ACTRIS CCRES

CloudNet-CloudSat comparison code

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EarthCARE overpasses

EarthCARE overpasses over CloudNet sites in 200 km and 15 km radiuses for a 28 day period.
Overpasses calculated with esovng and data from ESA.

Site	Country	200 km radius N° of overpasses	15 km radius N° of overpasses
Bucharest	Romania	12	0
Cabauw	Netherlands	13	1
Chilbolton	United Kingdom	12	0
Galati	Romania	12	0
Granada	Spain	10	0
Hyytiala	Finland	17	1
Julich	Germany	14	2
Kenttarova	Finland	22	2
Lampedusa	Italy	10	0
Leipzig	Germany	12	1
Lindenberg	Germany	13	1
Mace	Ireland	14	0
Mindelo	Cabo Verde	8	0
Munich	Germany	12	0
Norunda	Sweden	16	0
Ny-Alesund	Norway (Svalbard)	54	4
Palaiseau	France	12	0
Payerne	Switzerland	10	2
Potenza	Italy	11	0
Rzecin	Poland	13	1
Schneefernerhaus	Germany	12	1
Warsaw	Poland	14	2
Total		323	18
Mean		12	1

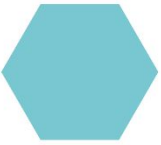# CloudSat-CloudNet comparison code

Goal: compare EarthCARE and CloudNet data for validation of EarthCARE products with ACTRIS

➢ Prepare the code with CloudSat data.

➢ Allows us to validate the code using historical ACTRIS data.

Summary of the code: compare CloudSat and CloudNet data on certain time periods using statistics (Protat et al. 2009, Kolias et al. 2019).

- Data are collocated beforehand. Date, time and distances of the overpasses are calculated for all the CloudNet sites.

- Data currently used:

CloudNet: categorize file (radar and model); classification file (rain mask).

CloudSat: raw radar file; DARDAR mask *(Delanoë, J., and R. J. Hogan, 2010)*(rain mask).

- Rain is filtered using the classification from CloudNet and Cloudsat DARDAR mask.
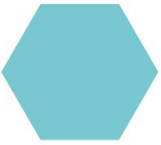
CloudSat-CloudNet comparison code
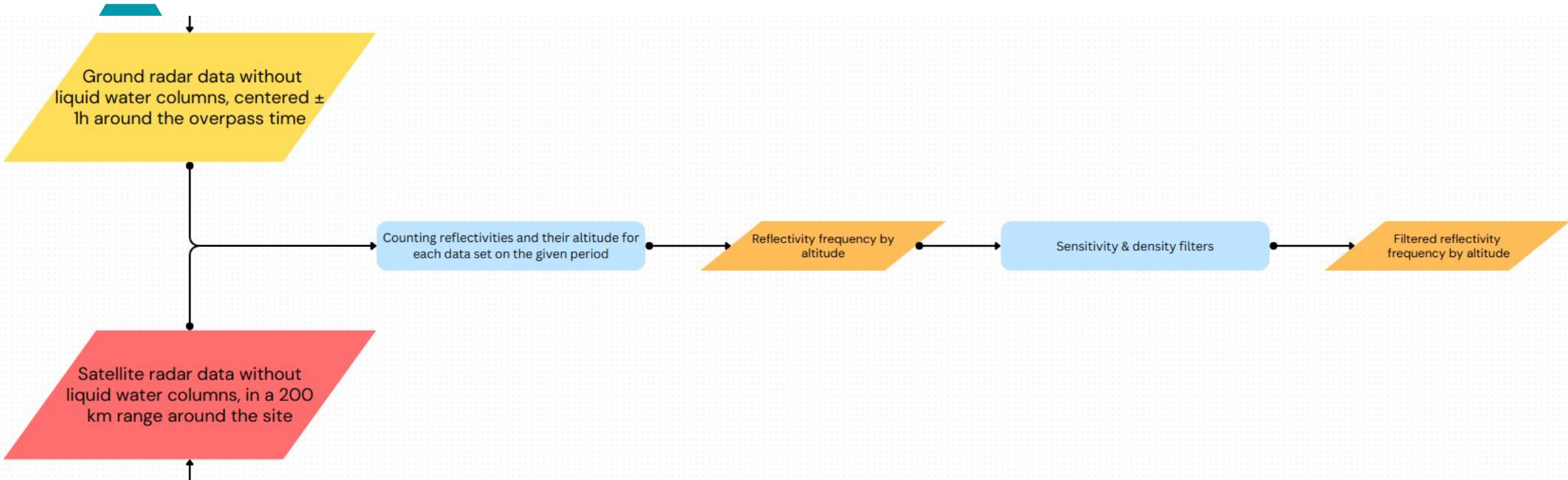
Code principles

CloudNet data processing

CloudNet Categorize file

↓

Select columns in ± 1h around the overpass time

↓

Ground radar data centered ± 1h around the overpass time → Remove radar columns containing liquid water using the classification

CloudNet classification data

↓

↓

Ground radar data without liquid water columns, centered ± 1h around the overpass time
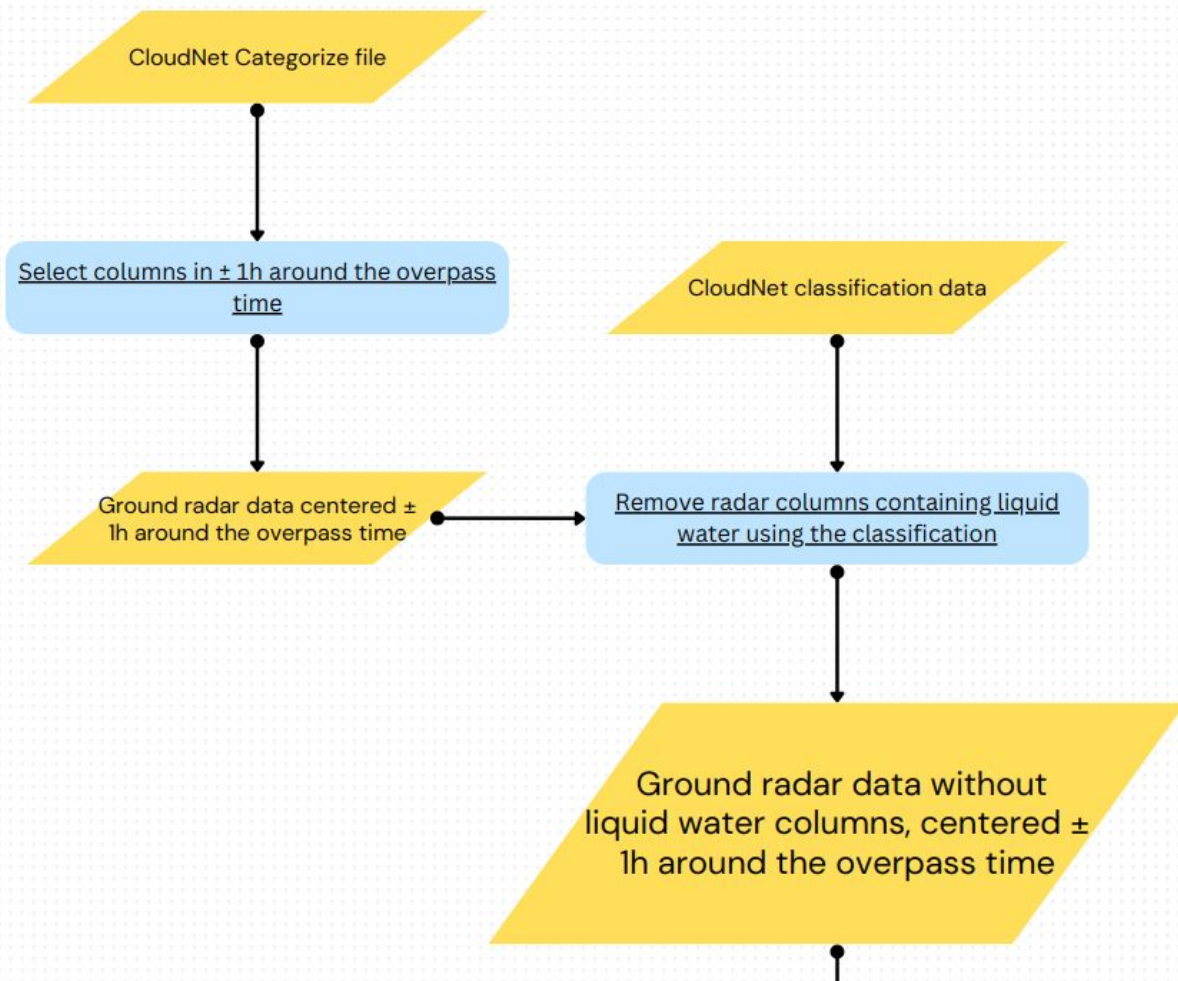
CloudSat data processing

Satellite radar data without liquid water columns, in a 200 km range around the site

↑

Satellite radar data → Remove radar columns containing liquid water using DARDAR mask

↑

Select columns in a 200 km range around the observation site

↑

DARDAR mask

↑

CloudSat radar data

CCRES

CloudSat-CloudNet comparison code
Code principles

Ground radar data without liquid water columns, centered ± 1h around the overpass time

Satellite radar data without liquid water columns, in a 200 km range around the site

Counting reflectivities and their altitude for each data set on the given period

Reflectivity frequency by altitude

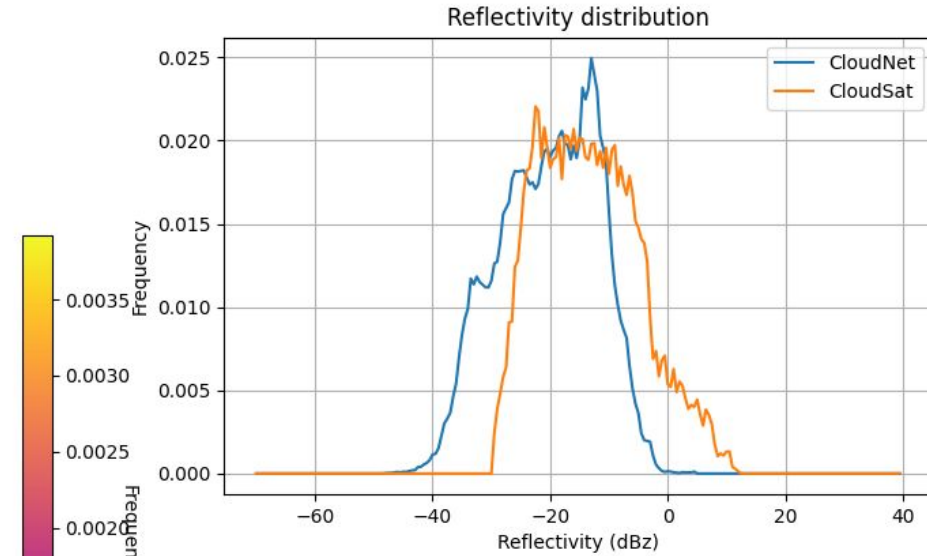Sensitivity & density filters

Filtered reflectivity frequency by altitude

Statistical comparison
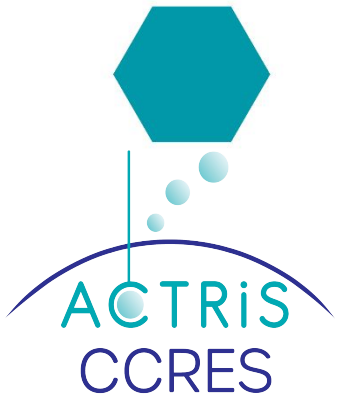
CloudSat-CloudNet comparison code
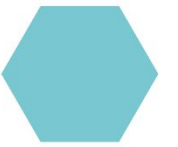
Output figures: masking data

Overpass of the 2017-08-08, at 02:18:28, over Palaiseau.
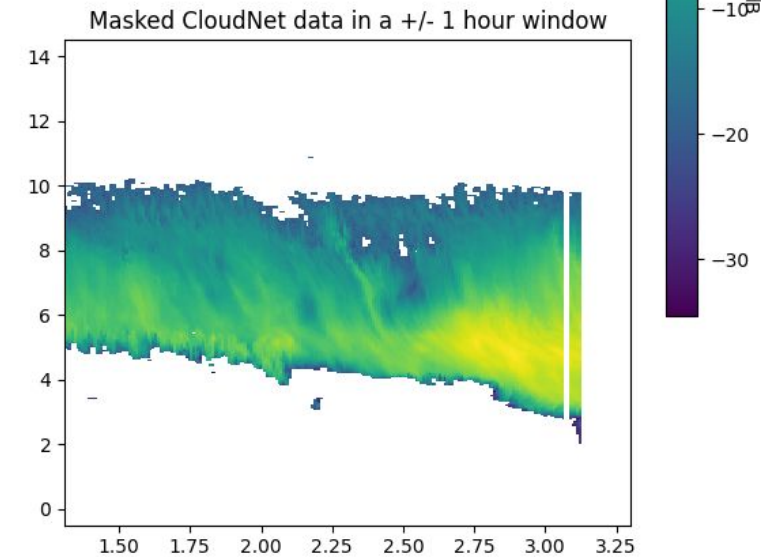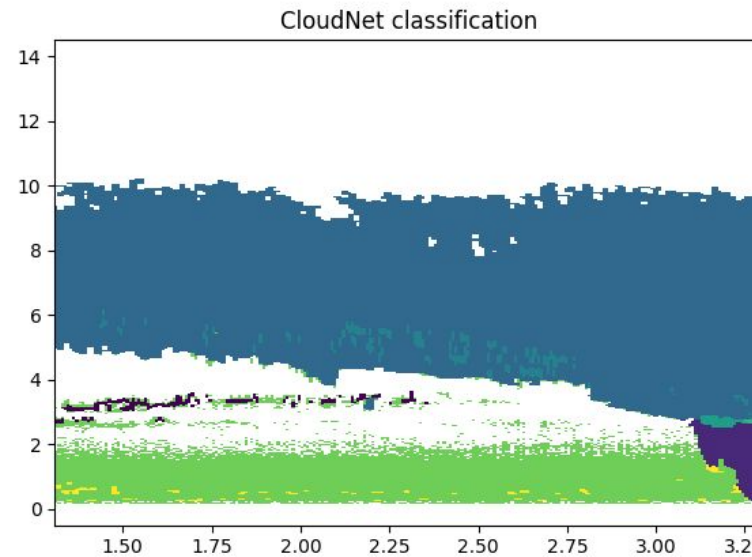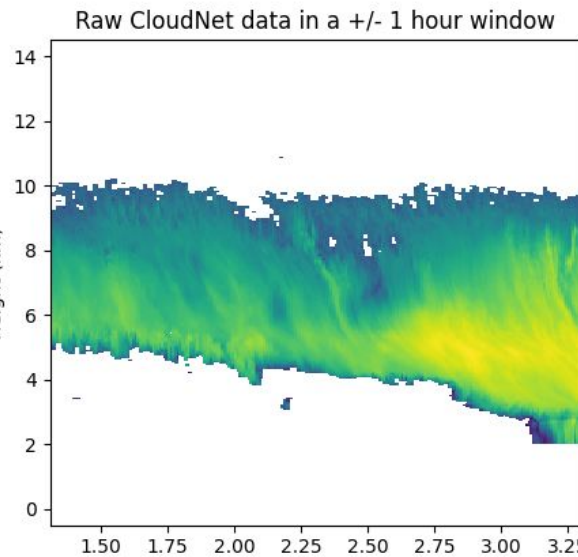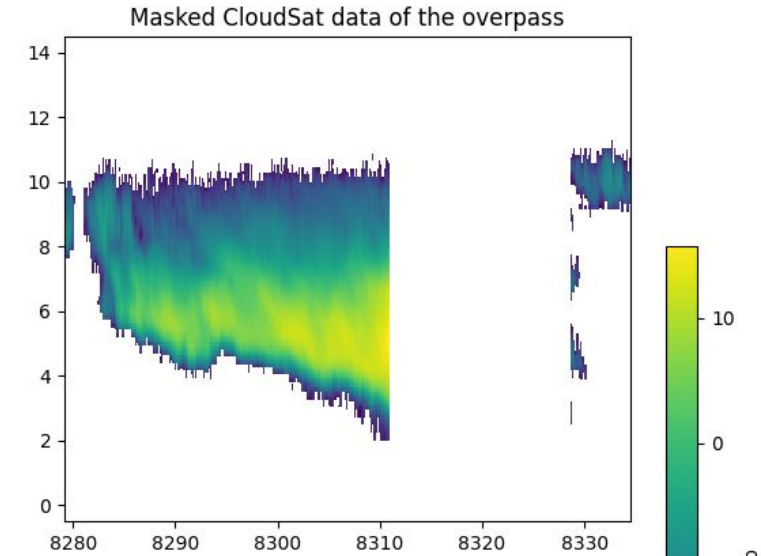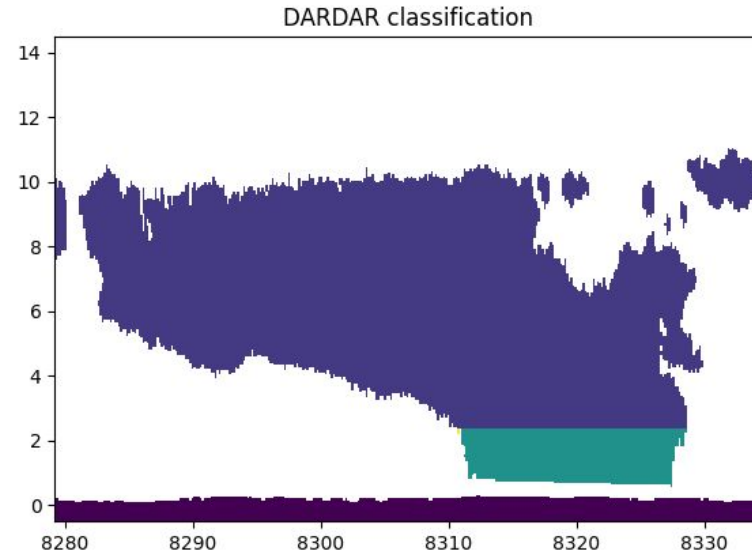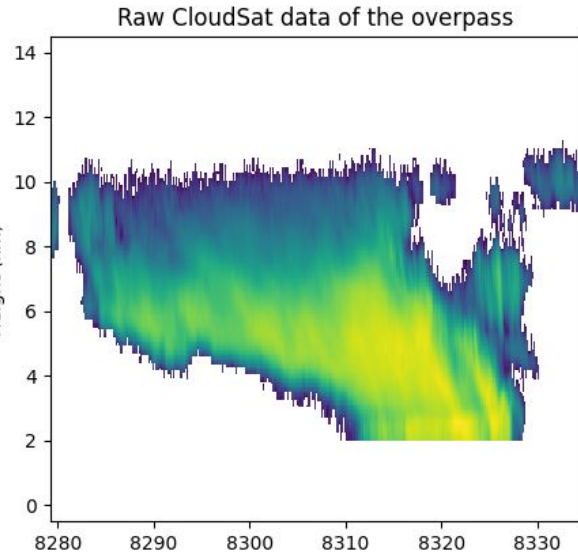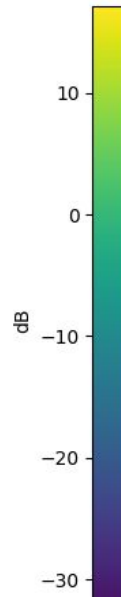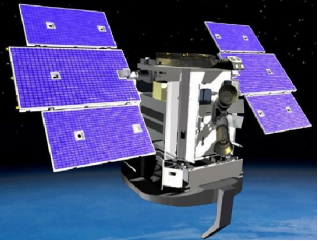
CloudSat-CloudNet comparison code

Output figures: daily statistics

CloudNet and CloudSat comparison for the overpass of the 2017-08-08 over Palaiseau.
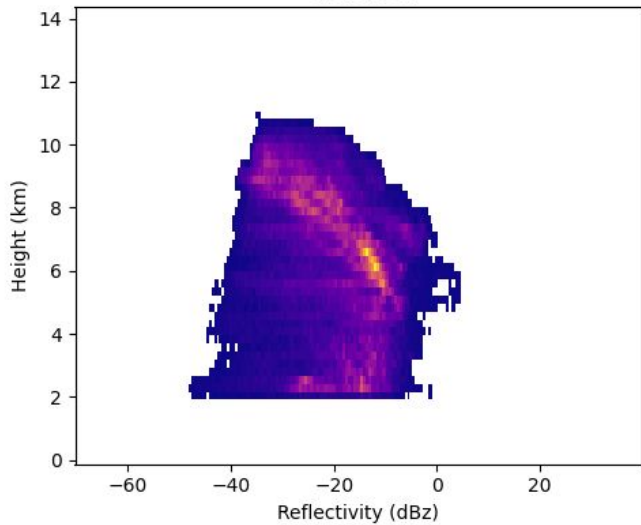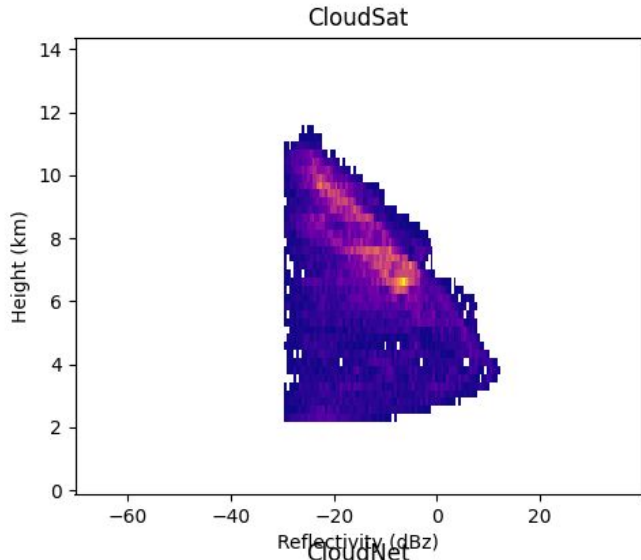CloudNet median: -4.0, CloudSat median: -8.3
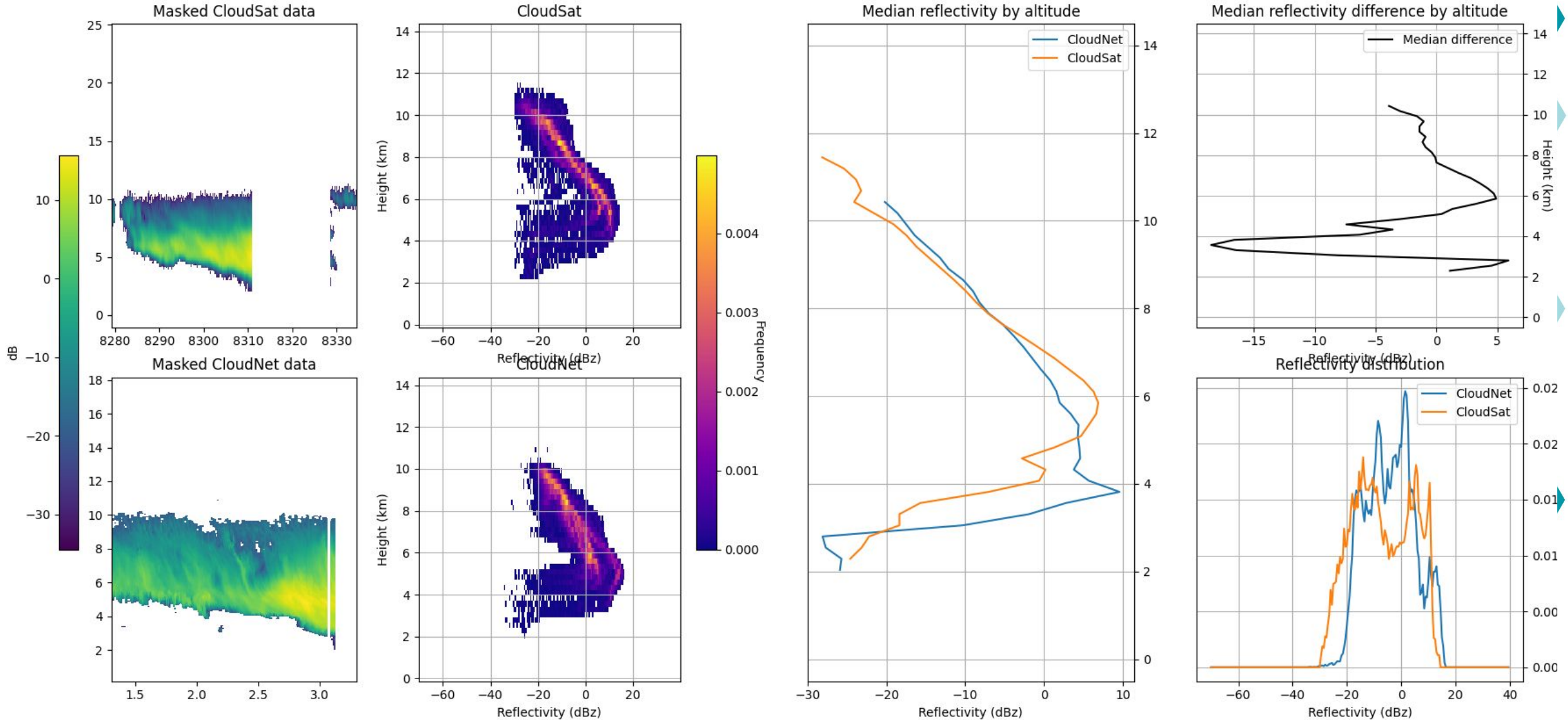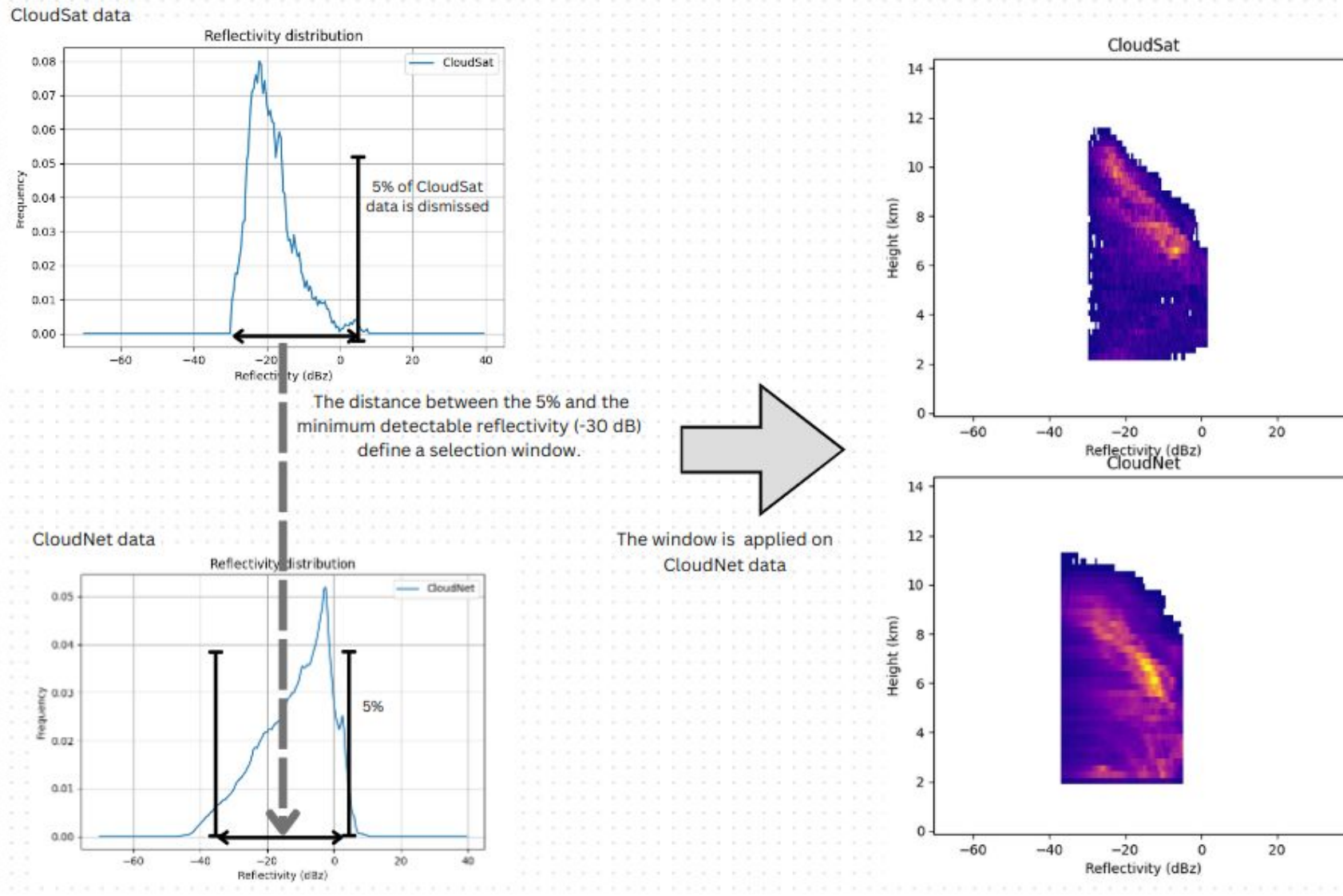
CloudSat-CloudNet comparison code

Output figures: statistics for a period

CloudNet and CloudSat comparison for Hyytiälä for the period: 2018-01-01--2018-12-31
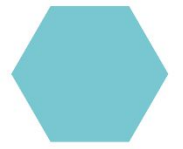CloudNet median: -20.0, CloudSat median: -14.3
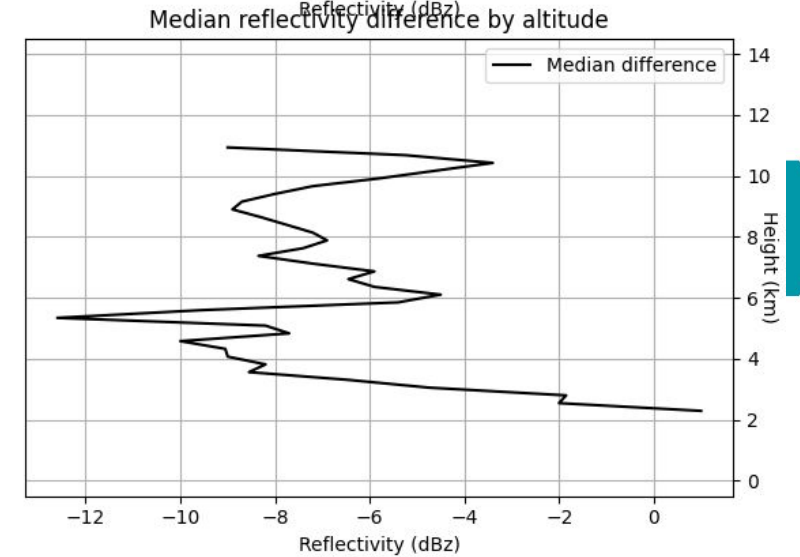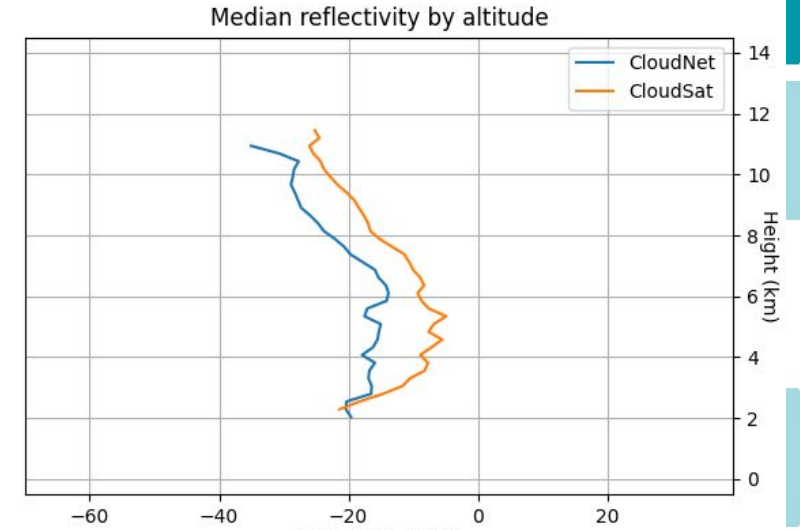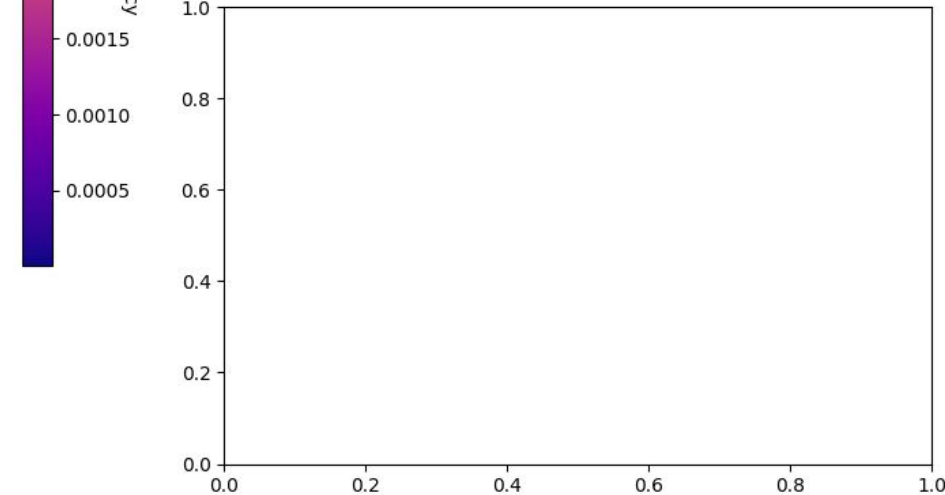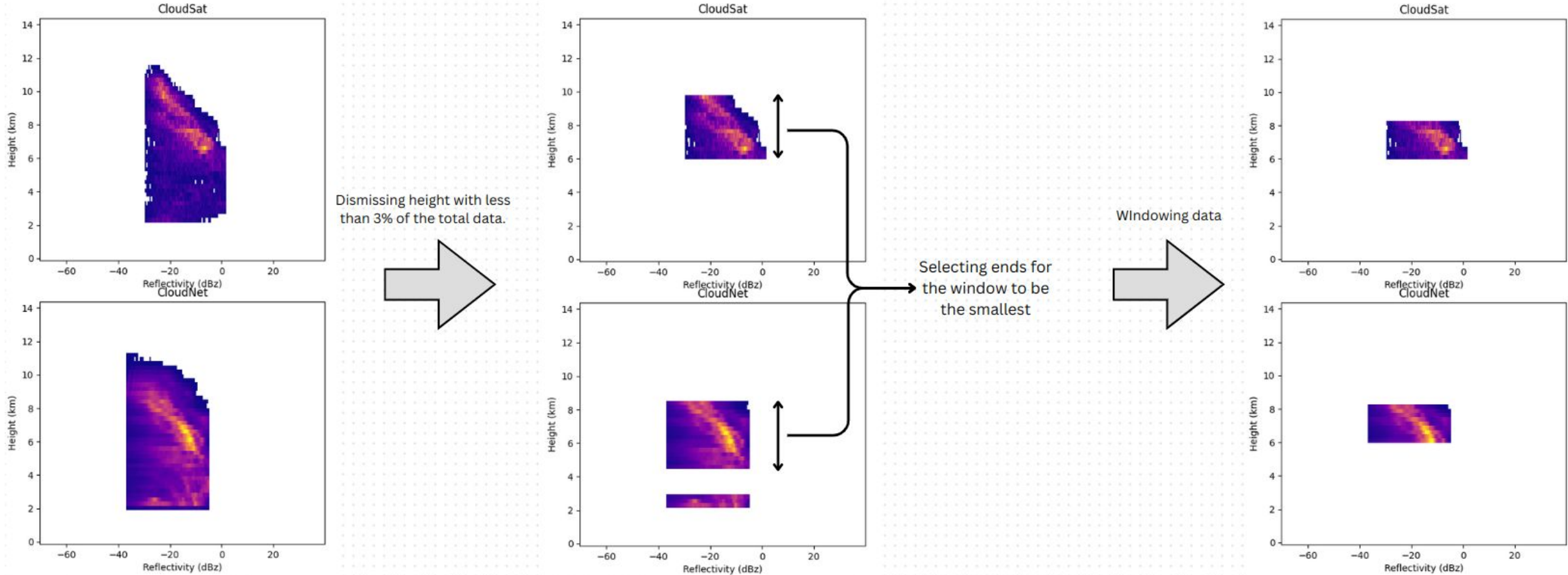
CloudSat-CloudNet comparison code

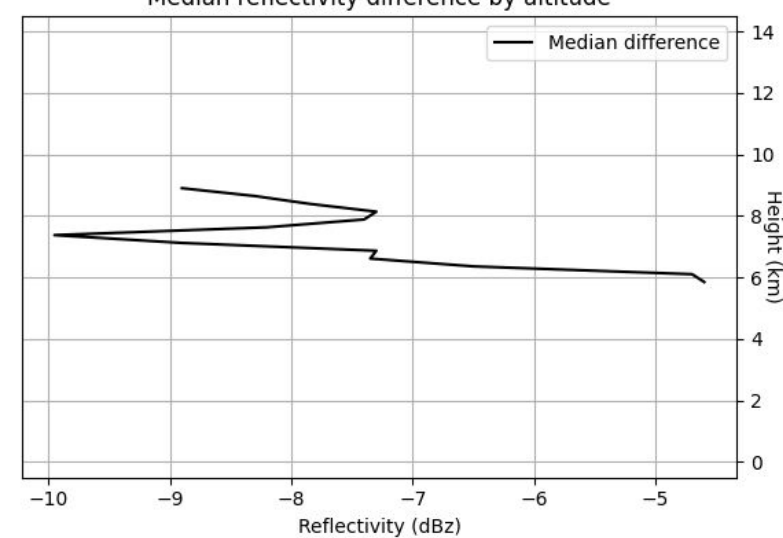## Sensitivity filter
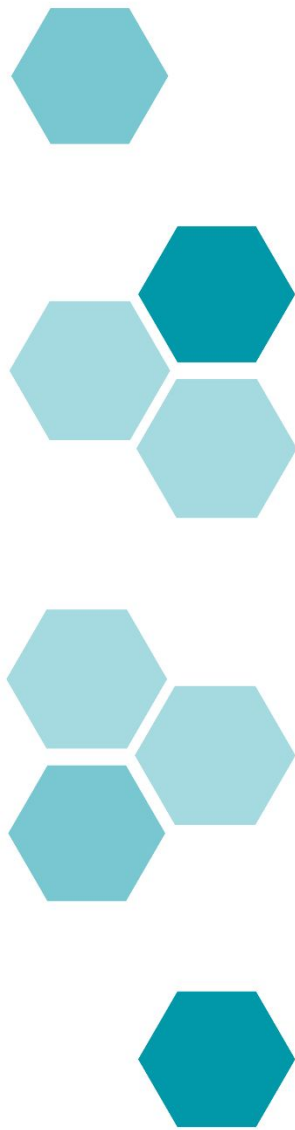
CloudSat-CloudNet comparison code

Density filter

CloudSat-CloudNet comparison code
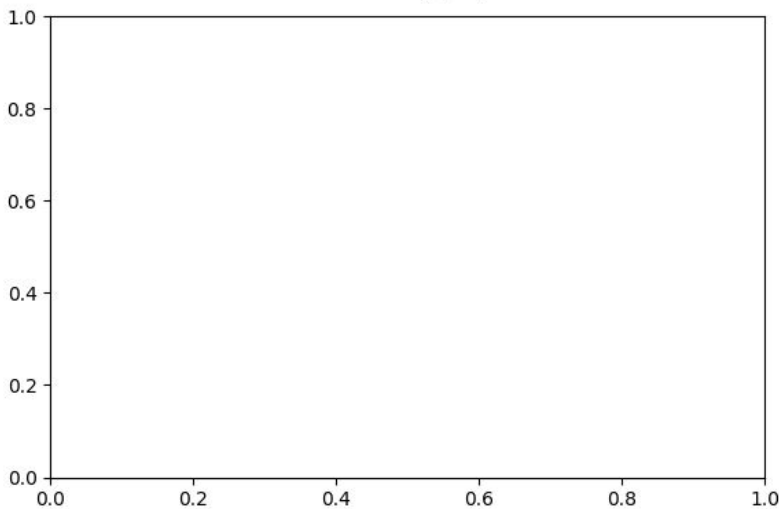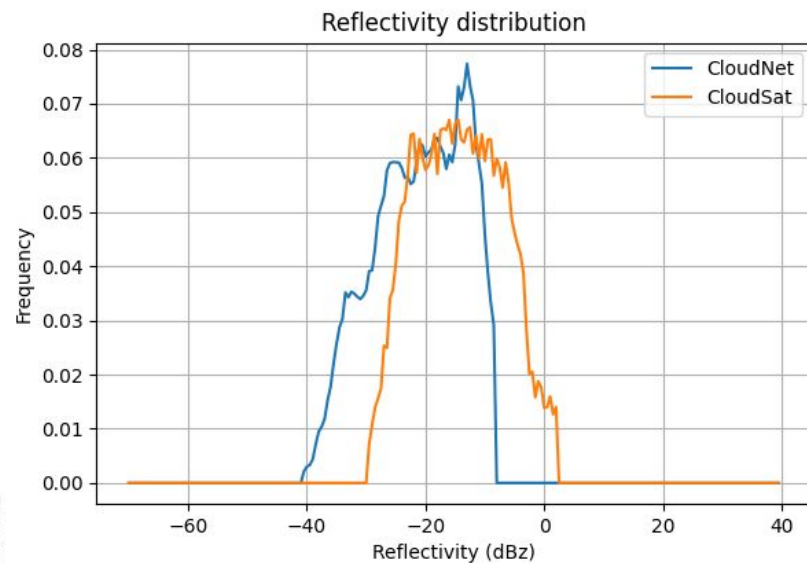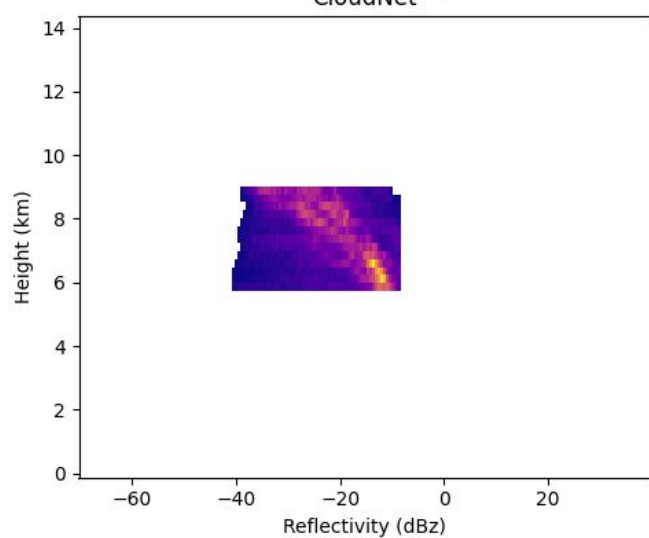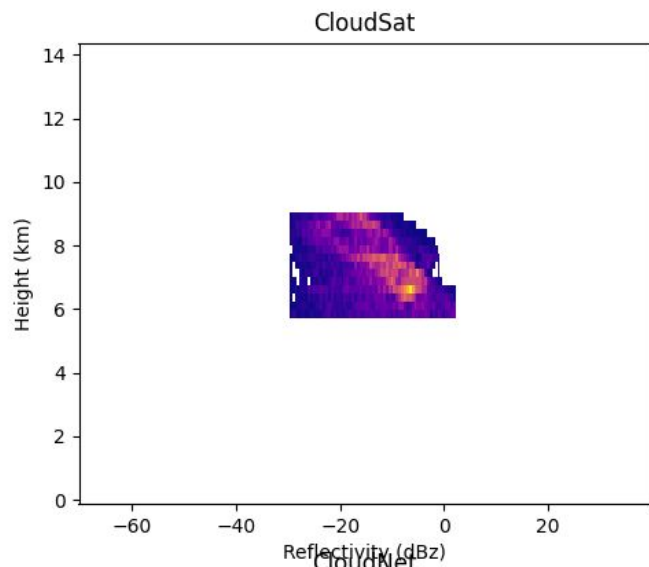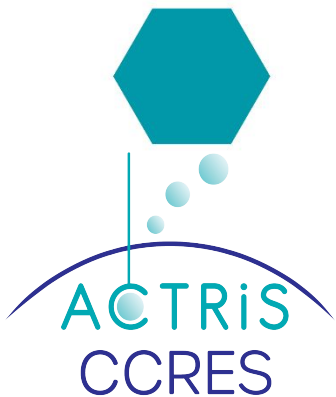
Output figures: filtered statistics for a period

CloudNet and CloudSat comparison for Hyytiälä for the period: 2018-01-01--2018-12-31
CloudNet median: -21.2, CloudSat median: -13.0
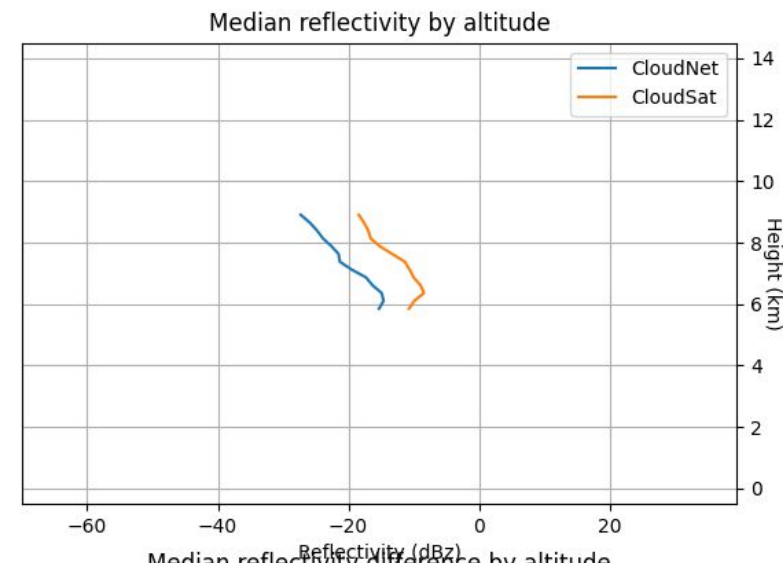
CloudSat-CloudNet comparison code

Work still to be done:

- Space re-sampling of the ground radar data to match ground and satellite resolutions.

- Evaluation of the time needed (number of overpasses) to obtain enough data for statistics.

- Evaluation of the offset between CloudSat and CloudNet for each period of time.

- Estimate the uncertainty in the results.

- Do the analysis on several ACTRIS sites.

Thank you