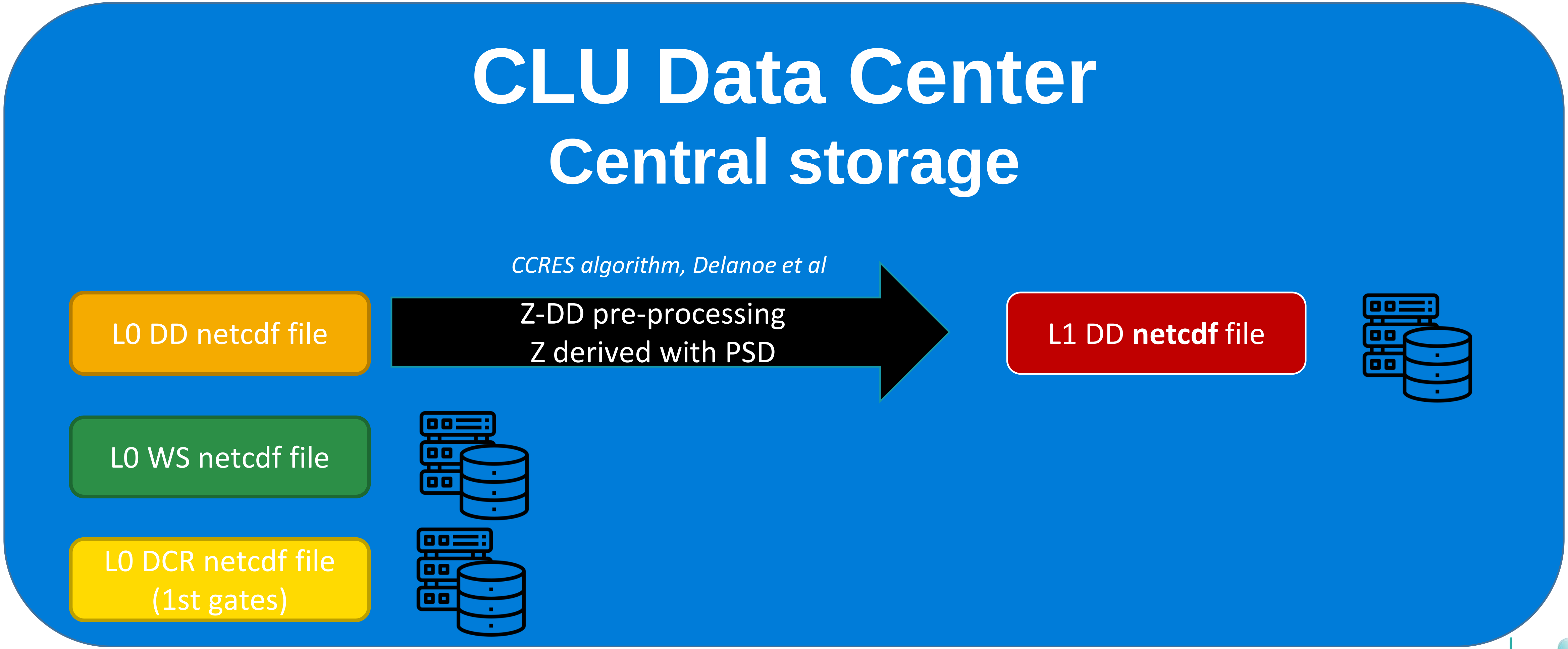
Weather Station : Conversion from ASCII to netCDF



Take home message for ASCII to netCDF conversion

- **Disdrometer**:
  - **Use disdroDB API :** need people to take over the effort and maintain the DISDRODB project
  - **Develop a new code** : to be discussed (reader, data and metadata naming)
- **Weather station :** development in progress (reader, data and metadata naming)
- **CLU Data Center** : the place to be for these ASCII to netCDF converters ?

Z-DD pre-processing at CLU Data Center



CLU Data Center

Central storage

CCRES algorithm, Delanoe et al

L0 DD netcdf file

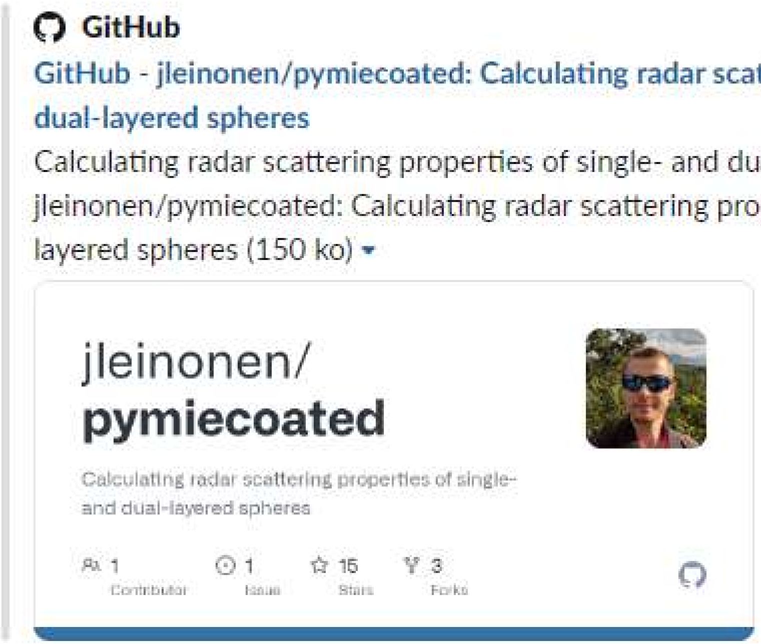
Z-DD pre-processing
Z derived with PSD

L1 DD **netcdf** file

L0 WS netcdf file

L0 DCR netcdf file
(1st gates)

Z-DD pre-processing at CLU Data Center



GitHub

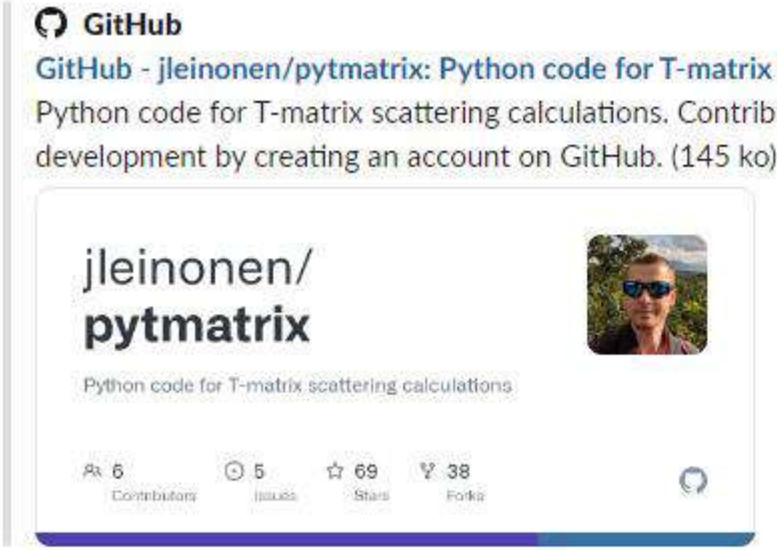
GitHub - jleinonen/pymiecoated: Calculating radar scattering properties of single- and dual-layered spheres

Calculating radar scattering properties of single- and dual-layered spheres - GitHub - jleinonen/pymiecoated: Calculating radar scattering properties of single- and dual-layered spheres (150 ko) ▾

jleinonen/
pymiecoated

Calculating radar scattering properties of single- and dual-layered spheres

1 Contributor · 1 Issue · 15 Stars · 3 Forks



GitHub

GitHub - jleinonen/pytmatrix: Python code for T-matrix scattering calculations

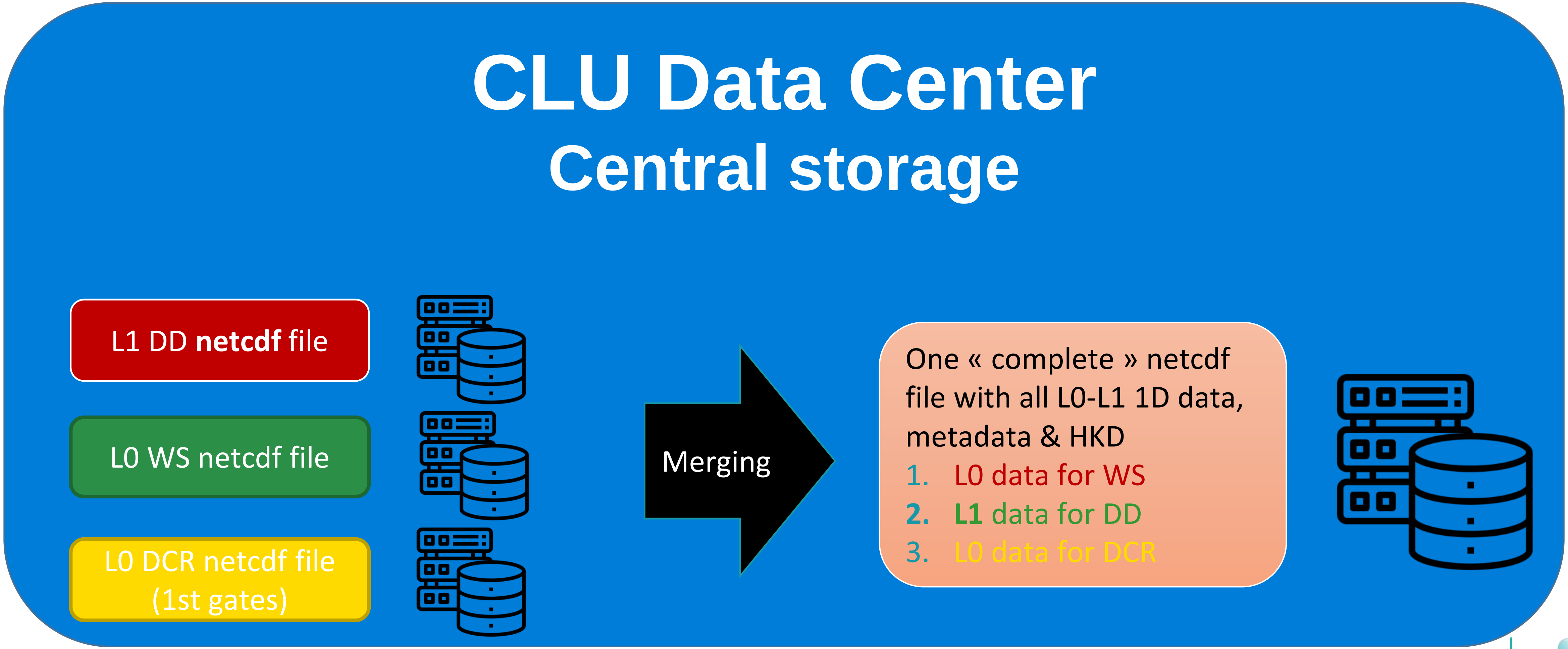
Python code for T-matrix scattering calculations. Contribute to jleinonen/pytmatrix development by creating an account on GitHub. (145 ko) ▾

jleinonen/
pytmatrix

Python code for T-matrix scattering calculations

6 Contributors · 5 Issues · 69 Stars · 38 Forks

Z-DD processing at CLU Data Center



CLU Data Center

Central storage

L1 DD **netcdf** file

L0 WS netcdf file

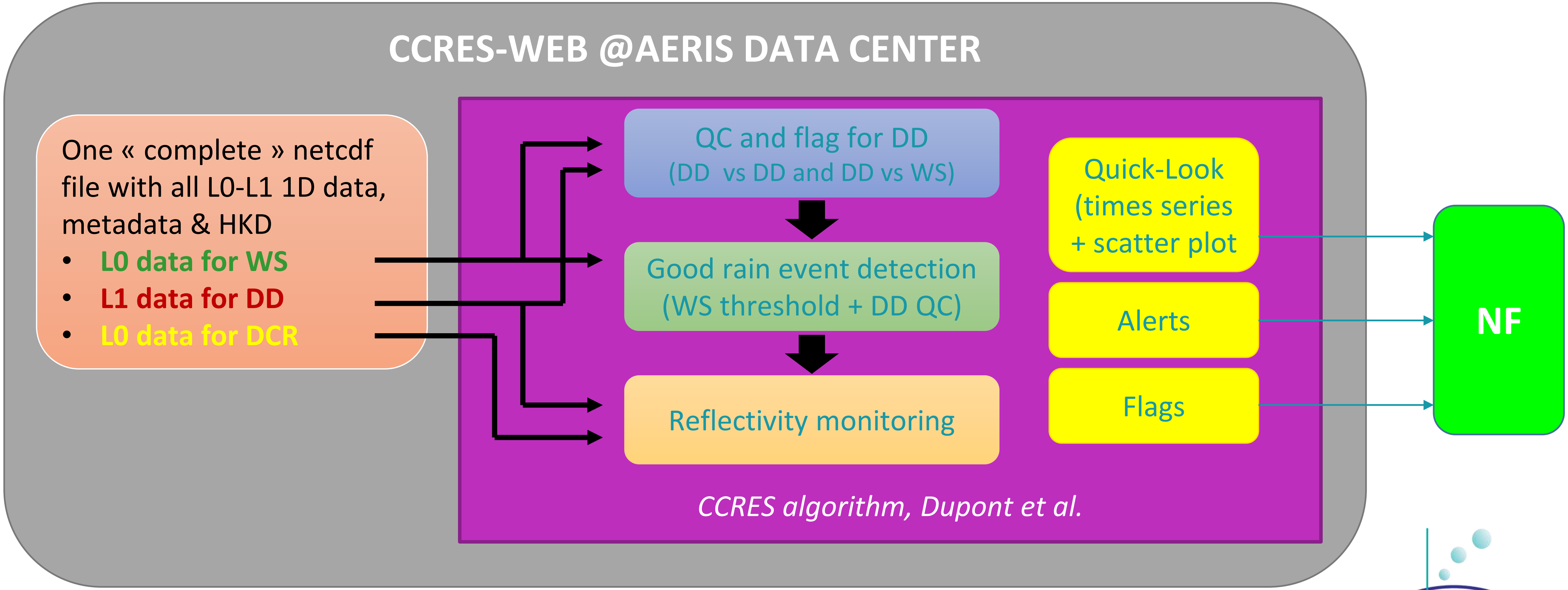
L0 DCR netcdf file (1st gates)

Merging

One « complete » netcdf file with all L0-L1 1D data, metadata & HKD

1. L0 data for WS
2. **L1** data for DD
3. L0 data for DCR

DCR-CC monitoring with CCRES algo @AERIS DC



CCRES-WEB @AERIS DATA CENTER

One « complete » netcdf file with all L0-L1 1D data, metadata & HKD

- L0 data for WS
- L1 data for DD
- L0 data for DCR

QC and flag for DD (DD vs DD and DD vs WS)

Good rain event detection (WS threshold + DD QC)

Reflectivity monitoring

Quick-Look (times series + scatter plot

Alerts

Flags

NF

CCRES algorithm, Dupont et al.

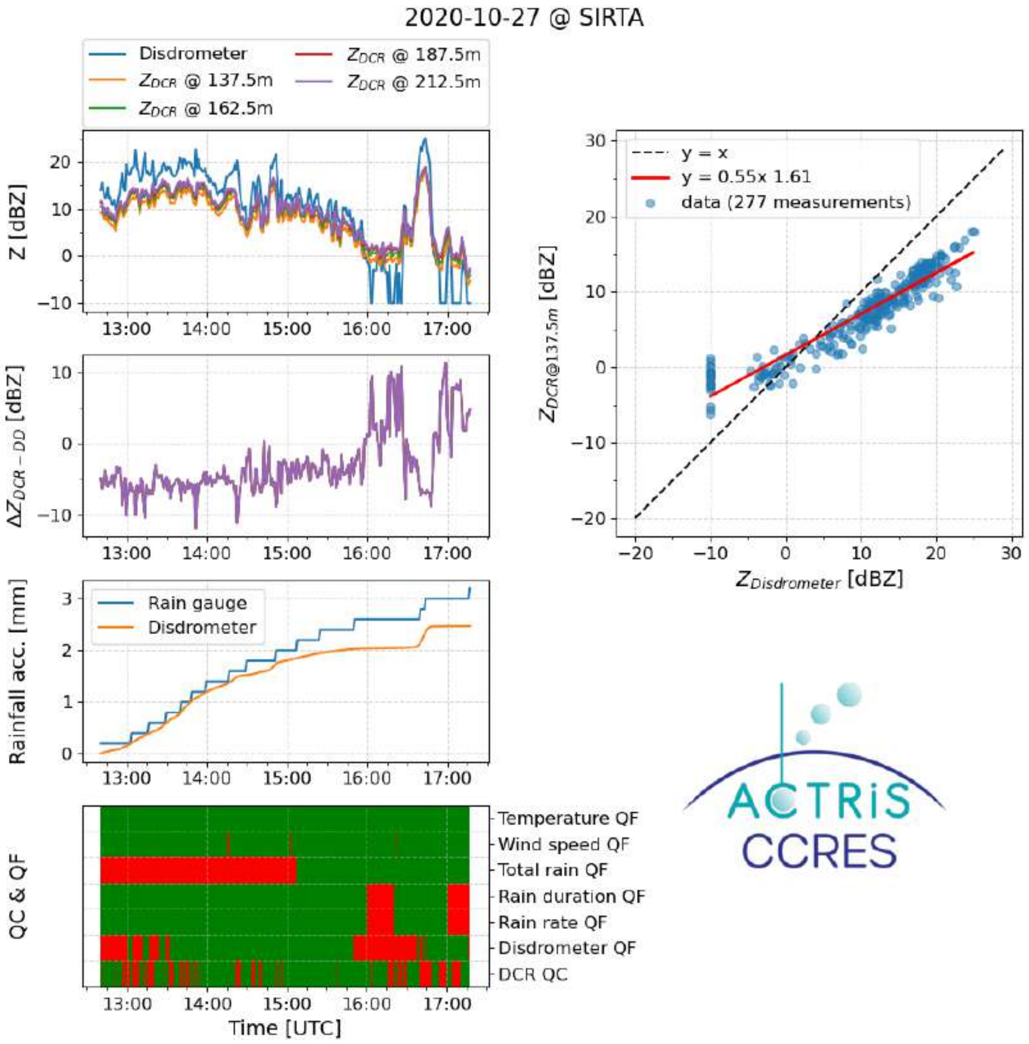
Take home message for DCR-CC monitoring

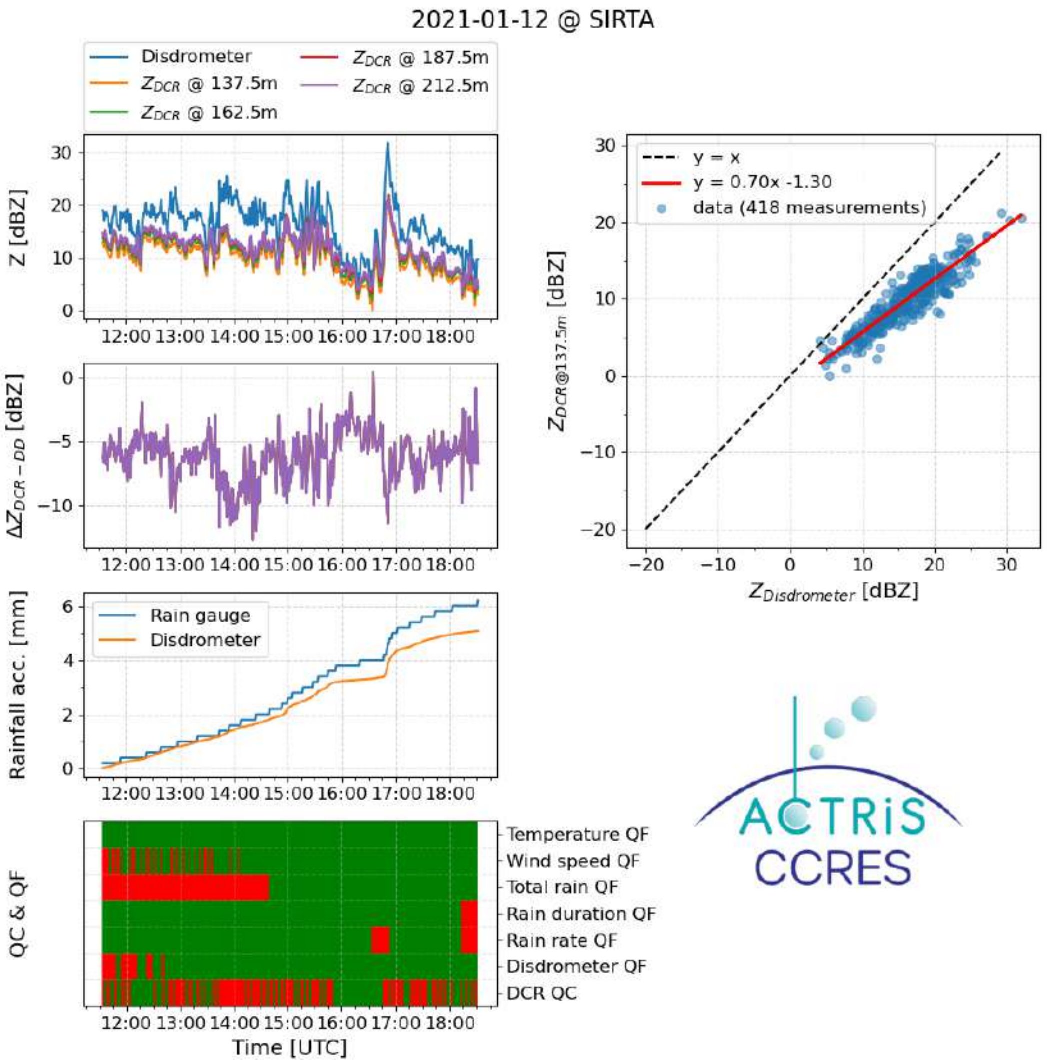
- **Z-DD processing**:
  - **Algo Z-DD_v0. :** was developed 5 years ago by Julien et al.
  - **Algo Z-DD_v1a :** update in 2021 by Marc-Antoine et al. (ready for SIRTA data for a long-term period), run at IPSL server
  - **Algo Z-DD_v1b :** apply to JOYCE dataset, run at IPSL server
  - **Algo Z-DD_v2 :** run Z-DD processing at **CLU-DC**.
    - Use DD homogeneous input data and metadata for all NF sites
    - Derive Z
    - Create one L1 DD dataset
- **CLU-DC** : Merge into one unique netcdf file and transfer to **AERIS-DC**
- **AERIS-DC :** DCR-CC monitoring algo.

Criteria to select a « good » rain event

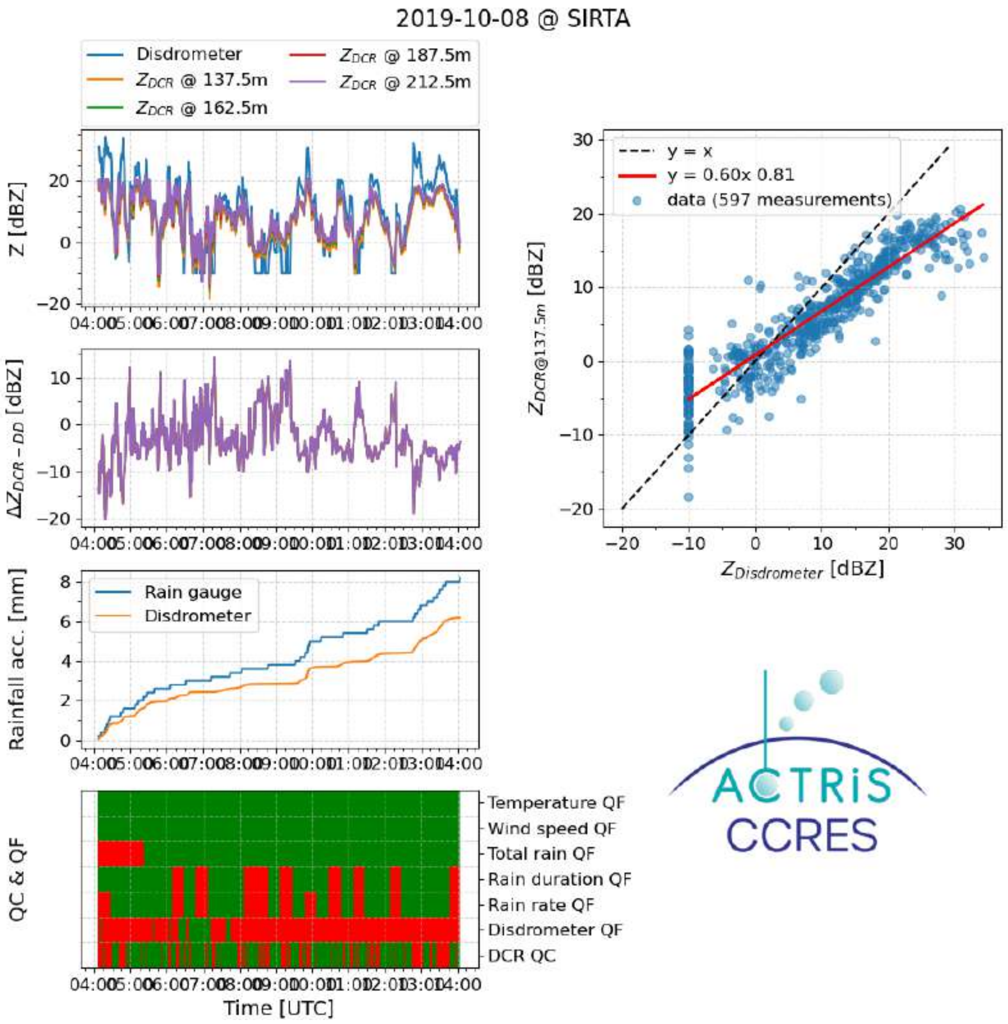
Variables	Limits	Objectives
Temperature	> 2°C	Remove solid precipitations
Wind speed	Max < 10 m/s Average < 7 m/s	Ensure good quality of disdrometer measurements
Rain gap	< 1 hour	Ensure rain continuity
Rain rate	> 0 mm/h < 3 mm/h	Have “moderate” precipitations
Cumulated rain	> 3 mm	Have significant cumulative precipitation to ensure good statistics
Rain duration	> 3 hours	

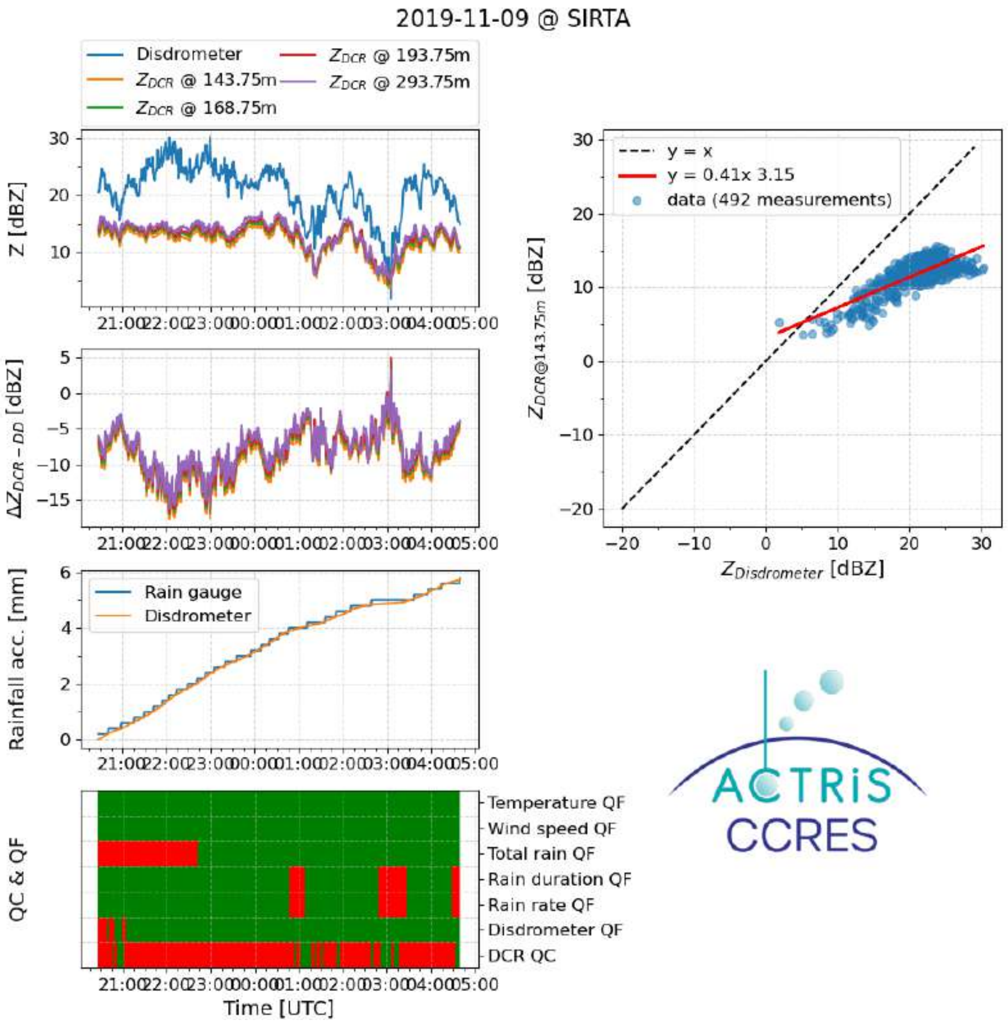
Some alerts and flags for typical rain events / monitoring at SIRTA site



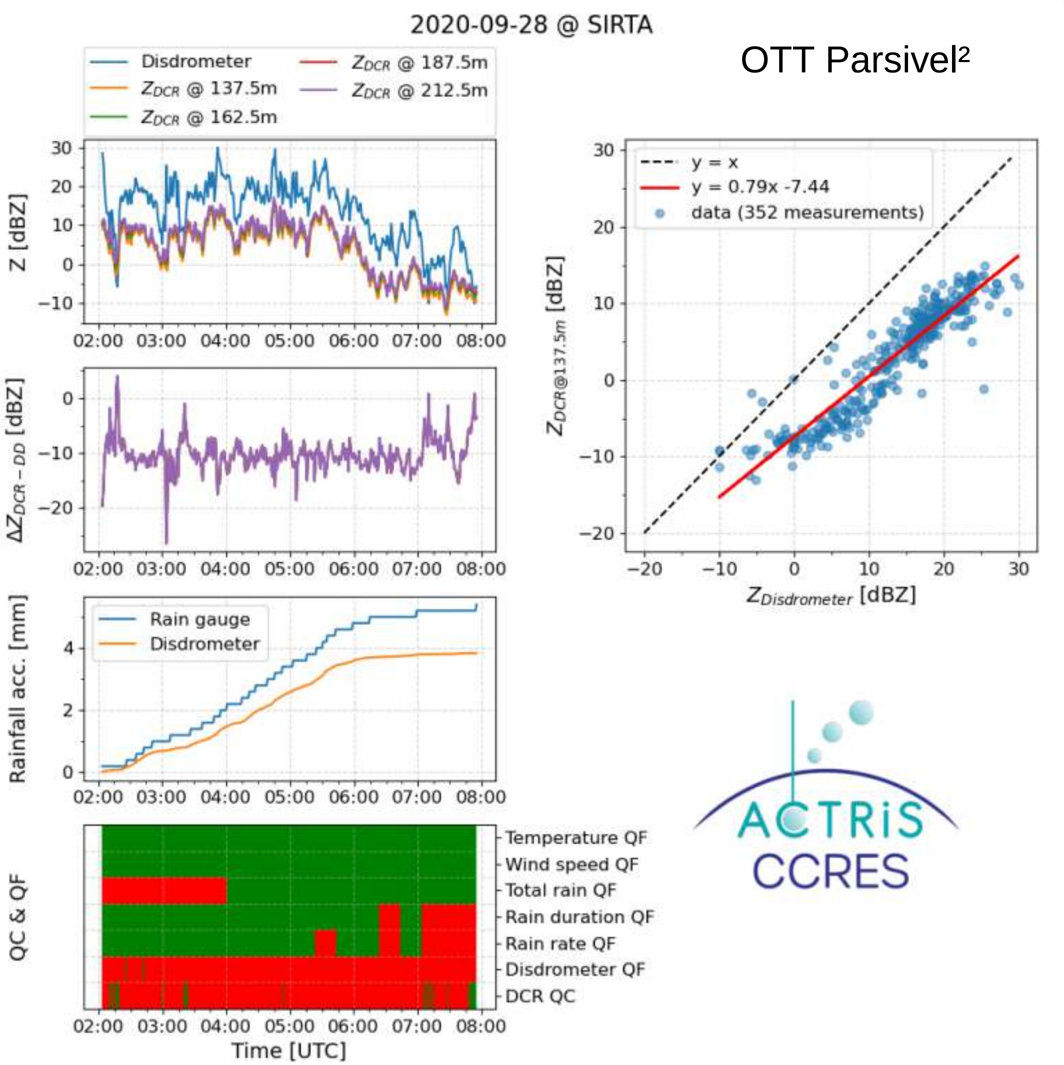


Some alerts and flags for typical rain events / monitoring at SIRTA site

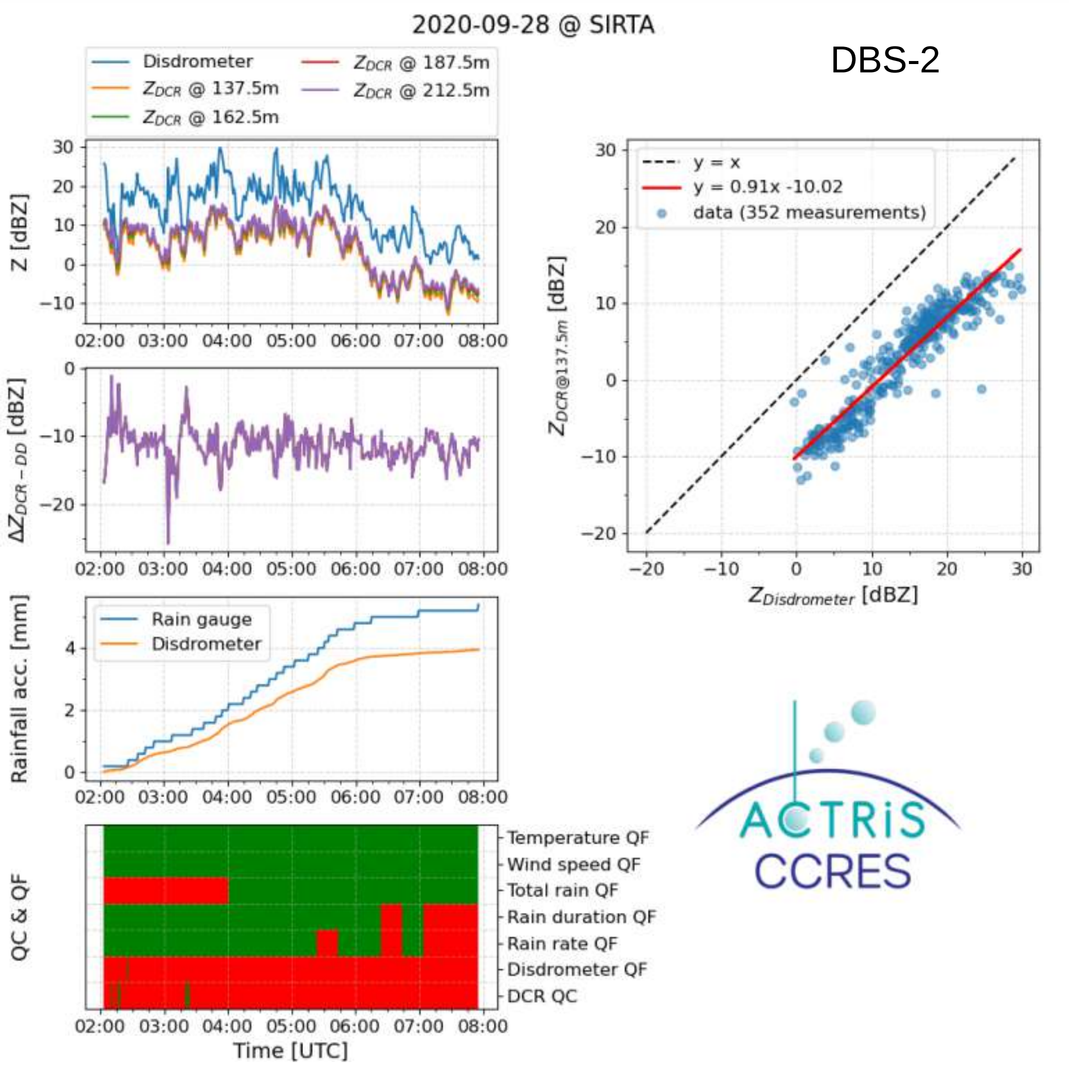




Some alerts and flags for typical rain events / monitoring at SIRTA site



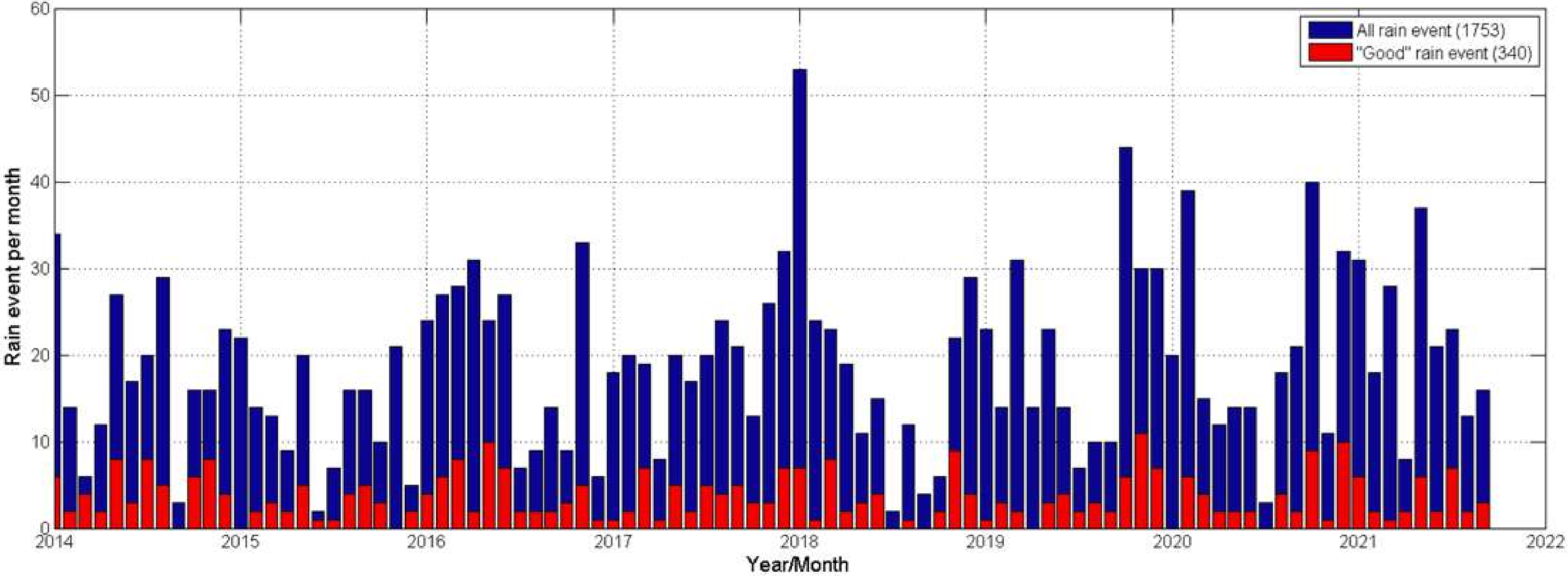
OTT Parsivel²



DBS-2

DCR-CC example for a long time series at SIRTA

“ALL” and “GOOD” rain events at SIRTA

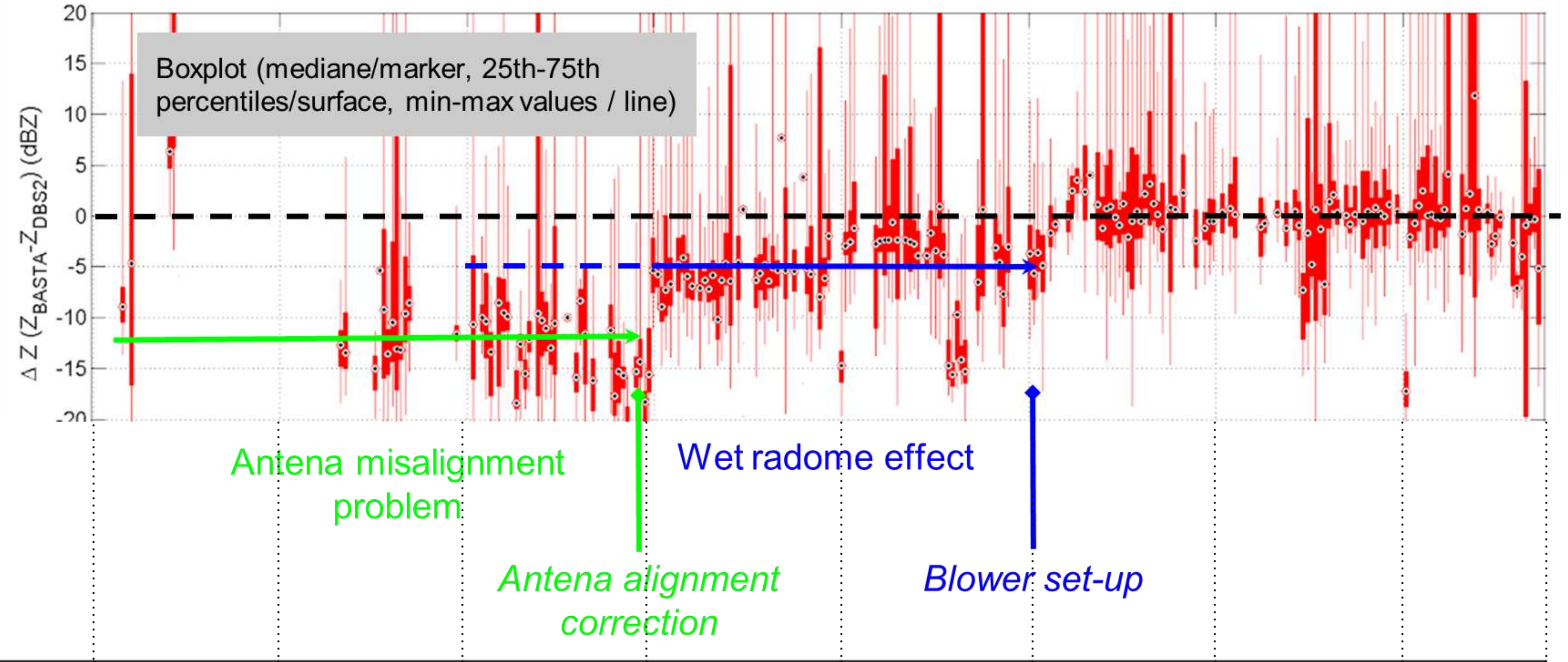


All = 1753 , Good = 340 events

→ **Around 40 events /year, OK for DCR-Z monitoring**

DCR-CC example for a long time series at SIRTA

Raw DCR-Z (@194m) monitoring with DD



Boxplot (mediane/marker, 25th-75th percentiles/surface, min-max values / line)

Antena misalignment problem

Antena alignment correction

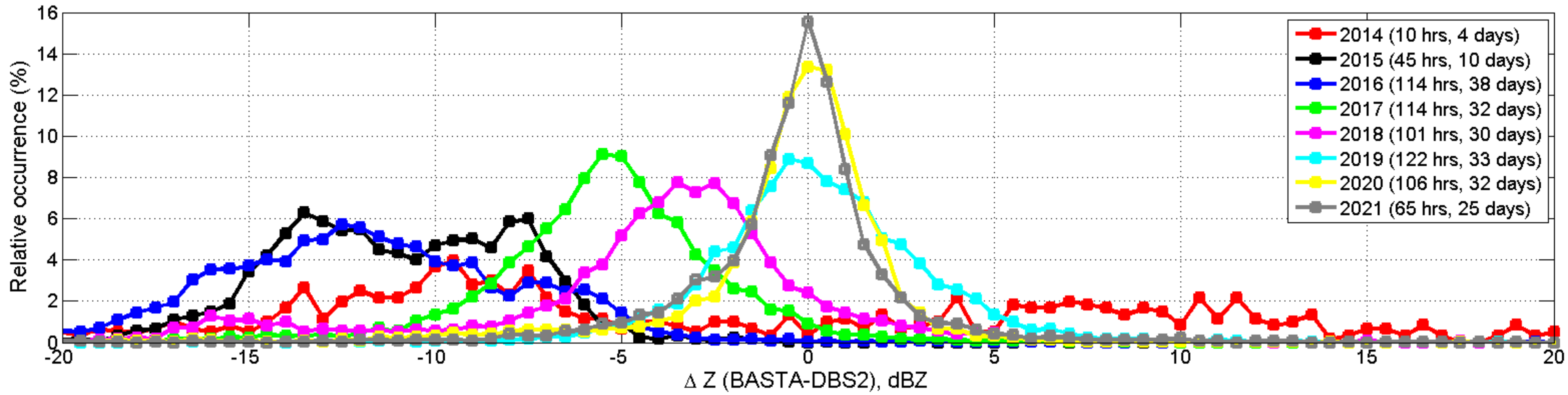
Wet radome effect

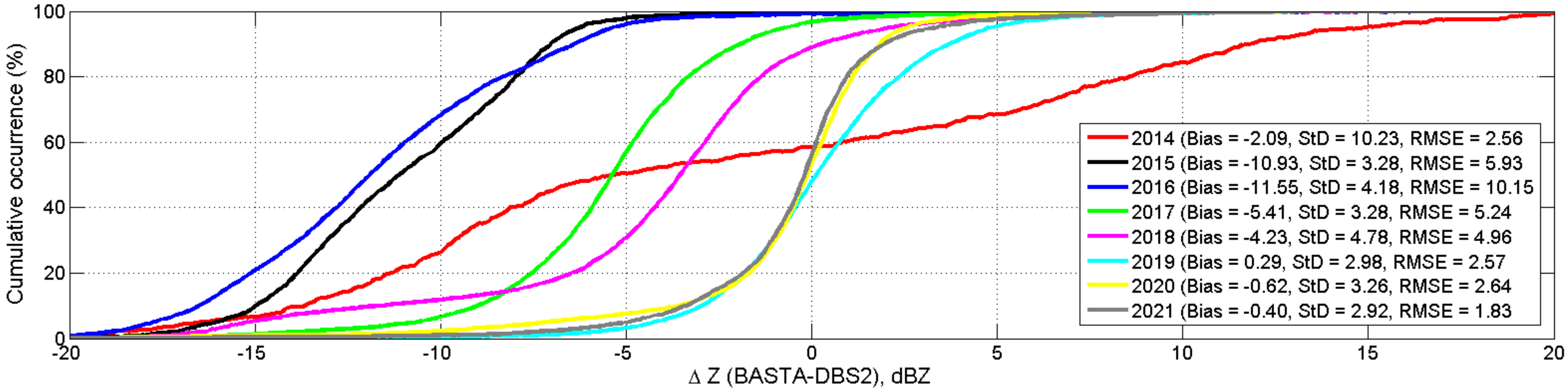
Blower set-up

	2014	2015	2016	2017	2018	2019	2020	2021
Avg.	-	-11.3	-12.1	-4.9	-4.9	0.5	-1.2	-0.2
Std.	-	2.9	3.8	3.8	4.5	1.6	3.7	3.4

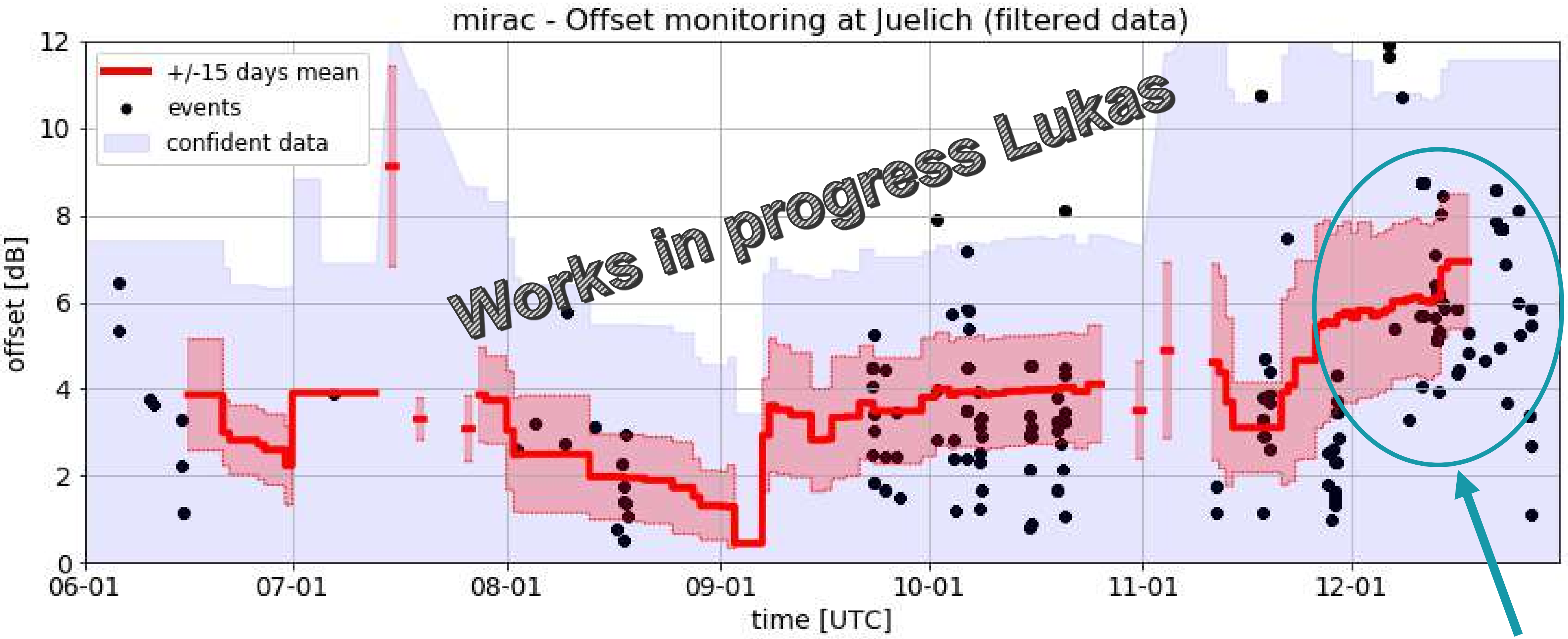
Two major changes on SIRTA DCR have been detected

DCR-CC versus DD, statistics at SIRTA





Example: JOYCE data June-Dec 2019



Averaging according to ESA needs
2 step filtering – 1) to eliminate outliers -> Blue area
2) Averaging in 30 day moving averaging

Melting snow!
Filtering used not good enough for the Dec cases

Perspectives

- See when and how the Weather Station data collection can be done by the CLU DC
  - PID
  - Data format
- See how we can implement the conversion from asccii to netcdf at CLU DC
  - DD : disdroDB or similar code
  - WS : python converter
- Apply our methodology to JOYCE dataset (DCR, WS and DD) : POC
- Follow the DisDrometer accuracy :
  - Develop the calibration methodology (fixed or mobile ref DD)
- Identify several pilot NF site :
  - to start the Weather Station data flow
  - to test the ascii/netcdf converter for WS and DD

ACTRIS

CCRES

Thanks for your attention. Questions ?

ccres_contact@listes.ipsl.fr