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# Standard Operating Procedures

## Disdrometer

This document describes the **Standard Operating Procedures (SOPs)** that must be applied to all disdrometers contributing measurements to the ACTRIS Cloud Remote Sensing Data Centre.

### Plan

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## I. Site requirements

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1	Operation area : environment surrounding the instrument	<ul style="list-style-type: none"><li>- Surface: stable, solid and easily accessible installation area.</li><li>- Open view within a cone of specified elevation angle from zenith to prevent obstacles such as buildings or trees.</li><li>- The prevailing wind direction is also important to find the optimal location of the disdrometer.</li></ul>
2	Specific points of attention	-
3	Reliability of internet and power (UPS)	200W for electrical power and internet access for the datalogger (PC+software)
4	Comply with local Safety and Security Rules	The Disdrometer optical laser is eye-safe.

## II. Operation modes

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1	Stability	Keep the instrument always on power. This ensures permanent temperature and humidity stabilization.
2	Scanning modes	-
3	Ensure collection of data	Data collection is ensured by the disdrometer software installed on a computer.
4	Ensure collection metadata and housekeeping data	Metadata and housekeeping data collection is ensured by the disdrometer software installed on a computer.
5	Continuity	24/7
6	Ensure accurate system clock and location	Use UTC if possible (no changing with Summer Time), use ntpd or GPS reference
7	Ancillary measurements to be performed	Weather station to monitor air temperature, precipitation rate and wind speed
8	Recommendations to maximize good working order of the instrument	The good working order of the instrument depends on the type of precipitation : (1) too thin precipitation can induce bias (limit of sensitivity of the sensor) (2) high wind speed can induce bias in the measurement (fall velocity versus turbulent/horizontal wind) (3) negative temperature leading to ice and snow.

## III. Monitoring of system parameters

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1	Instrument status dashboard(s) and (automatic) alert systems (applied on data and housekeeping data)	Objective : Quasi NRT HKD : disdrometer box temperature, sensor status, sensor voltage, heating current Geophysical data : min/max of drop size and velocity, min/max of precipitation rate System / data logger : free disk space
2	Housekeeping data threshold and available variability	To be discussed with manufacturer, different for each disdrometer
3	Web sites to access QLs	Time series of rain rate. 2D plot : size or velocity versus time , colorbar = density of measurement
4	Visual inspection of instrument (e.g. remotely controlled camera)	A remotely controlled camera can be a good idea to check that the sampling area is free of obstacle (insect for example).

#### IV. Data types and database connection

1	Data type	<ul style="list-style-type: none"> <li>- Size distribution and velocity distribution</li> <li>- Rain rate</li> <li>- Housekeeping data of the instrument (temperature, laser, status).</li> <li>- Metadata should be included to precise some important data/constant for the processing (collect surface for example).</li> </ul>
2	Data format	<ul style="list-style-type: none"> <li>- Netcdf file with data and metadata</li> <li>- Ascii file with data and header</li> <li>- Not binary file</li> </ul>
2	Temporal resolution of the data	Every 60 seconds for diameter and velocity bins. Same for rain rate. Should be clear if the time stamps indicate the starting time of the measurement or the ending time
3	Temporal resolution of the metadata	Similar to resolution of data
4	Range resolution of the data	-
4	Raw data and metadata flow (including housekeeping data) implementation to the data center	Site dependent (contact the CF)

## V. Maintenance schedule

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1	Preventive maintenance	Cleaning of the screen (insect, grass, etc.) Monitoring of the laser status and housekeeping data
2	Likely component replacements	Replacement of the laser after a few years of operation. Replacement of the air pump after a few years if needed for the disdrometer.
3	Likely software issues, software upgrades	

## VI. Documentation

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1	Synthesis of technical actions (e.g. on-line log book)	-
2	Procedure and technical documents	- CCRES DD Software configuration v1: <a href="#">link</a>
3	Web form	-
4	Training guides	
5	Recording of maintenance actions	