



Doppler wind LIDAR data for Paris (4 sites), Munich (2 sites) and Zurich (2 sites)

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1.15	2025-01-30	CH, AC	Split Paris datasets into 2 sections for clarity
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Introduction

This dataset overview document provides metadata for the Doppler Wind Lidar data obtained during the Pilot Applications in Urban Landscapes campaigns in Zurich, Munich and Paris. In Paris, data was obtained in a multi-institution, multi-project consolidated effort. The processing of the harmonized dataset in Paris was conducted with larger effort and different processing was applied, compared to the other datasets described in this document.

The datasets contain vertical profiles of the three wind components. All wind components were aggregated via vector averaging into 30-minute averages for all observed periods with valid data. For Paris, the harmonized dataset was aggregated into 1- and 60-minute averages.

Several different instruments were used during the campaigns. Two types of pulsed Scanning Doppler Wind Lidars were used by two different manufacturers, Vaisala (formerly Leosphere) WindCube series and Lumibird (formerly HaloPhotonics) Streamline (XR) series. In addition, a continuous-wave frequency-modulated Doppler Wind Lidar Metek Windranger 200 was used.

The Vaisala instruments utilize Vaisala's proprietary retrieval algorithms to obtain vertical profiles of the wind components from Doppler-Beam-Swinging (DBS) scans. Additionally, Fixed-Line-of-Sight scans were conducted between individual DBS scans, in which the vertical wind speed component was recorded with a roughly 1 Hz frequency. The pulsed instrument records all range gates along the entire profile simultaneously for each scan point.

Analogously, the Metek instrument utilizes its own algorithms developed by Metek. The wind components are evaluated from Velocity-Azimuth-Display (VAD) scans at 80 degrees elevation, which are executed once per second for one measurement height. The continuous-wave instrument records one focus height for each scan, and refocuses the telescope in different heights, to obtain vertical profile coverage.

The retrieval of the wind components from Velocity Azimuth Display (VAD) scans using the Lumibird devices was developed by C. C. Holst following the algebraic approach discussed by Teschke and Lehmann (2017, <https://doi.org/10.5194/amt-10-3265-2017>). Instead of applying this operation for each aggregation interval, the three wind components were obtained for each individual VAD scan at 70 degrees elevation angle and then aggregated using vector averaging for all individual components. This method has in our experience yielded more reliable statistics and especially allows more accurate estimates of wind direction fluctuations.

Any site-, instrument- or city-specific deviations from the general information described in this section is outlined in the corresponding sections below.

Zurich

Title

Doppler Wind Lidar vertical wind profiles at Hardau, Zurich, Switzerland

Description

In addition to the information mentioned in the introduction, there are a few important pieces of information required for data users.

Two Doppler Wind Lidar systems with different range capabilities were co-located near the flux tower measurements to obtain optimal coverage of the vertical wind profile. This means, that this data is provided in two segments: lower and higher altitude wind profile data; one for each instrument.

The filtering and confidence of the data retrieval are focus of this section. The pulsed DWL system and the continuous-wave DWL system were processed and filtered using different criteria as described in the following paragraphs.

For the pulsed system (Leosphere WindCube 100), the variables “Carrier-to-Noise-ratio” (*cnr*) and “Radial-Wind-Speed-Confidence-Interval” (*radial_wind_speed_ci*), as well as “Radial-Wind-Speed-Status” (*radial_wind_speed_status*) were used to classify data quality.

Values were filtered as invalid, when:

- *radial_wind_speed_ci* < 50
- *cnr* < -26
- *radial_wind_speed_status* ≠ 0

The filtering for the continuous-wave system (Metek Windranger 200) was derived from the “Quality” variable.

Values were filtered as invalid, when:

- *Quality* ≠ 0

All filtered values were replaced with NaN. Then, the resulting data of both instruments was aggregated, using the numpy nanmean and nanstd functions for each 30-minute interval during the measurement period. If no sufficient valid data was present in a 30-minute interval, the aggregate value was set to NaN (which is the FillValue for this dataset).

The vertical dimension was not aggregated or interpolated in any way, such that inherent technical limitations of the instrumentation limit the accuracy and data-availability of this aspect.

Data Level

This dataset is designed to be treated as Level 2 data.

It is important to point out, that Doppler Wind Lidar data is not easily classified, so there is a possibility, that the abovementioned quality checks missed some data of questionable quality. If in doubt, reach out to the authors for clarification.

Size

The Windranger dataset consists of 260 Files with a total size of approximately 20 MB.

The WindCube dataset consists of 208 Files with a total size of approximately 20 MB.

All data is compressed and encoded in binary files.

Date and time range

The start and end dates of the campaigns are given below.

Instrument	Leosphere WindCube 100	Metek Windranger 200
Start date	2022-09-08	2022-07-07
End date	2023-04-04	2023-04-12

Sampling height

Between the two instruments there are three sets of vertical measurement heights:

Leosphere WindCube 100	Vertical wind	Horizontal wind
Measurement height start in m	200	200
Measurement height end in m	12000	8100
Range gate length in m	100	50
Range gates count	119	159

The Metek Windranger 200 measured at 10, 20, 40, 60, 80 and 100m above the instrument.

Station location

This data was collected at the station VBZ Zentralwerkstätte ("zvbz") and Hardau II Tangoschule ("hard2"). Both instruments were located at slightly separate locations, as shown below:

Instrument	WindCube 100	Windranger 200
Short name	ZVBZ	Hard2
Long name	VBZ Zentralwerkstätte	Hardau II Tangoschule
Latitude	47.3859	47.38097
Longitude	8.4915	8.509833
Elevation (above sea level in meters)	407.3	413.0
Description, notes, comments	Times are in UTC.	

For practical purposes, the small spatial separation should not affect the interpretability of the data.

Variables

Both types of instruments share the data structure and follow common definitions and conventions, as well as formatting. For the Windranger 200 data the vertical coordinates are simpler, as only one scan mode was used, whereas the WindCube data requires two separate sets of vertical coordinates for horizontal and vertical wind components, respectively.

The Windranger data variables are shown here:

1-dimensional variables:

Short name	time_index
DataType	int16
Description, notes, comments	Time dimension index
Short name	z_index
Long name	height_index
DataType	int16
Description, notes, comments	Height dimension index

Short name	time_coverage_start
DataType	char
Encoding	utf-8
Description, notes, comments	Data aggregation start time UTC

Short name	time_coverage_end
DataType	char
Encoding	utf-8
Description, notes, comments	Data aggregation end time UTC

Short name	z_height
Long name	height_above_instrument
Unit symbol	m
Unit description	meter above instrument aperture
DataType	float
Description, notes, comments	Distance to target

2-dimensional variables:

Short name	U
Long name	eastward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average u-wind component
FillValue	NaN

Short name	V
Long name	northward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average v-wind component
FillValue	NaN

Short name	W
Long name	upward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average w-wind component
FillValue	NaN

Short name	sigma_U
Long name	standard_deviation_eastward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of u-wind component
FillValue	NaN

Short name	sigma_V
Long name	standard_deviation_northward_wind_component

Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of v-wind component
FillValue	NaN

Short name	sigma_W
Long name	standard_deviation_upward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of w-wind component
FillValue	NaN

For the WindCube data the only notable difference is, that two different vertical coordinates with their corresponding indices are required: one for vertical wind components (w) and one for horizontal wind components (u and v).

1-dimensional variables:

Short name	z_index_u
Long name	height_index_u
DataType	int16
Description, notes, comments	Height dimension index for horizontal wind

Short name	z_index_w
Long name	height_index_w
DataType	int16
Description, notes, comments	Height dimension index for vertical wind

Short name	z_height_u
Long name	height_above_instrument_u
Unit symbol	m
Unit description	meter above instrument aperture
DataType	float
Description, notes, comments	Distance to target for horizontal wind speed

Short name	z_height_w
Long name	height_above_instrument_w
Unit symbol	m
Unit description	meter above instrument aperture
DataType	float
Description, notes, comments	Distance to target for vertical wind speed

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Keywords

Keywords
Doppler Wind Lidar
Vertical wind profiles
Zurich

File Format

The files are provided as HDF5 compressed netCDF4 files with extension *.nc*, such that they are self-documented and machine-readable.

Licence

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Data Access & citation

The data have been uploaded to the ICOS Cities repository as individual daily files, each of which is assigned a basic persistent identifier (PID) and has an associated landing page. As an example, the Lidar data file collected on 2022-12-15 at the Oberpostdirektion site - OPD_2022-12-15.nc – has been assigned the unique persistent identifier string 11676/ gA5qWRKBigPr6Qmaoh8n0tg6 and the landing page <https://citymeta.icos-cp.eu/objects/gA5qWRKBigPr6Qmaoh8n0tg6> with a summary of its metadata and a download link.

To facilitate search and retrieval, the individual data files from the two sites - “Hardau II Tangoschule” and “VBZ Zentralwerkstätte” – have been grouped into two separate collections, which can be cited as follows:

- Holst, C., Hervo, M., Grange, S., Jahn, C., Mauder, M., Emmenegger, L., 2025. Doppler Wind Lidar vertical wind profiles at Zurich, Switzerland (Hard2). <https://doi.org/10.18160/ZB5B-KZ15>
- Holst, C., Hervo, M., Grange, S., Jahn, C., Mauder, M., Emmenegger, L., 2025. Doppler Wind Lidar vertical wind profiles at Zurich, Switzerland (ZVBZ). <https://doi.org/10.18160/WYTJ-5727>

Following the DOI links takes you to the collection landing pages, which list all included files.

Acknowledgements

This data was collected in the context of the “Pilot Application in Urban Landscapes - Towards integrated city observatories for greenhouse gases”, also referred to as ICOS-Cities, (grant agreement 101037319) campaigns in Zurich, financed by the European Commission, with instrumentation and measurement support by the Federal Office of Meteorology and Climatology MeteoSwiss. Special thanks to Maxime Hervo for acquiring the WindCube data, to Stuart Grange for facilitating the data transfer for processing and to Carsten Jahn for taking care of installation procedures, logistics and maintenance.

Paris – Low altitude

Title

Doppler Wind Lidar low-altitude vertical wind profile at LISA Université Paris Diderot, Paris, France

Description

The continuous-wave system WindRanger 200 was deployed at the PALUPD station from 2024-02-10 until present.

The filtering for the continuous-wave system (Metek Windranger 200) was derived from the “Quality” variable.

Values were filtered as invalid, when:

- *Quality* $\neq 0$

All filtered values were replaced with NaN. Then, the resulting data of both instruments was aggregated, using the numpy nanmean and nanstd functions for each 30-minute interval during the measurement period. If no sufficient valid data was present in a 30-minute interval, the aggregate value was set to NaN (which is the FillValue for this dataset).

The vertical dimension was not aggregated or interpolated in any way, such that inherent technical limitations of the instrumentation limit the accuracy and data-availability of this aspect.

Data Level

This dataset is designed to be treated as Level 2 data.

It is important to point out, that Doppler Wind Lidar data is not easily classified, so there is a possibility, that the abovementioned quality checks missed some data of questionable quality. If in doubt, reach out to the authors for clarification.

Size

The Windranger dataset consists of 338 Files with a total size of approximately 22 MB.

All data is compressed and encoded in binary files.

Date and time range

The start and end dates of the campaigns are given below.

Instrument	Metek Windranger 200
Start date	2024-02-10
End date	2025-01-30

Sampling height

The Metek Windranger 200 measured at 10, 20, 40, 60, 80 and 100m above the instrument.

Station location

Instrument	Windranger 200
Short name	PALUPD
Long name	LISA Université Paris Diderot
Latitude	48.8278
Longitude	2.38064
Terrain altitude (m asl)	39
Instrument altitude (m asl)	65
Instrument height (m agl)	26

Variables

1-dimensional variables:

Short name	time_index
DataType	int16
Description, notes, comments	Time dimension index
Short name	z_index
Long name	height_index
DataType	int16
Description, notes, comments	Height dimension index

Short name	time_coverage_start
DataType	char
Encoding	utf-8
Description, notes, comments	Data aggregation start time UTC

Short name	time_coverage_end
DataType	char
Encoding	utf-8
Description, notes, comments	Data aggregation end time UTC

Short name	z_height
Long name	height_above_instrument
Unit symbol	m
Unit description	meter above instrument aperture
DataType	float
Description, notes, comments	Distance to target

2-dimensional variables:

Short name	U
Long name	eastward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average u-wind component
FillValue	NaN

Short name	V
Long name	northward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average v-wind component
FillValue	NaN

Short name	W
Long name	upward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average w-wind component
FillValue	NaN

Short name	sigma_U
Long name	standard_deviation_eastward_wind_component
Unit symbol	m/s

Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of u-wind component
FillValue	NaN

Short name	sigma_V
Long name	standard_deviation_northward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of v-wind component
FillValue	NaN

Short name	sigma_W
Long name	standard_deviation_upward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of w-wind component
FillValue	NaN

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Keywords

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Vertical wind profiles
Paris

File Format

The files are provided as HDF5 compressed netCDF4 files with extension .nc, such that they are self-documented and machine-readable.

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Data Access & citation

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To facilitate search and retrieval, the individual data files were grouped into a collection, which can be cited as follows:

- Holst, C., Morrison, W., Jahn, C., Völksch, I., Michoud, V., Foret, G., Christen, A., & Mauder, M. (2025). Doppler Wind Lidar vertical wind profiles at LISA Université Diderot Paris, France (PALUDP) (Version 1.0). ICOS ERIC -- Carbon Portal. <https://doi.org/10.18160/9DAZ-D1N4>

Following the DOI link takes you to the collection landing page, which list all included files.

Acknowledgements

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Paris – harmonized network dataset

Title

Doppler Wind Lidar vertical wind profiles in Paris, France

Description

A total of six ground-based Doppler Wind Lidar (DWL) systems were deployed in a multi-institutional, multi-project effort along a 40 km transect through the centre of Paris (France). Three of these DWL were contributed by the ICOS Cities project. All data obtained in this DWL network operation was used to retrieve horizontal wind speed and direction through the ABL at 18 - 25 m vertical and 1- and 60-min temporal resolutions. The harmonised dataset provides unified temporal and vertical resolutions, quality control measures and file formats. The quality of the DWL derived dataset has been evaluated against *in-situ* measurements from the Eiffel Tower and radiosondes.

Data collected from each instrument are brought together as a harmonised dataset provided in Network Common Data Form (NetCDF) file format and processed as follows:

- To have a common vertical dimension that is consistent horizontally, the vertical dimension is adjusted to height from above sea level (NetCDF dimension name altitude) which is obtained from the known range gate, station elevation and scan angles.
- To have common vertical resolution, the eastward and northward wind components (u , v) are resampled to 25 m height by linear interpolation. The maximum interpolation is between two range gates of the individual sensor. If data are unavailable causing this distance to be exceeded, the wind components are set to a missing value. Where resampled heights contain multiple L2 QC flags, the maximum flag value is assigned.
- To have consistent vertical extent of data availability between sensors, the maximum altitude is 6500 m, constrained by the w400S valid retrieval extent.
- To have a common time dimension, the range-resampled data are analysed at regular intervals. Two harmonised time intervals are available (600 s and 3600 s). The time labels assigned indicate the end of the time integration period in UTC e.g., for the 600 s interval, 03:00 UTC is derived from data between 02:50:01 and 03:00:00 UTC.

Data Level

The dataset is provided as L2.

Sampling height

To have common vertical resolution, the eastward and northward wind components (u , v) are resampled to 25 m height by linear interpolation. The maximum interpolation is between two range gates of the individual sensor. If data are unavailable causing this distance to be exceeded, the wind components are set to a missing value. Where resampled heights contain multiple L2 QC flags, the maximum flag value is assigned.

To have consistent vertical extent of data availability between sensors, the maximum altitude is 6500 m, constrained by the WindCube 400S valid retrieval extent.

Station location and date range

The table below summarizes the network station locations and Doppler Wind Lidar sensor height, with station altitude given as height of station above WGS84 EGM96 Geoid determined using Google Earth Pro v7.3.6.9796 3D surface geometry with asl height above sea level and agl height above ground level. Sites owners include LATMOS: Laboratoire Atmosphères, Observations Spatiales and SIRTa: Site Instrumental de Recherche par Télédétection Atmosphérique, LMD Laboratoire de Météorologie Dynamique. Regional location relative to the city centre (CC).

Short name	PAJUSS	PALUPD	PASIRT
Long name	Tour Zamansky, Jussieu	LISA Université Paris Diderot	Observatoire PASIRTA 2020 SIRTa
Latitude	48.8469	48.8278	48.7173
Longitude	2.3555	2.38064	2.20887
Terrain altitude (m asl)	37	39	154
Instrument altitude (m asl)	125	65	154
Instrument height (m agl)	88	26	0
Mounting Level	Roof	Roof	Ground
Building Type	26 storeys	8 storeys	
Site Owner/operator	LATMOS, Sorbonne University	Laboratoire Interuniversitaire des Systèmes Atmosphériques University	SIRTa, LMD
Regional location	Inner CC	Inner CC	Suburbs/rural 18 km Southwest of CC

Operation period	01/2022 – present	29/11/2022 – 07/02/2024	06/2009 – present
References		Foret <i>et al.</i> , 2022	Haeffelin <i>et al.</i> , 2005; Dupont <i>et al.</i> , 2016

Variables

NetCDF standard_name (variable name)	#-d	Description
time	1	Timestamp: end of time interval. 600 s and 3600 s time intervals are provided, in separate data files (600 s e.g. 00:00:01 → 00:10:00 and 3600 s e.g. 00:00:01 → 01:00:00). All variables are harmonised to this resolution as averages (e.g. wind) or percentage occurrence (e.g. flags)
altitude	1	Altitude of centre of each measurement gate above mean sea level (m). Harmonised gates are 25 m from 0 – 6500 m with values linearly interpolated to this resolution
station	1	Measurement location identifier, all are listed even if no valid data are retrieved during the file's date.
eastward_wind (u)	3	Mean eastward wind component (m s^{-1}) using all valid samples within time interval
northward_wind (v)	3	Mean northward wind component (m s^{-1}) using all valid samples within time interval
wind_speed (ws)	3	Horizontal wind speed calculated from eastward_wind and northward_wind (m s^{-1}) (Eqn 1)
wind_from_direction (wd)	3	Horizontal wind direction calculated from eastward_wind and northward_wind (degrees from true north) (Eqn 2)
system_id	2	Serial number of sensor deployed at station at a given time
latitude (station_lat)	1	Latitude of the measurement station (degrees, decimal, WGS84)
longitude (station_lon)	1	Longitude of the measurement station (degrees, decimal, WGS84)
station_altitude	1	Average height of station above sea level (reference_geoid: EGM96) (m)
station_height	1	Measurement station height above ground level (m). Ground level is the “street” level so if the station is on a rooftop, the height will accounts for the building height and any mounting structure
n_rays_in_scan	2	Number of rays in a scan. e.g. 12 for a VAD scan that has 12 samples within one scan
n_pulses	2	Number of pulses in a given ray. More pulses, the higher the integration time
raw_gate_length	2	Gate length prior to L3 aggregation (m)

<i>flag_suspect_retrieval_warn</i>	3	Percentage of values within time interval with retrieval warning not linked to low signal (<i>flag_low_signal_warn_pc</i>) or out of range (<i>flag_ws_out_of_range_removed_pc</i>). Retrievals retained but treat with caution
<i>flag_suspect_retrieval_removed</i>	3	Percentage of values within time interval with retrieval error not linked to low signal (<i>flag_low_signal_warn_pc</i>) or out of range (<i>flag_ws_out_of_range_removed_pc</i>). Data removed
<i>flag_low_signal_warn</i>	3	Percentage of values within time interval with a low SNR. Retrievals retained but treat with caution
<i>flag_low_signal_removed</i>	3	Percentage of values within time interval with a low SNR. Retrieval rejected
<i>flag_ws_out_of_range_removed</i>	3	Percentage of values within time interval with wind speed outside reasonable retrievable range ($> 60 \text{ m s}^{-1}$) (i.e. removed). Evaluated after all other retrieval QC

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Keywords

Keywords
Doppler Wind Lidar
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Paris

File Format

The files are provided as HDF5 compressed netCDF4 files with extension .nc, such that they are self-documented and machine-readable.

Licence

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Citation

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Data Access

The harmonized network Doppler Wind Lidar data will be available at <https://doi.org/10.5281/zenodo.13141383>.

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Munich

Title

Doppler Wind Lidar vertical wind profiles at Oberpostdirektion and Feldkirchen, Munich, Germany

Description

In addition to the information mentioned in the introduction, there are a few important pieces of information required for data users.

Most importantly the filtering and confidence of the data retrieval. The pulsed DWL system data was processed and filtered using different criteria as described in the following paragraphs.

The variables “Signal-to-Noise-ratio” (*snr*) and “Structure-function-variance” (*structure_fn*) in comparison to the fitted windspeed were used to classify data quality.

Pre-fit, values were filtered as invalid, when $snr < -21dB$

Post-fit, the fit characteristics were compared to the windspeed and data with $MAE(structure_fn) > 3 \times windspeed$ was filtered as invalid.

All filtered values were replaced with NaN. Then, the resulting data was aggregated, using the numpy nanmean and nanstd functions for each 30-minute interval. If no sufficient valid data was present in a 30-minute interval, the aggregate value was set to NaN (which is the FillValue for this dataset).

The fitting and retrieval were done with a tool called DWLprocessor, which was developed in-house and will be released on GitHub later in 2025, after some further testing and preparation of a code publication.

Data Level

This dataset is designed to be treated as Level 2 data.

It is important to point out, that Doppler Wind Lidar data is not easily classified, so there is a possibility, that the abovementioned quality checks missed some data of questionable quality. If in doubt, reach out to the authors for clarification.

Size

The dataset comprises of approximately 750 files with total size of 100 MB.

Date and time range

	DE-OPD	FEL
Start date	2022-12-15	2025-01-20
End date	2025-02-10	2025-02-10
Notes	Both stations are still operating until probably autumn 2025. The dataset will be updated monthly.	

Sampling height

The sampling heights of these measurements are determined by the technical range-gate-lengths of the instruments.

The elevation angle 70 degrees and range gate length of 18 meters lead to an effective measurement height separation

$$\Delta h = \sin\left(\frac{70\pi}{180}\right) \times 18m \sim 16.91 m.$$

The instruments recorded 180 (DE-OPD) and 167 (FEL) range gates. This results in a total range of 3036.15 m (DE-OPD) and 2818.26 m (FEL). The lowest technical measurement height is at

$$h_{\min} = 0.5\Delta h = \sin\left(\frac{70\pi}{180}\right) \times 9m \sim 8.46 m.$$

Due to internal reflections and other technical reasons, the lowest usable measurement height is typically above 59.20 m, which corresponds to the fourth range gate. In some conditions, the fourth range gate shows noisy behaviour and should be discarded. If in doubt, compare the fluctuation variables to the next higher range gates to check for discontinuity.

The measurement height in this dataset was saved as integer, because height rounding errors of less than 0.5 m do not affect the interpretability of results, due to the range gate length being 18 m and the lowest practically usable height being above 59.20 m, larger than 100 times that maximum rounding error.

Station location

Short name	DE-OPD	FEL
Long name	Oberpostdirektion	MUCCnet East Station
Latitude	48.14739	48.14750
Longitude	1.54739	11.73027
Elevation (above sea level in meters)	529.52	522.80
Elevation (above ground level in meters)	8.38	12.10
Description, notes, comments	Co-located with net-irradiation measurement near the flux tower	Co-located with EM-27 total column measurement

Variables

1-dimensional variables:

Short name	time_index
DataType	int16
Description, notes, comments	Time dimension index

Short name	z_index
Long name	height_index
DataType	int16
Description, notes, comments	Height dimension index

Short name	time_coverage_start
DataType	char
Encoding	utf-8
Description, notes, comments	Data aggregation start time UTC

Short name	time_coverage_end
DataType	char
Encoding	utf-8
Description, notes, comments	Data aggregation end time UTC

Short name	z_height
Long name	height_above_instrument
Unit symbol	m
Unit description	meter above instrument aperture
DataType	float
Description, notes, comments	Distance to target

2-dimensional variables:

Short name	U
Long name	eastward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average u-wind component
FillValue	NaN

Short name	V
Long name	northward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average v-wind component
FillValue	NaN

Short name	W
Long name	upward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	average w-wind component
FillValue	NaN

Short name	sigma_U
Long name	standard_deviation_eastward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of u-wind component
FillValue	NaN

Short name	sigma_V
Long name	standard_deviation_northward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of v-wind component
FillValue	NaN

Short name	sigma_W
Long name	standard_deviation_upward_wind_component
Unit symbol	m/s
Unit description	meters per second
DataType	float
Description, notes, comments	standard deviation of w-wind component
FillValue	NaN

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Keywords

Keywords
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File Format

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Licence

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Data Access & citation

The data have been uploaded to the ICOS Cities repository as individual daily files, each of which is assigned a basic persistent identifier (PID) and has an associated landing page. As an example, the Lidar data file collected on 2022-12-15 at the Oberpostdirektion site - OPD_2022-12-15.nc – has been assigned the unique persistent identifier string 11676/0mWajz8YEKqubGV85hVfVUNw and the landing page <https://citymeta.icos-cp.eu/objects/0mWajz8YEKqubGV85hVfVUNw> with a summary of its metadata and a download link.

To facilitate search and retrieval, the individual data files from the two sites - “Oberpostdirektion” and “Freikirchen” – have been grouped into two separate collections, which can be cited as follows:

- Holst, C., Jahn, C., Völksch, I., Sellmaier, S., Luther, A., Chen, J., & Mauder, M. (2025). Doppler Wind Lidar vertical wind profiles at Oberpostdirektion Munich, Germany (DE-OPD) (Version 1.0). ICOS ERIC -- Carbon Portal. <https://doi.org/10.18160/9T81-C19T>

- Holst, C., Jahn, C., Völksch, I., Sellmaier, S., Luther, A., Chen, J., & Mauder, M. (2025). Doppler Wind Lidar vertical wind profiles at Feldkirchen Munich, Germany (FEL) (Version 1.0). ICOS ERIC -- Carbon Portal. <https://doi.org/10.18160/6TVP-TX2B>

Following the DOI links takes you to the collection landing pages, which list all included files.

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