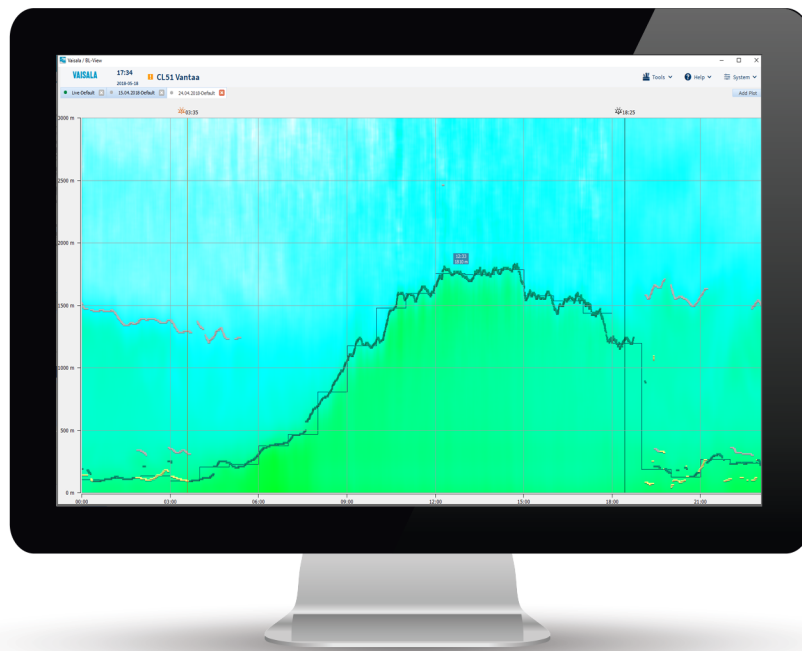


User Guide

Vaisala Boundary Layer View Software

BL-View



VAISALA

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1. About This Document

1.1 Version Information

This document provides information for installing, configuring, and using Vaisala Boundary Layer View Software BL-View.

Table 1 Document Versions (English)

Document Code	Date	Description
M211185EN-D	November 2018	Release 2.1.1 contains the following new features: <ul style="list-style-type: none"> • Full ceilometer profile up to 15 400 meters (50 520 feet) • Language selection for English/Chinese • Scheduled snapshot
M211185EN-C	June 2018	Release 2.1 contains the following new features: <ul style="list-style-type: none"> • Support for multiple ceilometers • Embedded CL-VIEW functions • Mixing-layer height information added to HIS files • User interface update
M211185EN-B	June 2017	Release 2.0 contains the following new features: <ul style="list-style-type: none"> • New algorithm • 1-hour average mixing layer height • NetCDF data files • TCP/IP connection to ceilometer • Visual update to UI Removed features: BL-View PostgreSQL database.



This *Vaisala Boundary Layer View Software BL-View User Guide* is available as follows:

- BL-View software contains the online help (from 2.0 onwards).
- USB drive contains the online and PDF help.

The help content is identical in the PDF and online.

1.2 Related Manuals

Table 2 Related Manuals

Document Code	Name
M210482EN	<i>Vaisala Ceilometer CL31 User Guide</i>
M210801EN	<i>Vaisala Ceilometer CL51 User Guide</i>
M212160EN	<i>BL-View NetCDF Example File Technical Reference</i>

1.3 Documentation Conventions



WARNING! Warning alerts you to a serious hazard. If you do not read and follow instructions carefully at this point, there is a risk of injury or even death.



CAUTION! Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.



Note highlights important information on using the product.



Tip gives information for using the product more efficiently.



Lists tools needed to perform the task.



Indicates that you need to take some notes during the task.

1.4 Trademarks

AviMet® is a registered trademark of Vaisala Oyj.

Vaisala® is a registered trademark of Vaisala Oyj.

Microsoft® and Windows® are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.

All other product or company names that may be mentioned in this publication are trade names, trademarks, or registered trademarks of their respective owners.

2. Vaisala Boundary Layer View Software BL-View

Vaisala Boundary Layer View BL-View is a software application for planetary boundary layer analysis and visualization. It is an independent data collection, storage, analysis, and presentation tool designed for use with Vaisala Ceilometers CL31 and CL51.

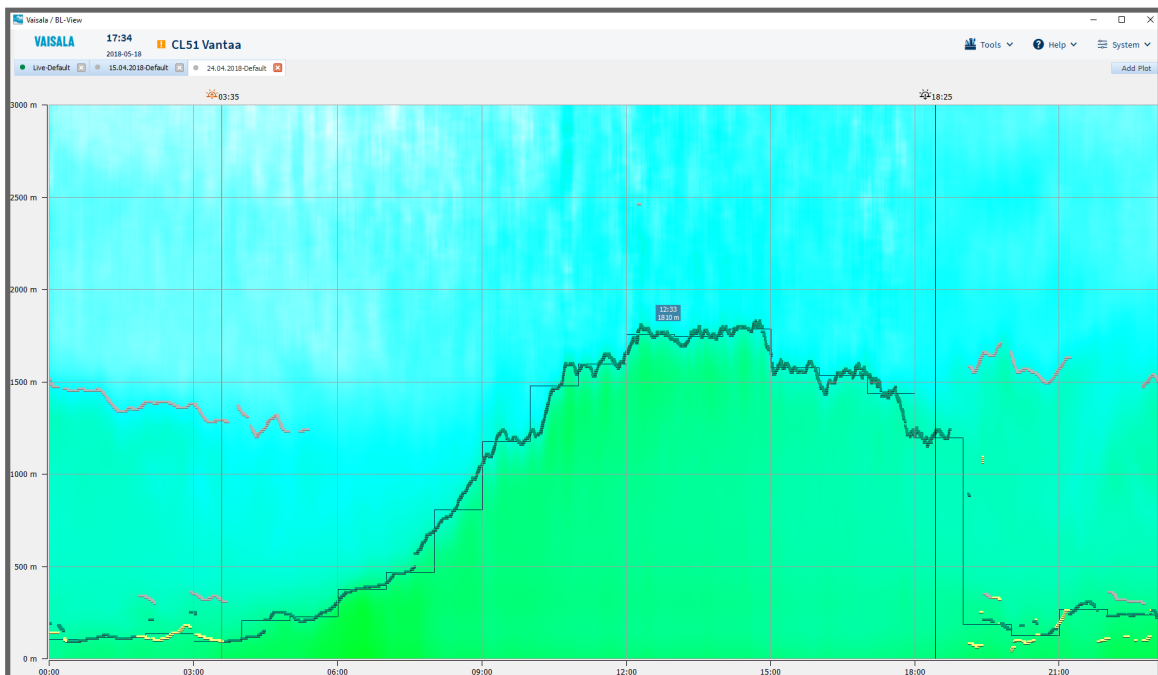


Figure 1 Vaisala Boundary Layer View Software BL-View

Improved Decision Making with Accurate Boundary Layer Visualization

The planetary boundary layer height, also known as the mixing layer height (MLH), is a key parameter in the characterization of air pollution, together with urban emission source strengths, traffic emissions, and weather influences. Because emissions and other near-surface pollutants are diluted in a vertical direction within the planetary boundary layer, monitoring the MLH is critical for estimating the nature, transformation, and removal of pollutants. It is also a necessary parameter for the verification of numerical air pollution simulations.

BL-View generates an online visual representation of the MLH that provides you with an immediate understanding of local conditions. The MLH data can also be seamlessly integrated into numerical weather prediction models. You can view and analyze logged data while logging and displaying real-time data. The insights enabled by BL-View help to improve your air quality monitoring and forecasting.

Reliable Data Whatever the Weather

Vaisala Ceilometer measures the backscatter profile of the atmosphere and provides the profile for analysis on BL-View. The software features an automatic algorithm for online retrieval of boundary layer depth and additional residual structures. BL-View calculation is based on combined gradient and idealized backscatter methods and enables reliable automatic reporting of the convective mixing layer height (MLH). The algorithm also takes into account time of day and location in order to improve automatic reporting in all conditions.

The layer that is most relevant for air quality is reported as the MLH. In normal conditions, this layer follows the convective layer. But in some cases if a strong additional layer forms inside the convective layer, that layer is reported as the MLH due to the fact it traps all emissions and therefore is the most relevant for air quality. To ensure reliable reporting in all weather conditions, BL-View also uses an all-weather algorithm that takes into account possible precipitation and cloud events.

Fast Data Analysis

Vaisala BL-View is compatible with computers running Microsoft Windows®. Communication between the ceilometer and computer is via Ethernet or a serial line, and ceilometer messages are stored in netCDF format on the computer hard drive. This format enables easy and fast data analysis and sharing. The automatically analyzed boundary layer data is stored in log files that can be easily transferred to other applications, for example as inputs to numerical weather prediction models.

Flexible User Interface

The ceilometer backscatter profile data is automatically analyzed by default parameters in order to report the convective mixing layer height (MLH) and other boundary layer structures such as residual boundary layer heights. In addition to real-time MLH reporting, the software reports the hourly average MLH.

It is possible to run simultaneous operator-specific analyses with user-set algorithm parameters. The stored profiles can be re-analyzed using any user-set parameters without interfering with the real-time data analysis and visualization.

The clear graphical user interface allows easy and convenient multiprocessing. Operators can zoom in on any point in a detailed analysis. The ceilometer and communication status is permanently displayed on the main screen so that possible operational alerts can be investigated. These warnings and alarms are also stored automatically to log files for easy retrieval.

2.1 Supported Ceilometers

BL-View supports up to 10 ceilometers. Vaisala Ceilometers CL31 and CL51 can be connected to BL-View.

More Information

- [Adding Ceilometers to BL-View \(page 27\)](#)

2.2 Minimum System Requirements

Table 3 Minimum System Requirements

Component	Minimum Requirement
Computer	Ethernet port, serial port, or USB serial converter
Operating system	Windows 10 Pro Windows 10 Pro Enterprise Windows 7 Ultimate (32-bit or 64-bit) Windows 7 Professional (32-bit or 64-bit)
RAM	2 GB
Hard disk space	For BL-View installation: 600 MB For BL-View data files: 40 GB / year / ceilometer (typically) Required total hard disk space depends on the number of ceilometers



Do not use BL-View on the same computer as AviMet Automated Weather Observing System or Vaisala Observation Network Manager NM10.

2.3 Licensing

BL-View requires a software license to run. To activate the license, you need a product key.

Vaisala delivers the product key when you purchase the software. If you have purchased the software and you have not received the product key, contact Vaisala.

The license is mapped to the hardware. If your hardware changes and you need to re-install BL-View, you must request a replacement license from your Vaisala representative.

The license can include one or several devices. After license activation, you can add devices in BL-View.

For license updates and new licenses, contact Vaisala.

Vaisala License Manager is used for activating the Vaisala software license. The license allows one activation.

3. Operating Principle

The planetary boundary layer (or atmospheric boundary layer) is the lowest part of the Earth's atmosphere. It is directly influenced by its contact with the Earth's surface. The planetary boundary layer responds to heat transfer, pollutant emission, and other surface forcings in a timescale of an hour or less.

The depth of the planetary boundary layer depends on, for example, the location, season, time of day, and weather. Typically, the planetary boundary layer extends 50 ... 3000 m (164 ... 9840 ft) from the Earth's surface. Fog, haze, mist, smog, and air pollution are typical phenomena in the planetary boundary layer.

The planetary boundary layer contains several layer types:

- **Convective boundary layer:** Layer of air in which particles mix well due to mechanical and thermal forces. The depth of the convective boundary layer is called the mixing height.
- **Nocturnal boundary layer:** Stable layer of air that forms around sunset. Its top is often marked by a temperature inversion. The layer usually dissolves by convection in the morning hours, but it can also stay during daytime when solar heating is not sufficient to disperse the nocturnal boundary layer.
- **Residual layer:** Layer of air containing the particles left from the previous convective boundary layer after sunset or from long-range transportation by winds.
- **Surface layer:** Layer of air that is situated closest to the ground. Its thickness is typically 50 ... 100 m (164 ... 328 ft), about 10 % of the boundary layer height.

3.1 Diurnal Variation in Planetary Boundary Layer

Variations that occur during the day in the planetary boundary layer are called diurnal variation.

The following phenomena affect the formation of the component layers:

- Solar radiation heats the Earth's surface, causing thermals of warm air to rise from the ground.
- Radiative cooling from the clouds at the top of the planetary boundary layer creates thermals of cool air that sink down.
- Wind shear across the top of the convective boundary layer contributes to the generation of turbulence.

During the day, diurnal variation has the following effects on the planetary boundary layer:

1. The turbulence in the air is caused by solar radiation and radiative cooling, both of which occur simultaneously. At night, the radiative cooling of the surface controls the boundary layer, creating the nocturnal layer. The nocturnal layer blocks the interference between the surface layer and the residual layer. Before sunrise, the nocturnal boundary layer height is the mixing height.

2. After sunrise the solar radiation destabilizes the situation on the surface, creating thermals of warm air that rise upwards. The thermals continue to rise until their temperature has dropped to the same temperature as the surrounding air. At the same time thermals of cool air sink down from the top of the clouds. The resulting turbulence causes heat, moisture, and particles to mix uniformly in the convective boundary layer. The convective boundary layer reaches its maximum mixing height in the late afternoon. The entrainment zone acts as an interface between the convective boundary layer and free atmosphere. Turbulent air from above is mixed into the convective boundary layer in this region of the atmosphere. When the convective boundary layer reaches the level of the residual boundary layer, both layers are mixed together. This is an important process for air pollution transportation in time and space. The horizontal dispersion and transportation have a strong influence on the air quality.
3. When the sun sets, radiative cooling causes the convective boundary layer to collapse. A new nocturnal boundary layer is formed, and it is again replaced with a new convective boundary layer during the next day.

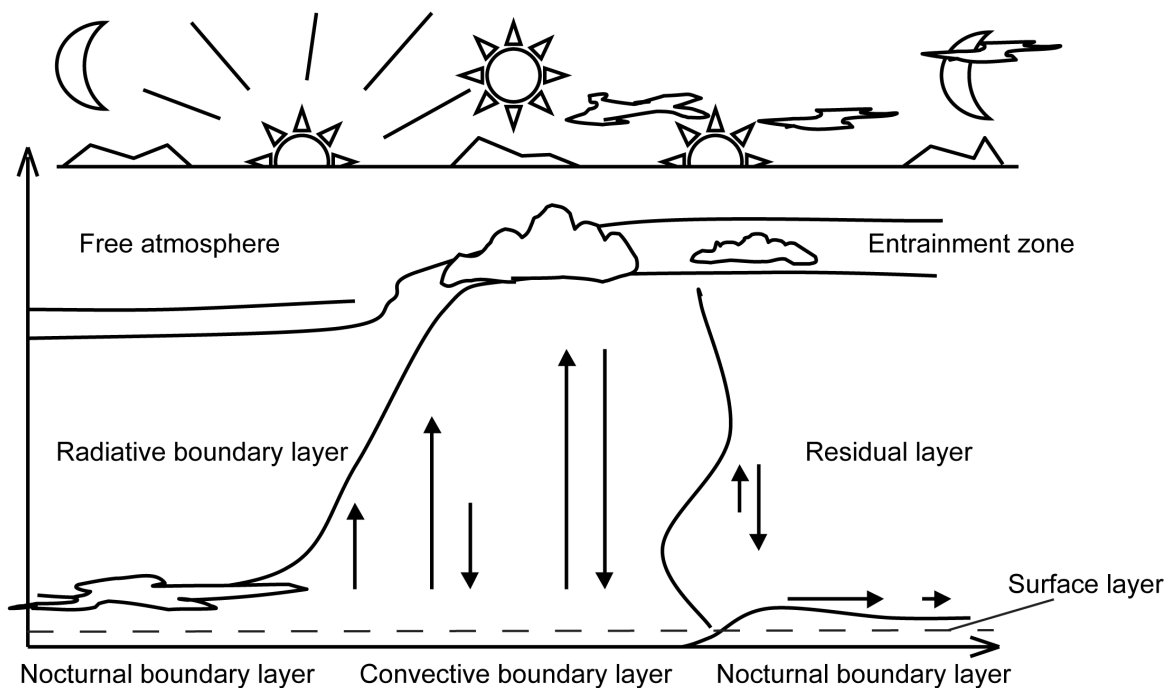


Figure 2 Planetary Boundary Layer Structure and Diurnal Variation

3.2 Boundary Layer Analysis

A ceilometer sends out short, powerful laser pulses in a vertical or near-vertical direction. The light reflection caused by haze, fog, mist, virga, precipitation, aerosols, and clouds, known as backscatter, is measured as the laser pulses traverse the sky.

The backscatter profile, that is, the signal strength versus the height, is stored and processed, and the data is used to calculate the cloud bases and the planetary boundary layer structure.

The planetary boundary layer is the portion of the lower atmosphere where wind, temperature, and moisture are strongly influenced by the Earth's surface. The depth of this layer, also known as the mixing height layer, is important for analyzing the state of the atmosphere, for example, for air quality evaluation and aviation.

The backscatter signal is typically stronger in the planetary boundary layer where particle concentration is higher, but weaker in the free atmosphere where the atmosphere typically has fewer particles. BL-View detects the backscatter gradient between the planetary boundary layer and free atmosphere (the mixing height), as well as other atmospheric structures, such as residual boundary layers and elevated smoke or aerosol plumes that may produce strong backscatter gradients.

To reduce sensitivity to noise and transient details in atmospheric structure, BL-View performs vertical and temporal averaging on the ceilometer data.

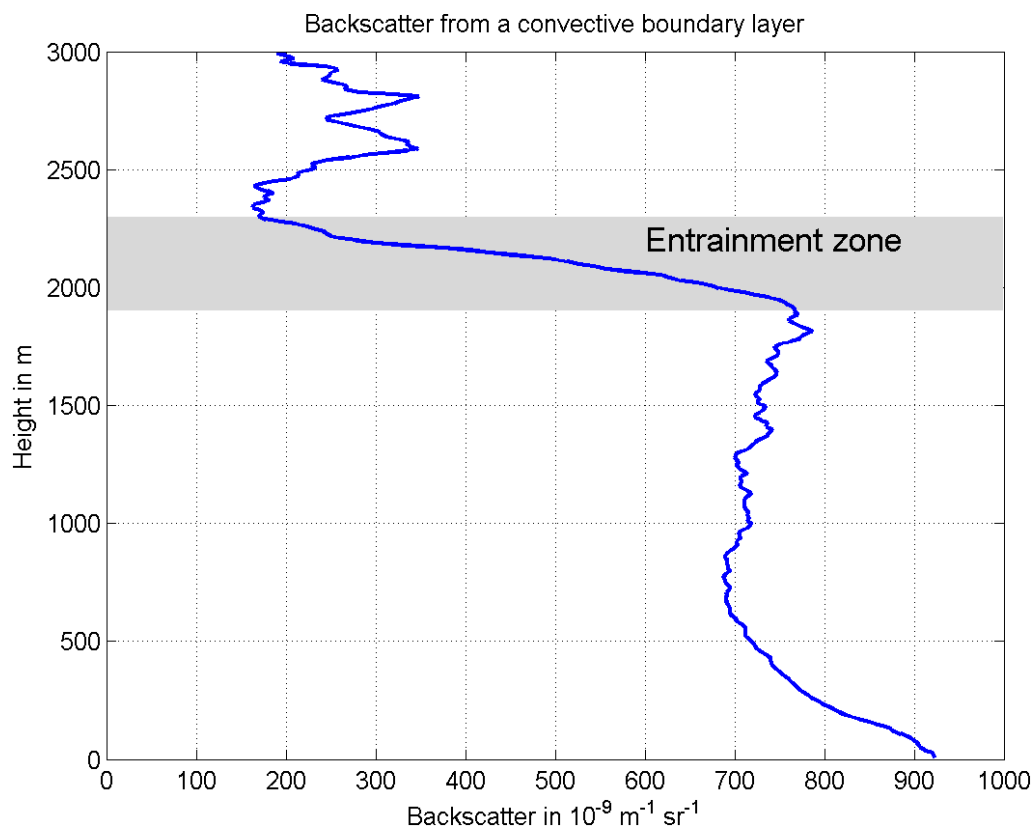


Figure 3 Backscatter Profile from Convective Boundary Layer

3.3 Mixing Height Algorithm

BL-View uses 3 different algorithm methods:

- Gradient
- Profile fit
- Merged gradient and profile fit

Gradient Method

The gradient method can detect up to 3 aerosol layers and performs well in many situations, particularly for shallow nocturnal boundary layers at less than 500 m (1640 ft) above ground level.

Profile Fit Method

The profile fit method detects only a single layer, and successfully estimates mixing heights when the aerosol backscatter signal is weak, local gradients are weak and diffuse, and the boundary layer evolves rapidly with time during morning and evening transitions.

Merged Gradient and Profile Fit Method

The merged gradient and profile fit method merges the strengths of the gradient and profile fit methods, but retains the ability to detect multiple layers in a backscatter profile. The merged method uses the following rules to select the mixing height from the gradient and profile fit retrievals:

- The gradient method's lowest retrieval for cloud profiles and shallow, high quality boundary layers.
- Profile fit retrieval in all other cases (the gradient method's lowest retrieval is not displayed unless it differs by more than 1000 m (3280 ft)).
- Second and third gradient retrievals are displayed in all cases, as they may indicate residual layers or other aloft aerosol layers.

The algorithm identifies reliably the various boundary layers, such as the nocturnal, convective, marine, and residual layers, and differentiates the mixed layer from other aerosol layers detected by BL-View. It also provides an outlier removal method, cloud filter, and other changes to improve performance for evening boundary layer transitions and to increase flexibility and robustness for handling data from both CL31 and CL51 ceilometers.

The algorithm determines the mixing height by fitting an idealized backscatter profile to observed range-corrected ceilometer backscatter profiles. Clouds and precipitation produce backscattering profiles that deviate substantially from an idealized profile, which results in poor mixing height estimates. The algorithm can produce valid retrievals even if the backscatter profile deviates significantly from the idealized profile.

When a ceilometer detects multiple aerosol layers, the algorithm attributes 1 aerosol layer as the mixing height. When there are multiple aerosol layers present, the lowest layer is a reasonable first guess for attributing one of these layers as the mixing height.

More Information

- ▶ [Creating Calculation Presets \(page 69\)](#)
- ▶ [Modifying Calculation Presets \(page 71\)](#)

3.3.1 Cloud and Precipitation Filter

Cloud filters prevent spurious mixing height retrievals caused by clouds or precipitation in the backscatter profiles, especially below 4000 m (13 123 ft) above ground level.

- In the gradient method, clouds and precipitation produce strong local gradients that may be unrelated to the mixing height.
- In the profile fit method, clouds and precipitation produce backscattering profiles that deviate substantially from an idealized profile, which result in poor mixing height estimates.

The cloud filter significantly improves the mixing height estimate, and eliminates retrievals in the morning when there are clouds and strong backscatter near the ground.

The algorithm does not report a mixing height when one or more of the following circumstances exists:

1. Clouds are present below 160 m (525 ft) above ground level.
2. Precipitation or excessively high backscatter are detected in the backscatter profile.
3. Clouds are present below 4000 m (13 123 ft) above ground level and there is excessive backscatter below 1000 m (3280 ft). Retrievals are still allowed when there are shallow, non-precipitating clouds below 4000 m (13 123 ft), but above 160 m (525 ft).

3.3.2 Variable Averaging

Long averaging intervals help prevent false gradient minima hits generated by signal noise. However, this approach reduces the ability of the algorithm to respond to short scale signal fluctuations in space and time. The amount of signal noise depends on the range and time of the day. The gradient method provides variable averaging parameters.

BL-View default settings use 80-m (262-ft) height averaging close to the ground. This interval is gradually increased to 360-m (1181-ft) averaging used at heights above 1500 m (4920 ft).

The selected time averaging interval depends on the signal noise. It varies between 14 minutes during night-time and 52 minutes on a bright, cloudy day.

3.3.3 Variable Threshold

Small density fluctuations within a convective boundary layer with a high aerosol load can have lower gradient values than the top of the layer in dry rural surroundings.

BL-View prevents the reporting of these fluctuations as the top of the aerosol layer by using variable threshold values that depend on the average backscatter signal from the boundary layer. A local gradient minimum is only reported if its value is below the threshold.

3.3.4 Outlier Removal

Outlier removal filters spurious mixing height retrievals that are caused by instrument noise, transient small-scale aerosol features, or other artifacts that cannot be removed by traditional averaging techniques. However, this retains important details of the boundary layer evolution throughout the day.

To avoid removing valid mixing heights, the algorithm relaxes the figure-of-merit criteria for distinguishing valid retrievals from outliers. For each retrieval, the outlier removal method computes a figure-of-merit score based on proximity (in height) to other retrievals in the preceding four minutes. The algorithm deems retrievals with an insufficient number of neighbors (a low figure-of-merit score) as outliers and replaces them by the most recent valid retrieval.

3.4 Impact of Weather Conditions

The following weather conditions have an impact on the analysis of planetary boundary layer structure.

Precipitation

During precipitation, mixing height or other aerosol layers cannot be reported. This is due to the very high signal from precipitation dominating the backscatter from any remaining aerosol layers, which makes it impossible to distinguish these from the precipitation.

Low-layer Clouds

Low-layer clouds appear at height 0 ... 2000 m (0 ... 6560 ft). If there are low-layer clouds, the mixing height is typically situated at the top of the clouds. In these conditions, BL-View does not show the true mixing height due to the measurement principle of Vaisala Ceilometer (LIDAR). In normal conditions, the deviation between the reported local gradient minimum and the top of the cloud is typically less than 200 m (656 ft).

Mid-layer and High-layer Clouds

Mid-layer clouds appear at height 2000 ... 5000 m (6560 ... 16 400 ft) and high-layer clouds at height over 5000 m (16 400 ft). Mid-layer clouds and high-layer clouds do not typically create any problems for mixing height measurement. The mixing height is reported normally from the collected data.

Fog or Ground-based Obscuration

Fog or ground-based obscuration affects the mixing height measurement.

If the fog or ground-based obscuration is too dense, the laser light does not penetrate the layer, which makes it extremely difficult to estimate the mixing height.

In these conditions, Vaisala ceilometers typically report the vertical visibility reading with the highest altitude from which the backscatter signal can be received. If the signal is not strong enough, the mixing height reading is reported automatically.

4. Installation

If you are installing BL-View to a computer that has a previous version of BL-View, perform the following procedures first.

1. [Backing up BL-View Data \(page 17\)](#)
2. [Uninstalling BL-View \(page 18\)](#)

New installations (computer with no BL-View):

- [Installing BL-View \(page 19\)](#)

4.1 Backing up BL-View Data



- If you are using BL-View version 1.1 or older, back up all BL-View data before you uninstall the previous version of BL-View.
- If you are using BL-View 2.0 or newer, back up the netCDF files. Regular back up of netCDF files is recommended.



These instructions are valid for BL-View version 1.1 or older.

- ▶ 1. On your computer, select **Start > Command Prompt**.
2. To go to the BL-View *PostgreSQL* folder, type:

```
cd c:\BLView\Postgresql
```

3. To back up the BL-View database, type folder and file name:

```
take_backup.bat <backup folder path>\<backup file name>
```

For example:

```
take_backup.bat c:\temp\blv_backup.dmp
```



CAUTION! To avoid losing data, do not save the backup file in the BL-View or BL-View database installation folders (*C:\BLView* and *C:\Postgresql*).

The BL-View database is backed up and saved in the selected backup folder.

4. Close the command prompt.

If you accidentally uninstall the database, reinstall it manually from the backup file.

4.2 Uninstalling BL-View



CAUTION! Before you uninstall BL-View, back up BL-View data.



Removing BL-View does not remove the gathered data from your computer.

- ▶ 1. Check the settings in your current BL-View installation and write them down or take screenshots.
2. Select **Start > Control Panel**.
3. Depending on the operating system of your computer, select **Add or remove programs**, **Programs and Features**, or similar.
4. Select **BL-View > Uninstall**.
5. Follow the onscreen instructions.

4.3 Installing BL-View



CAUTION! Install BL-View on a computer that does not contain any previous version of BL-View. Otherwise you may lose existing BL-View files.



To perform installation on your computer, log in as an administrator.

- ▶ 1. Insert the USB drive in a USB port on your computer.
The BL-View installation program launches automatically in a few seconds. If the installation does not launch automatically, double-click the executable (EXE) file on the USB drive.
2. Follow the onscreen instructions.
Install BL-View to the following folder: *C:\Program Files (x86)*.
3. To activate BL-View, follow the onscreen instructions in License Manager. Use the product key from the cover letter.
If the computer running BL-View is not connected to the internet, see [Activating License without Internet Connection \(page 19\)](#).
4. To complete and verify the installation, restart your computer and open BL-View: **Start > (> All Programs >) > Vaisala > BL-View > BL-View.**

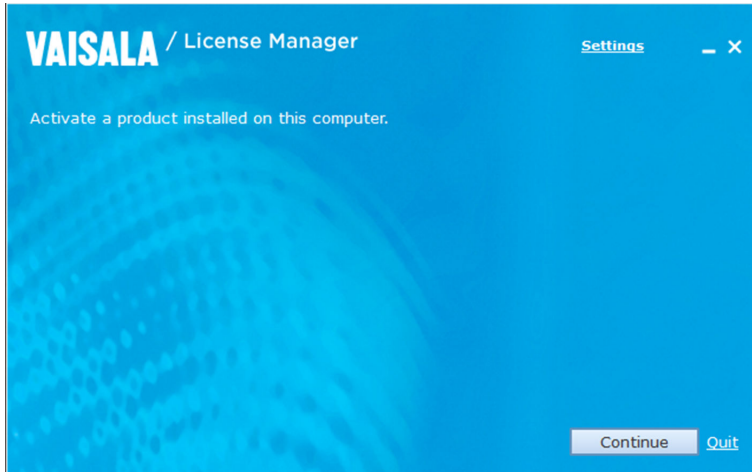
If you choose to use the trial license, you see the number of days after which the trial expires when you open BL-View. The trial license supports adding 1 device.

4.3.1 Activating License without Internet Connection

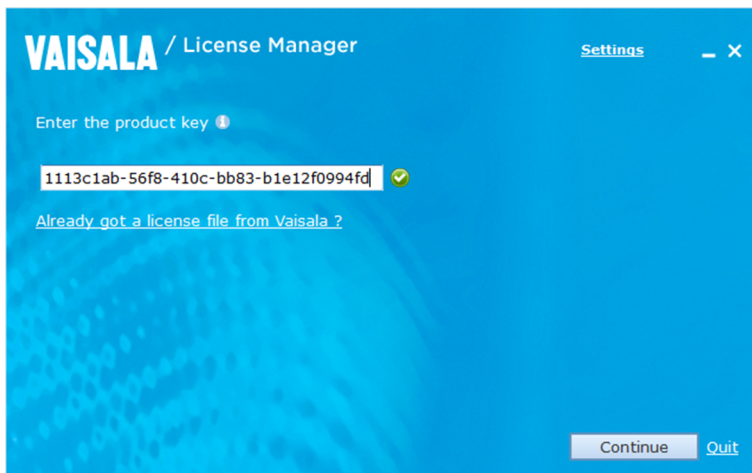
If the computer running BL-View is not connected to the internet, you must activate the license using an another online computer and then transfer the license file to the BL-View computer.

Before you begin, make sure that you have, for example, a USB drive for storing the license file obtained and transferring it to another computer.

- ▶ 1. When License Manager opens, select **Continue**.

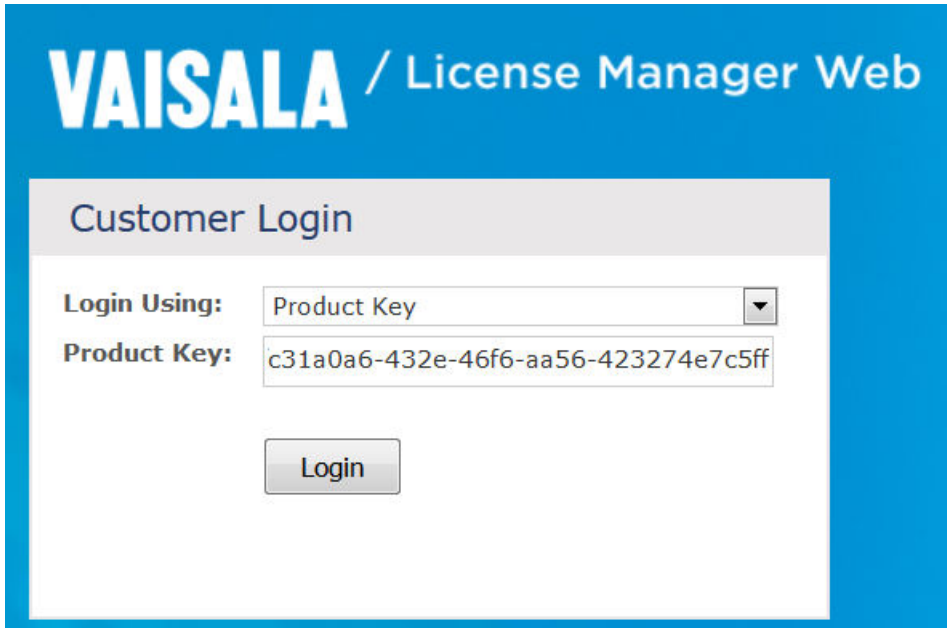


2. Type the product key. The product key is in the cover letter. Select **Continue**.



3. A window opens with the message that there is no connection.
 - a. Write down the product key and the request code shown, or select **Save codes as txt** to save the codes as a TXT file on a media that you can take with you, for example a USB drive.
 - b. Do not close the License Manager window, you will later on need to upload the license file with License Manager.
4. Take the USB drive with you and go to another computer that is connected to Internet, and go to <https://licensing.vaisala.com>.

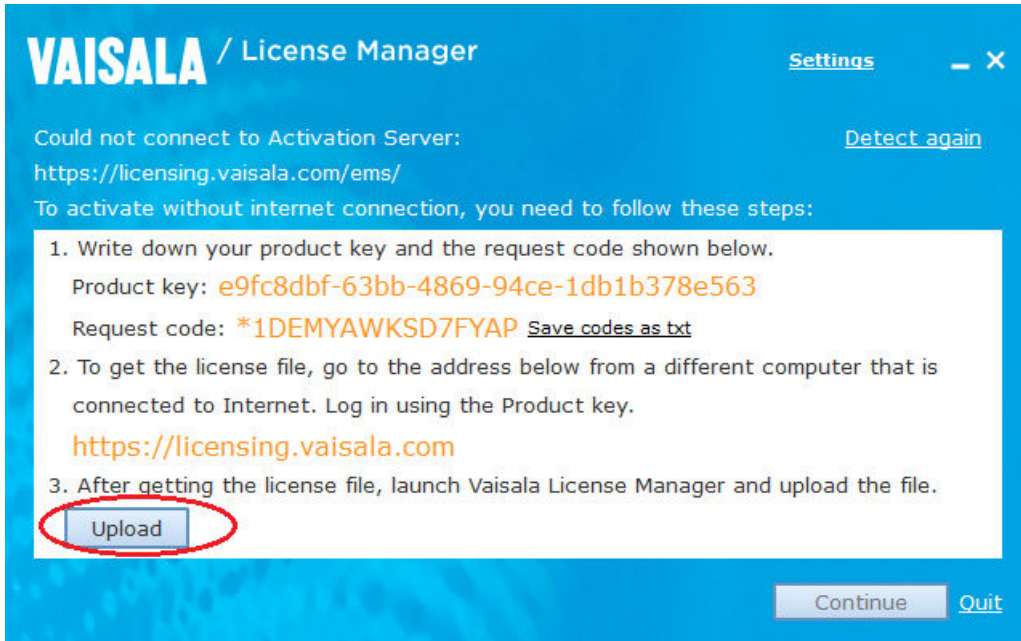
5. In **Login Using**, select **Product Key** and type the product key. Select **Login**.



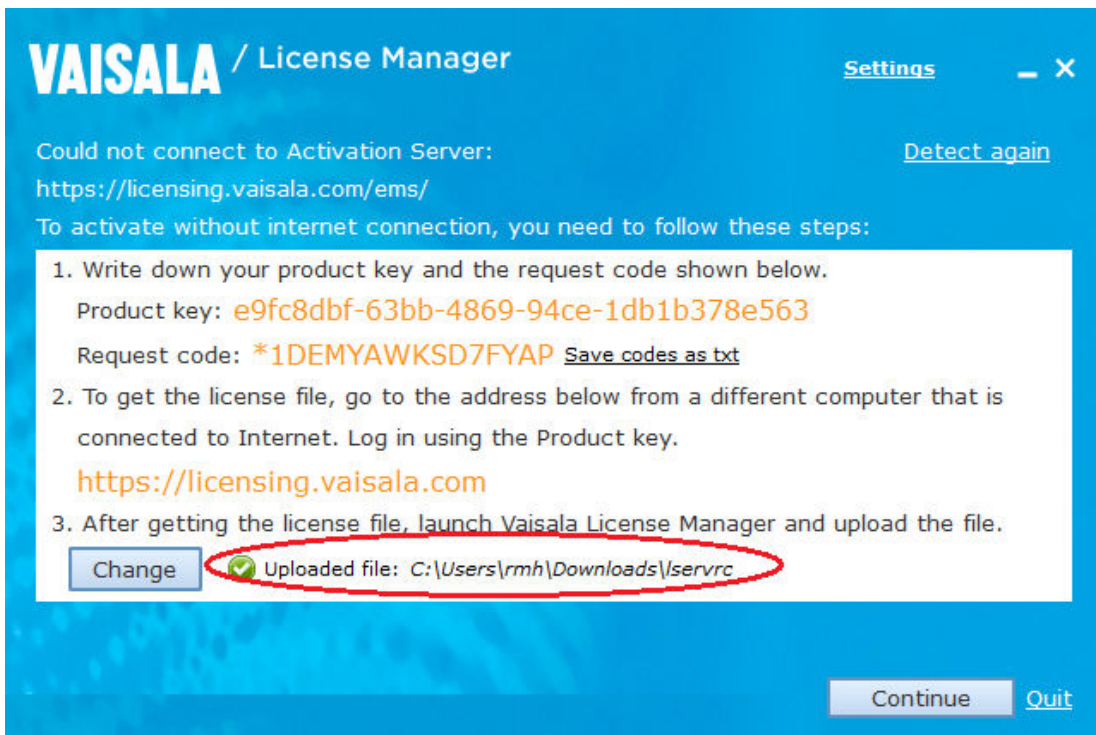
The screenshot shows the VAISALA License Manager Web interface. At the top, the text "VAISALA / License Manager Web" is displayed in white on a blue background. Below this is a "Customer Login" form with a light gray header. The form contains two input fields: "Login Using:" with a dropdown menu set to "Product Key", and "Product Key:" with a text box containing the alphanumeric string "c31a0a6-432e-46f6-aa56-423274e7c5ff". A "Login" button is positioned below the text box.

6. In the window that opens, select **Product Details > Activate**.
7. Type the request code in **Primary 1 info** and select **Generate**.
If the request code contains an asterisk, make sure to include it.
8. The license file is generated. Select **Save to File** to save the license file (*lserverc*) to a media that you can transfer to the system, for example a USB drive.
9. Take the USB drive with you and go back to the computer where the License Manager window is still open.

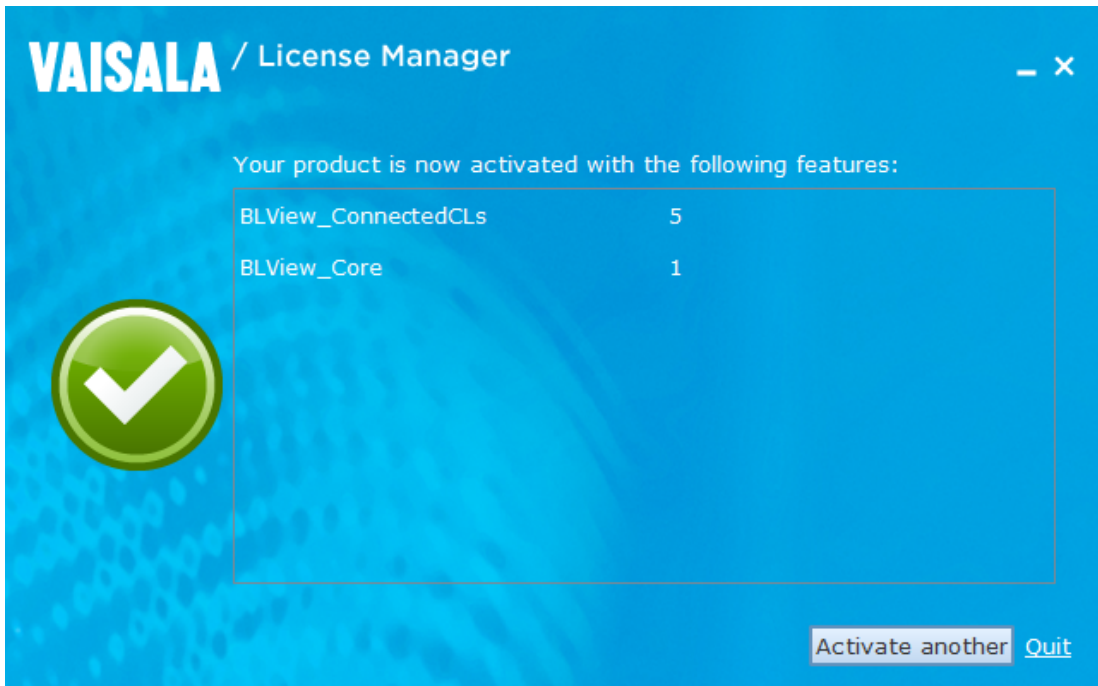
- 10. To load the license file to the system, select **Upload**.



- 11. Browse to the location where the license file is stored and select **Open**.
- 12. The green icon indicates that the upload was successful. Select **Continue**.



13. After a successful activation, a window is displayed listing the activated features. Check that the installed features match your license.



14. To exit License Manager, select **Quit**.
15. To complete and verify the installation, restart your computer and open BL-View: **Start > (> All Programs >) > Vaisala > BL-View > BL-View**.

If the activation fails, the reason and remedy for the failure are displayed. If you need further assistance, contact Vaisala.

5. Configuration

BL-View is connected to a ceilometer through a serial line, TCP/IP, or UDP connection.

When the BL-View installation is complete, the software starts to receive and analyze data continuously even when the graphical user interface is not open.

Before using BL-View to view and analyze live data from the ceilometer:

1. Make sure that the ceilometer is connected to a computer.
For more information, see *Vaisala Ceilometer CL31 User Guide* and *Vaisala Ceilometer CL51 User Guide*.
2. Check that the ceilometer settings are correctly configured.
See [Configuring Ceilometer \(page 25\)](#).
3. Add the location parameters of the ceilometer to BL-View.
See [Adding Ceilometers to BL-View \(page 27\)](#).
4. Configure the BL-View connection settings.
See [BL-View Connection Settings \(page 30\)](#).
5. Configure the message settings.
See [Configuring Message Settings \(page 34\)](#).



When you have completed adding the ceilometers and configured the connection settings and message settings, restart the computer.

5.1 Configuring Ceilometer

If you have not ordered the ceilometer together with BL-View, you may need to change the ceilometer settings before using BL-View to analyze live data from the ceilometer.



For optimum performance, use the recommended settings for the selected ceilometer type.

Setting	Supported Values	Recommended Value for CL31	Recommended Value for CL51
Data message	msg1_10x770	msg2_10x770 If the Sky Condition algorithm is disabled: msg1_10x770	msg2_10x1540 If the Sky Condition algorithm is disabled: msg1_10x1540
	msg1_20x385		
	msg1_5x1500		
	msg1_10x1540		
	msg2_10x770		
	msg2_20x385		
	msg2_5x1500		
	msg2_10x1540		
Message interval	2 ... 75 seconds	16 seconds	36 seconds

- ▶ 1. Open the connection to the ceilometer.
See [Opening Terminal Connection \(page 87\)](#).
2. Open the communication port to the ceilometer.
See [Opening and Closing Communication Port \(page 88\)](#).
3. To set advanced level commands, type:

```
advanced
```

4. To set the message format, type:

```
set message type <message format>
```

- For example, for CL31

```
set message type msg2_10x770
```

- For example, for CL51:

```
set message type msg2_10x1540
```

- To set the message interval, type the following:
 - For CL31:

```
set message interval 16
```

- For CL51:

```
set message interval 36
```

- To enable the range gate normalization, type:

```
set message profile noise_h2 on
```

The range gate data is always range-normalized, including the noise.

- To get the factory parameters of CL31, type:

```
get params factory
```

- Check the receiver type for CL31 in the response. If the receiver type is CLR321, go to the next step. Otherwise, change the algorithm parameters with the following command:

```
set factory algo_sensit high_cloud 5
```

- Close the communication port.
See [Opening and Closing Communication Port \(page 88\)](#).
- Verify that the output message is correct.

5.2 Adding Ceilometers to BL-View

When you start BL-View the first time or when you have new ceilometers, add the ceilometer information to BL-View.

This information is used as parameters in the output files.

BL-View shows how many devices are connected and how many devices are included in the license, for example **2/5 devices added**.



Make sure to use the same settings for ceilometers that you had in BL-View 2.0 and 2.1. Refer to the notes or screenshots you took before uninstalling the previous software version.

1. Select **Start > (> All Programs >) > Vaisala > BL-View > BL-View**.
2. In BL-View, select **System > Settings > Devices** and **Add**.
If you cannot select **Add**, it is possible you have in use all the devices that are allowed by your license. For license updates and new licenses, contact Vaisala.

3. In **Device**, set the following:

Device Name

Type a descriptive name for the ceilometer, for example **CL31 Helsinki**.
Use the same that you had for the ceilometer in 2.0 or 2.1.

Latitude

Type the latitude coordinate of the ceilometer. Give the coordinates according to the standard WGS84: -90.0000 ... 90.0000 degrees south, north.
Use the same that you had for the ceilometer in 2.0 or 2.1.

Longitude

Type the longitude coordinate of the ceilometer. Give the coordinates according to the standard WGS84: -180.0000 ... 180.0000 degrees west, east.
Use the same that you had for the ceilometer in 2.0 or 2.1.

Altitude

Type the altitude of the ceilometer location. The resolution is in full meters and feet. For values below sea level, use for example **-5**.

You can also ignore this setting and leave the value to the default **0**.

UTC offset

Select the time zone of the ceilometer location.

Use the same that you had for the ceilometer in 2.0 or 2.1.

WMO station number (optional)

Type the station number that consists of the WMO block number (2 digits) and the station number (3 digits).

Use the same that you had for the ceilometer in 2.0 or 2.1.

If you are moving from BL-View 2.0, check the information from the netCDF file name, "station name"

(*L2_<STATION_NAME>_YYYYMMDDHHMM_<FREE_FORMAT>.nc*).

The screenshot shows the 'BL-View - Settings' dialog box with the 'Devices' tab selected. A list on the left shows 'CL31 Helsinki' and 'CL51 Vantaa'. The 'Device' configuration for 'CL31 Helsinki' is highlighted with a red box. The fields are: Device Name (CL31 Helsinki), Latitude (60.2815), Longitude (24.8766), Altitude (180.4 ft), UTC offset (UTC +02:00), and WMO station number (06610). Below this, the 'Data' section has 'File suffix' and 'File path' (D:\BLViewData) with a 'Browse' button. The 'Connection' section has radio buttons for Serial, UDP, TCP Server, and TCP Client (which is selected).

4. In **Data**, set the following:

File suffix (optional)

Define text that is added to the end of netCDF filenames.

Use the same that you had in 2.0 or 2.1.

If you are moving from BL-View 2.0, check the information from the netCDF file name, "free format"

(*L2_<STATION_NAME>_YYYYMMDDHHMM_<FREE_FORMAT>.nc*).

File path

To define where to store the netCDF files, select **Browse**. The default location is *C:\BLViewData*. A folder is created in this directory for the specified device name.

5. Configure the **Connection** and **Messages** settings.
6. Select **Save** and **Close**.
7. When you have completed adding the ceilometers and configured the connection settings and message settings, restart the computer.

The ceilometer information is shown in BL-View and BL-View starts collecting data to HIS files and netCDF files.

More Information

- [BL-View Connection Settings \(page 30\)](#)
- [Configuring Message Settings \(page 34\)](#)

5.3 BL-View Connection Settings

The following connection types are available for connecting BL-View to the ceilometer:

- Serial line connection
- UDP connection
- TCP/IP connection (client or server)



Make sure to use the same settings for ceilometers that you had in BL-View 2.0 and 2.1. Refer to the notes or screenshots you took before uninstalling the previous software version.

5.3.1 Configuring Serial Line Connection

Select the settings for serial communication with the ceilometer.

- ▶ 1. In BL-View, select **System > Settings > Devices**.

2. In **Connection**, set the following:

Connection type

Select **Serial**.

Baud rate

Set the baud rate. The options are 9600, 19200, 38400, 57600, and 115200.

Serial port number

Select a COM port to communicate with the ceilometer. The available range is COM1 ... COM20.

Data bits

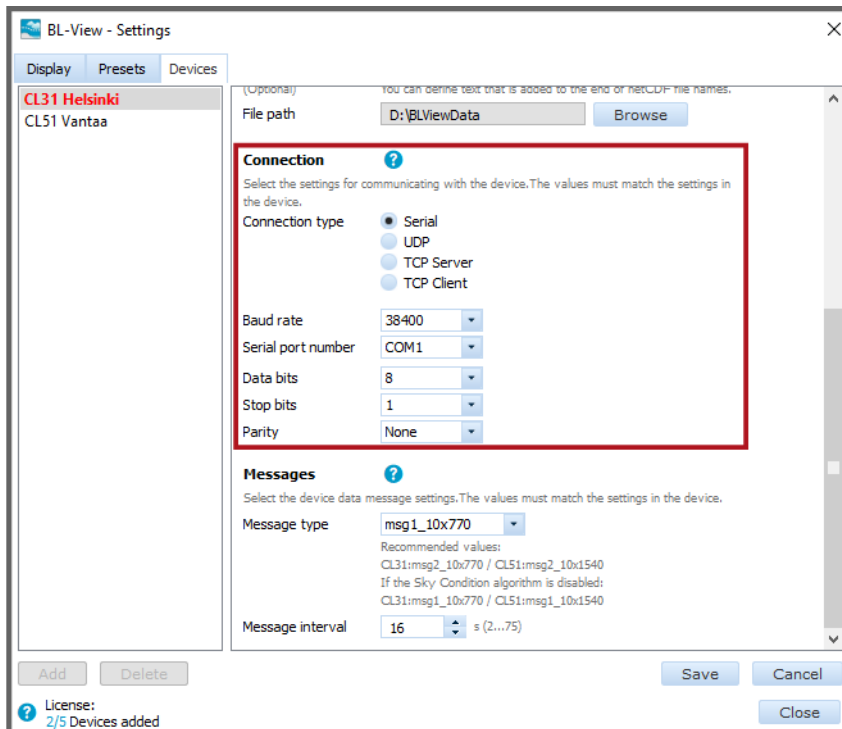
Set the number of data bits to use. The available range is 5 ... 9. The default value is 8.

Stop bits

Set the number of stop bits to use. The available range is 0 ... 4. The default value is 1.

Parity

Select the parity. The options are **None**, **Odd**, **Even**, **Mark**, or **Space**.



3. Configure the message settings.
4. Select **Save** and **Close**.

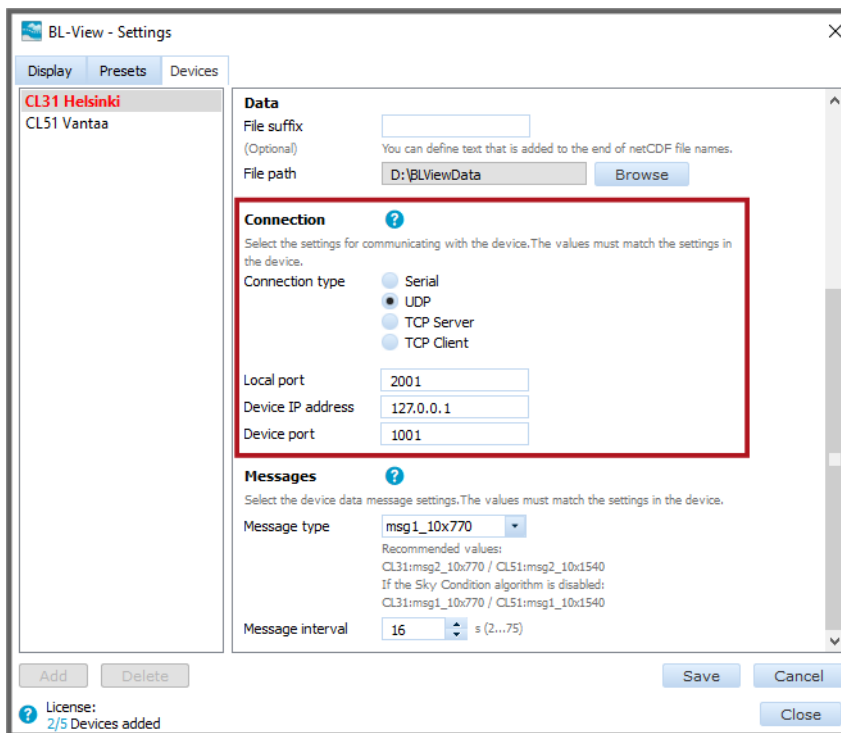
More Information

- [Configuring Message Settings \(page 34\)](#)

5.3.2 Configuring UDP Connection

Select the settings for UDP communication with the ceilometer.

- ▶ 1. In BL-View, select **System > Settings > Devices**.
2. In **Connection**, set the following:
 - Connection type**
Select **UDP**.
 - Local port**
The port on your computer.
 - Device IP address**
Ceilometer IP address. Select to match the setting in ceilometer.
 - Device port**
Ceilometer port number.



3. Configure the message settings.
4. Select **Save** and **Close**.

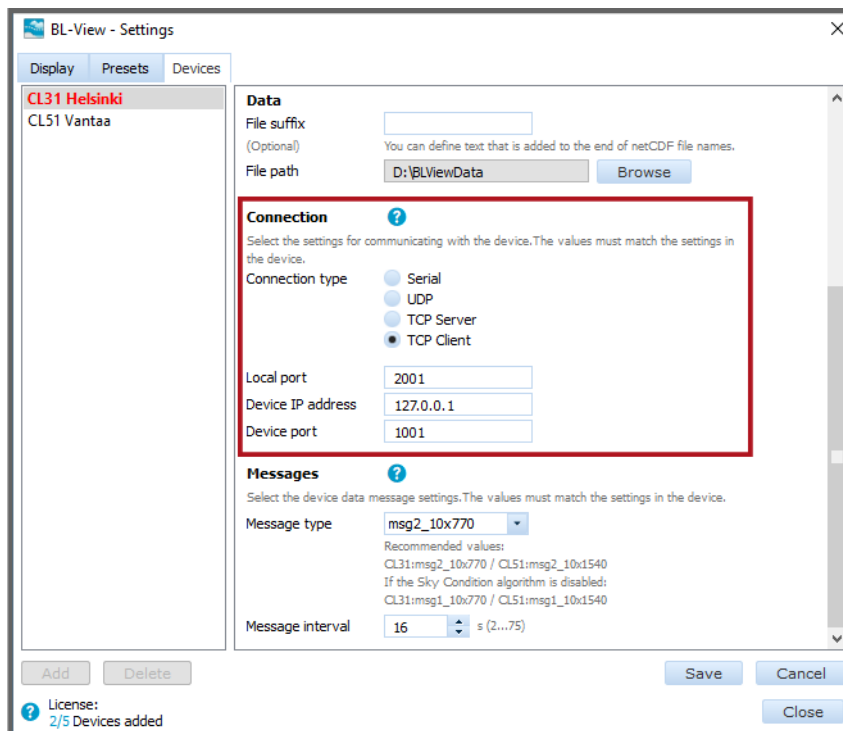
More Information

- ▶ [Configuring Message Settings \(page 34\)](#)

5.3.3 Configuring TCP/IP Connection

BL-View supports remote connection to the ceilometer. Select the settings for the TCP/IP communication with the ceilometer.

- ▶ 1. In BL-View, select **System > Settings > Devices**.
2. In **Connection**, set the following:
 - Connection type**
Select **TCP Server** or **TCP Client**. If you set BL-View as the TCP server, you only need to specify the local port.
 - Local port**
The port on your computer.
 - Device IP address**
Ceilometer IP address. Select to match the setting in ceilometer.
 - Device port**
Ceilometer port number.



3. Configure the message settings.
4. Select **Save** and **Close**.

More Information

- ▶ [Configuring Message Settings \(page 34\)](#)

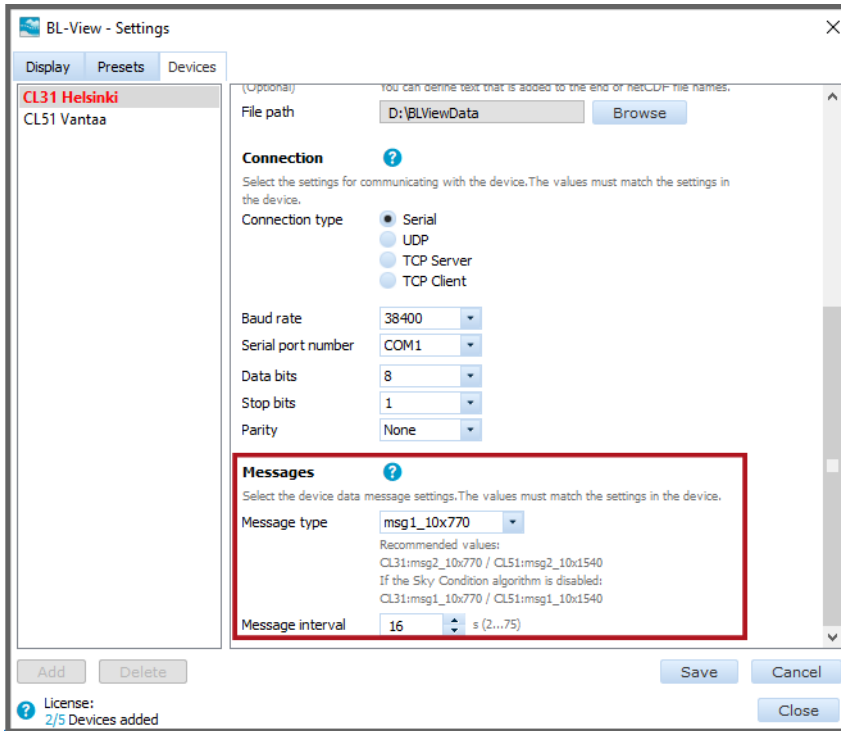
5.4 Configuring Message Settings



Make sure to use the same settings for ceilometers that you had in BL-View 2.0 and 2.1. Refer to the notes or screenshots you took before uninstalling the previous software version.

- ▶ 1. In BL-View, select **System > Settings > Devices**.

- In **Messages**, set the **Message type**.
This value must match the message format set for the ceilometer.



Setting	Supported Values	Recommended Value for CL31	Recommended Value for CL51
Data message	msg1_10x770	msg2_10x770	msg2_10x1540
	msg1_20x385	If the Sky Condition algorithm is disabled: msg1_10x770	If the Sky Condition algorithm is disabled: msg1_10x1540
	msg1_5x1500		
	msg1_10x1540		
	msg2_10x770		
	msg2_20x385		
	msg2_5x1500		
	msg2_10x1540		
Message interval	2 ... 75 seconds		

- In **Message interval**, set the message interval in seconds.
- Select **Save** and **Close**.

5.5 Verifying Setup

After you have installed and configured the new BL-View version, verify the setup.

- ▶ 1. Check that BL-View starts to receive data.
The default storage location of netCDF files is *C:\BLViewData*.
Each device has a separate folder for the files based on the device name as defined in **System > Settings > Devices**.
The storage location of HIS files is:
 - *C:\BLView\History\<year>\<month>* (automatically generated files)
 - *C:\Program Files (x86)\Vaisala\BL-View\bin\History\<month>* (manually generated / exported files)

5.6 Fetching Data Gathered with Other BL-View Version

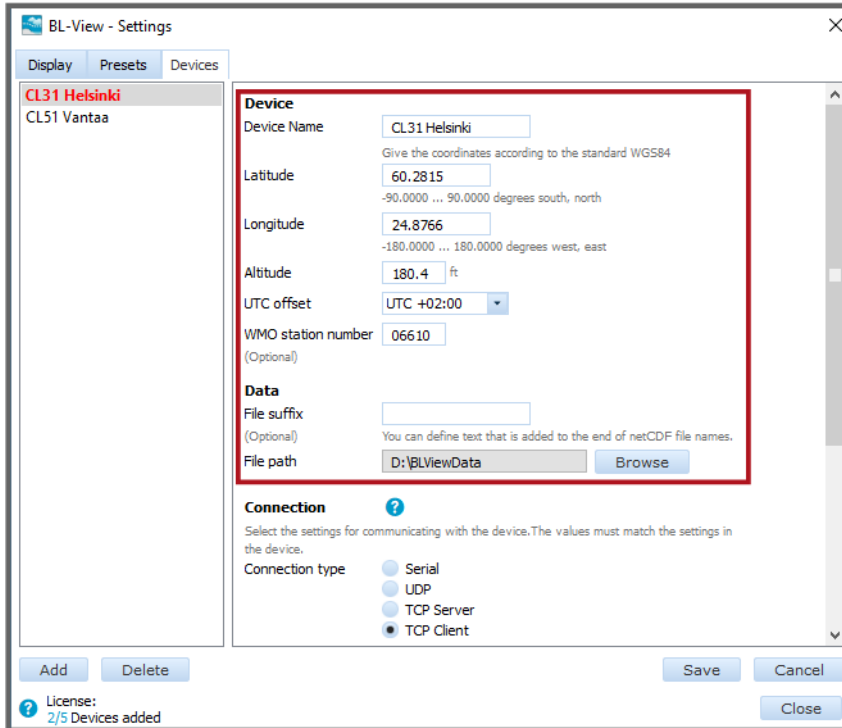
To fetch and show data that is gathered with a previous BL-View version:

- The device, data, connection, and message settings in BL-View must match the information in the netCDF files.
- The netCDF files need to be in a specific folder.

The data that can be fetched is level 2 (L2) data.

- ▶ 1. Locate the files gathered with a previous BL-View version and copy/move them to the correct device folder under *C:\BLViewData*.
There are subfolders for each ceilometer. The folders are named according to the device name as defined in **System > Settings > Devices**.
Use the ceilometer name as the folder name.

- In BL-View, check the settings in **System > Settings > Devices**. The settings must match the information in the BL-View files that you copied/moved. For **File path**, browse to the folder where you copied the netCDF files. The default location is `C:\BLViewData`.



- Verify that BL-View can open the files. In BL-View, select **Add Plot, Archive**, and a date. Select a date that you know has data. If BL-View does not open the file, make sure you have the same settings in the previous BL-View version and in the current BL-View version (**System > Settings > Devices**).

When sharing L2 netCDF files with other users, make sure to check that the following information matches in the system and in the files:

- Device name
- Latitude and longitude
- UTC offset
- WMO station number/name
- File suffix
- File storage location (file path)

6. Functional Description

6.1 Data Inputs

BL-View supports the following file types:

- Vaisala BL-View netCDF files
- Vaisala CL-VIEW DAT files

You can bring existing L2 and L3 netCDF files to BL-View using File Manager and open the data for viewing in BL-View.

You can import existing DAT files to BL-View. For viewing the data in BL-View, the service converts them to netCDF format.

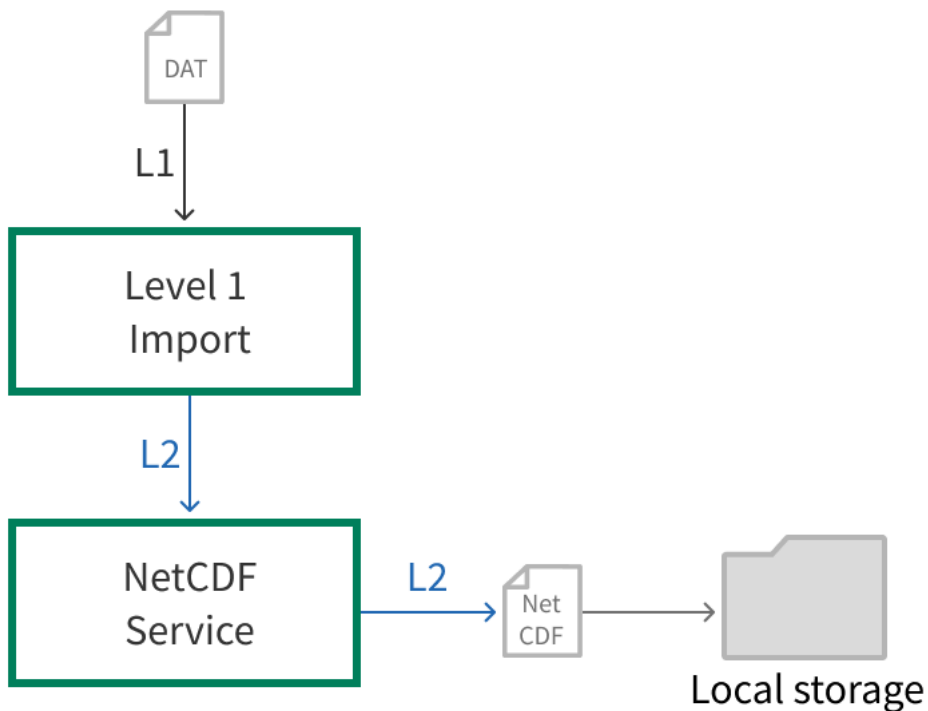


Figure 4 BL-View Import Data

More Information

- [Accessing netCDF Files \(page 85\)](#)
- [Viewing Archive Data \(page 59\)](#)
- [Importing Data \(DAT files\) \(page 80\)](#)

6.2 Operating Modes

You can view live and archive data in BL-View.

BL-View uses the 16-second message interval when plotting data.

The available altitude units are meters (m) and feet (ft).

6.2.1 Archive Data

You can access archive data from the ceilometer.

You can analyze the data according to a default or customized parameter set.

BL-View automatically stores the data to netCDF files.

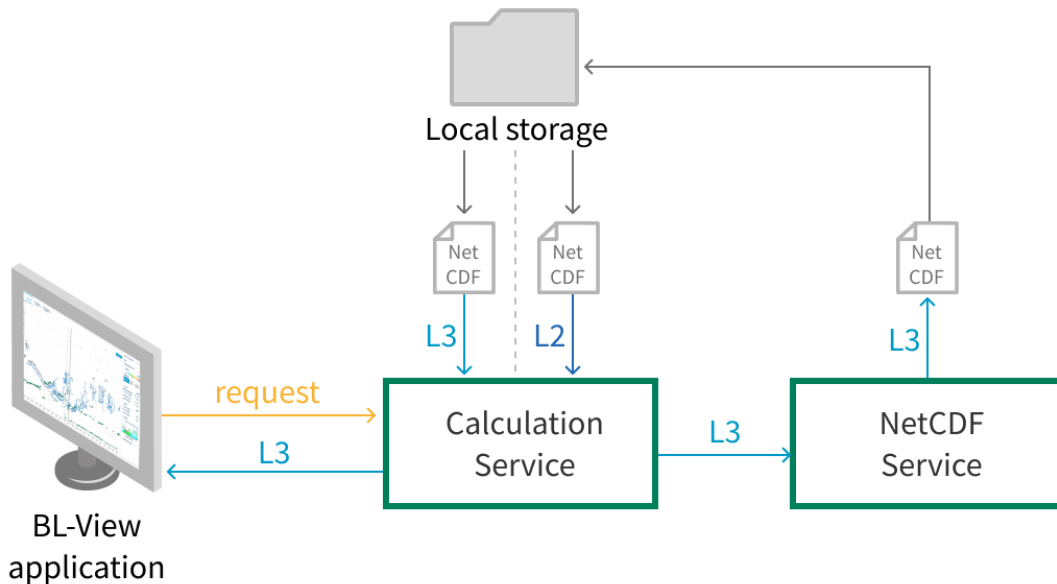


Figure 5 BL-View Archive Data

More Information

- [Viewing Archive Data \(page 59\)](#)
- [NetCDF Files \(page 44\)](#)

6.2.2 Live Data

You can access real-time live data from the ceilometer.

As soon as you have connected BL-View to a ceilometer, BL-View starts to collect data that is based on the default parameters. BL-View collects the data even when you are not using BL-View. By default, BL-View processes the data according to the default rendering parameters.

You can create customized parameter sets. For these, BL-View stores the data when you have the plot open.

BL-View automatically stores the data to netCDF files.

- The netCDF L1 data file contains level 1 (L1) data from the ceilometer.
- The netCDF L2 data file contains level 2 (L2) data that has gone through the precalculation service and averaging.
- The netCDF L3 data file contains level 3 (L3) data that has gone through the calculation service and includes all the data from the algorithms, including mixing layer height values and quality index data.

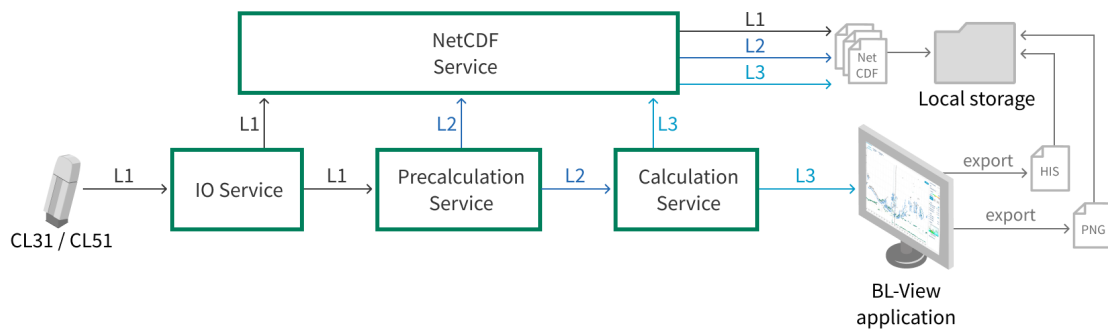


Figure 6 BL-View Live Data and Data Outputs

More Information

- [Viewing Live Data \(page 58\)](#)
- [Data Outputs \(page 41\)](#)

6.3 Data Outputs

BL-View supports the creation of several file types.

6.3.1 Image Files (PNG)

BL-View supports the creation of image files from onscreen data.

You can easily save the view in a PNG image file.

The saved image displays the device name, date, and information about the used algorithm at the top of the image.

More Information

- [Taking Instant Snapshots \(PNG Files\) \(page 82\)](#)
- [Scheduling Snapshots \(PNG Files\) \(page 82\)](#)

6.3.2 HIS Files (ASCII)

HIS files are log files that contain measurement data in ASCII format.

HIS files are generated automatically for level 2 (L2) and level 3 (L3) data. Manually generated HIS files contain level 3 data.

Table 4 HIS Files

His File Property	Automatically Generated Files	Manually Generated Files (Export)
Data	Level 2, level 3	Level 3
Preset	Default and all existing presets (separate files for each preset)	User-selectable preset
Storage location	<i>C:\BLView\History\<year>\<month></i>	<i>C:\Program Files (x86)\Vaisala\BLView\bin\History\<month></i>

The filename is of format

<CEILOMETER_NAME>_<DATA_LEVEL>_<PRESET>_<DD>.his.

An example of a filename: *CEILOMETER_1_LEVEL_2_DEFAULT_27.his.*

Table 5 Fields of HIS Filenames

Name	Description	Value
CEILOMETER_NAME	Ceilometer identifier as defined in ceilometer	CEILOMETER_1
DATA_LEVEL	Identification of the data level	LEVEL_2
PRESET	Algorithm information (L3 files only)	DEFAULT
DD	Day of month	27

Table 6 Level 2 HIS Files

Property	Description
CREATEDATE	Timestamp in format YYYY-MM-DD hh:mm:ss (UTC)
UNIXTIME	Timestamp (Unix time)
CEILOMETER	Ceilometer identifier
PERIOD	Data update period in seconds
BS_PROFILE	Signal backscatter profile rendered with the resolution of 10 and height of 4500 meters (14 760 ft)

Table 7 Level 3 HIS Files

Property	Description
CREATEDATE	Timestamp in format YYYY-MM-DD hh:mm:ss (UTC)
UNIXTIME	Timestamp (Unix time)
CEILOMETER	Ceilometer identifier
PERIOD	Data update period in seconds
SAMPLE_COUNT	Number of level 2 samples used to compute this level 3
BL_HEIGHT_1	First boundary layer height candidate (meters) (-999 if no candidate)
BL_HEIGHT_2	Second boundary layer height candidate (meters) (-999 if no candidate)
BL_HEIGHT_3	Third boundary layer height candidate (meters) (-999 if no candidate)
BL_INDEX_1	Quality index for first boundary layer height candidate (-999 if no candidate)
BL_INDEX_2	Quality index for second boundary layer height candidate (-999 if no candidate)
BL_INDEX_3	Quality index for third boundary layer height candidate (-999 if no candidate)
MEAN_LAYER_HEIGHT	Hourly average mixing layer height
MEAN_LAYER_INDEX	Quality index for the hourly average mixing layer height
CLOUD_STATUS	Cloud detection status, 0 - 4
CLOUD_1	First cloud base (meters) or vertical visibility (meters) (-999 if no cloud base or vertical visibility)
CLOUD_2	Second cloud base (meters) or highest received signal in vertical visibility (meters) (-999 if no cloud base or vertical visibility)
CLOUD_3	Third cloud base (meters) (-999 if no cloud base)
PARAMETERS	Level 2 to level 3 algorithm parameters

Here is an example of a level 3 HIS file with custom parameters.

```
History file
CREATEDATE, UNIXTIME, CEILOMETER, PERIOD, SAMPLE_COUNT, BL_HEIGHT_1,
BL_HEIGHT_2, BL_HEIGHT_3, BL_INDEX_1, BL_INDEX_2, BL_INDEX_3,
MEAN_LAYER_HEIGHT, MEAN_LAYER_INDEX, CLOUD_STATUS, CLOUD_1, CLOUD_2, CLOUD_3,
PARAMETERS
2018-04-23 00:00:00, 1524441600, CL31 - C2, 16, 82, 70, 320, 600, 2, 1, 2, 83,
1, 1, 7405, -999, -999, 1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60
2018-04-23 00:00:16, 1524441616, CL31 - C2, 16, 81, 70, 320, 600, 2, 1, 2, 83,
1, 1, 7445, -999, -999, 1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60
2018-04-23 00:00:32, 1524441632, CL31 - C2, 16, 81, 70, 320, 600, 2, 1, 2, 83,
1, 1, 7405, -999, -999, 1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60
```

Property	Description/Value
CREATEDATE	2018-02-28 22:00:00
UNIXTIME	1519855200
CEILOMETER	HelsinkiNE
PERIOD	
SAMPLE_COUNT	82
BL_HEIGHT_1	350
BL_HEIGHT_2	-999 (no candidate)
BL_HEIGHT_3	-999 (no candidate)
BL_INDEX_1	3
BL_INDEX_2	-999 (no candidate)
BL_INDEX_3	-999 (no candidate)
MEAN_LAYER_HEIGHT	190
MEAN_LAYER_INDEX	3
CLOUD_STATUS	0
CLOUD_1	-999 (no cloud base or vertical visibility)
CLOUD_2	-999 (no cloud base or vertical visibility)
CLOUD_3	-999 (no cloud base)
PARAMETERS	1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60

More Information

- [Exporting Data \(HIS Files\) \(page 84\)](#)

6.3.3 NetCDF Files

Network Common Data Form (netCDF) is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.

The netCDF service in BL-View follows level 1 (L1), level 2 (L2), and level 3 (L3) data. Measurement and calculation events that occur every 16, 30, or 36 second trigger the service to read the L1, L2, and L3 fields, and write the data to the respective netCDF file.

The service creates the following files every 24 hours for each connected device:

- 1 netCDF file for L1 data
- 1 netCDF file for L2 data
- 1 netCDF file for L3 data with default profile settings
- Optionally, if configured: netCDF file for L3 data with customized profile settings (1 file for each custom setting)

The extension of netCDF files is .nc. The default storage location of netCDF files is *C:\BLViewData*. Each device has a separate folder for the files.

Vaisala recommends backing up netCDF files regularly.

An example of a level 3 (L3) netCDF file is in *BL-View NetCDF Example File Technical Reference*.

More Information

- ▶ [Accessing netCDF Files \(page 85\)](#)

6.3.3.1 NetCDF L1 File Format

The netCDF L1 data file contains level 1 (L1) data from the ceilometer.

NetCDF L1 filenames have the following format:

L1_<STATION_NUMBER>_YYYYMMDDHHMM_<FREE_FORMAT>.nc

Table 8 Fields of L1 Filenames

Name	Description
L1	Identification of the data level
STATION_NUMBER	WMO station number, if defined in System > Settings > Devices .
YYYYMMDDHHMM	UTC time
FREE FORMAT	File suffix, if defined in System > Settings > Devices .

Example: *L1_201609290722*

The following `global` attributes are used:

- `site_location`
- `instrument_type`

Table 9 L1 Dimensions

Dimension Name	Description
<code>time</code>	Number of profiles
<code>range</code>	Number of vertical bins

Table 10 NetCDF L1 Data File Fields

Variable Name	Attributes	Description
time	Units = days Type = double Dimension = time axis = T	Unix time
name	Dimension = time	Data identifier (ceilometer name) as defined in System > Settings > Devices
range	Dimension = range	7700 m (25 260 ft), values with 10 m (33 ft) resolution meaning 770 samples
message_type	Dimension = time	Ceilometer data message type (11, 12, 13, 16, 21, 22, 23, or 26)
version	Dimension = time	Ceilometer version number
date_stamp	Units = days Type = double Dimension = time axis = T	Measurement timestamp in textual form (yyyy-MM-dd hh:mm:ss)
period	Dimension = time	Sending frequency of ceilometer data message in milliseconds. The boundary layer height algorithm is optimized for 16 second message interval
tilt_angle	Units = degree Type = integer Dimension = time	Ceilometer tilt angle (0 ... 90 degrees).
cloud_status	Dimension = time	0 = no significant backscatter/some obscuration but determined to be transparent 1 = one cloud layer 2 = two cloud layers or full obscuration (vertical visibility and highest signal detected) 3 = three cloud layers 4 = change cloud status to 2, reports vertical visibility and highest signal
cloud_data	Dimension = time	Cloud bases or vertical visibility/highest signal detected (meters or feet)

Variable Name	Attributes	Description
status_bits	Dimension = time	Ceilometer status bits (12 characters)
profile_scale	Dimension = time	Scaling parameter of ceilometer signal backscatter profile (0 ... 9999, 100 = no scaling)
profile_resolution	Dimension = time	Resolution of ceilometer signal backscatter profile (5, 10, or 20 m (16, 33, or 66 ft), depending on the message type)
profile_length	Dimension = time	Number of samples in ceilometer signal backscatter profile (385, 770, or 1540), depending on the message type
rscs_910	Dimension = time, range	Ceilometer signal backscatter profile Each sample is coded with a 20-bit HEX ASCII character set

6.3.3.2 NetCDF L2 File Format

The netCDF L2 data file contains level 2 (L2) data that has gone through the precalculation service and averaging.

The profile is set to 4500 m (14 764 ft).

NetCDF L2 filenames have the following format:

L2_<STATION_NUMBER>_YYYYMMDDHHMM_<FREE_FORMAT>.nc

Table 11 Fields of L2 Filenames

Name	Description
L2	Identification of the data level
STATION_NUMBER	WMO station number, if defined in System > Settings > Devices .
YYYYMMDDHHMM	UTC time
FREE_FORMAT	File suffix, if defined in System > Settings > Devices .

Example: *L2_201609290722*

Table 12 L2 Dimensions

Dimension Name	Description
time	Number of profiles
range	Number of vertical bins

Table 13 NetCDF L2 Data File Fields

Variable Name	Attributes	Description
time	Units = days Type = double Dimension = time axis = T	Unix time
name	Dimension = time	Data identifier (ceilometer name) as defined in System > Settings > Devices
version	Dimension = time	Ceilometer version number
date_stamp	Units = days Type = double Dimension = time axis = T	Measurement timestamp in textual form (yyyy-MM-dd hh:mm:ss)
range	Dimension = range	4500 m (14 764 ft), values with 10 m (33 ft) resolution meaning 450 samples
period	Dimension = time	Sending frequency of ceilometer data message in seconds
cloud_status	Dimension = time	0 = no significant backscatter/some obscuration but determined to be transparent 1 = one cloud layer 2 = two cloud layers or full obscuration (vertical visibility and highest signal detected) 3 = three cloud layers
cloud_data	Dimension = time	Cloud bases or vertical visibility/highest signal detected (meters or feet)
status_bits	Dimension = time	Ceilometer status bits (12 characters)
profile_length	Dimension = time	Number of samples in ceilometer signal backscatter profile (450)
bs_std	Dimension = time	Standard deviation of ceilometer signal backscatter profile, computed from height range 6210 ... 6700 m or 7210 ... 7700 m (20 374 ... 21 982 ft or 23 655 ... 25 260 ft)
profile_data	Dimension = time, range	Ceilometer signal backscatter profile (10-m / 33-ft resolution, 450 samples up to height of 4500 m / 14 764 ft)
longitude	Dimension = time	Longitude of each measurement. Based on ceilometer location as defined in System > Settings > Devices
latitude	Dimension = time	Latitude of each measurement. Based on ceilometer location as defined in System > Settings > Devices
altitude	Dimension = time	Altitude above sea level. Based on ceilometer location as defined in System > Settings > Devices
utc_offset	Dimension = time	UTC offset

6.3.3.3 NetCDF L3 File Format

The netCDF L3 data file contains level 3 (L3) data that has gone through the calculation service and includes all the data from the algorithms, including mixing layer height values and quality index data.

There are 3 different L3 file types:

- L3 default file: This file contains L3 data that uses the default preset for a live plot.
- L3 custom file: This file contains L3 data that uses a custom preset for a live plot.
- L3 archive file: This file contains L3 data from archive plots.

NetCDF L3 filenames have the formats that are shown in the following table.

Table 14 Naming of NetCDF L3 Files

L3 File Type	Filename
L3 with default profile settings	<i>L3_DEFAULT_<STATION_NUMBER>_YYYYMMDDHHMM_<ParameterKey>_<FREE_FORMAT>.nc</i>
L3 with custom profile settings	<i>L3_CUSTOM_<STATION_NUMBER>_YYYYMMDDHHMM_<ParameterKey>_<FREE_FORMAT>.nc</i>
L3 for archive plot	<i>L3_OFFLINE_<STATION_NUMBER>_YYYYMMDDHHMM_<ParameterKey>_<FREE_FORMAT>.nc</i>

Table 15 Fields of L3 Filenames

Name	Description
L3	Identification of the data level
DEFAULT	Identification of the L3 file type
CUSTOM	
OFFLINE	
STATION_NUMBER	WMO station number, if defined in System > Settings > Devices .
YYYYMMDDHHMM	UTC time
ParameterKey	Identification of the advanced algorithm settings. See the table below for an explanation.
FREE_FORMAT	File suffix, if defined in System > Settings > Devices .

Example filename:

L3_DEFAULT_06610_201701160000_1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60.nc

Example parameter key:

```
1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60
```

Table 16 Calculation Parameters in Parameter Key

Property	Description	Example Value
Automatic height averaging	0 = no 1 = yes	1
Height averaging interval (Automatic: Max. height averaging interval)	The default value is 360 m (1181 ft).	360
Automatic time averaging	0 = no 1 = yes	1
Time averaging interval in s (Automatic: Max. time averaging interval in s)	The available range is 60 ... 3000 seconds. The default value is 3000.	3120
Algorithm sensitivity	The available range is 0 ... 20. The default value is 5.	10
Boundary layer min	The available range is 30 ... 500 m (99 ... 1640 ft). The default value is 30 m (99 ft).	30
Boundary layer max	The available range is 200 ... 4000 m (656 ... 13 120 ft). The default value is 4000 m (13 120 ft).	4000
Number of boundary layers	The available range is 1 ... 3. The default value is 3.	3
Algorithm method	0 = merged 1 = gradient 2 = profile fit	0
Profile fit settings		
SNR	The available range is 0 ... 100. The default value is 1.	1
SNR average window	The available range is 20 ... 1000 m (66 ... 3280 ft). The default value is 500 m (1640 ft).	500
Night profile length	The available range is 10 ... 4500 m (33 ... 14 760 ft). The default value is 1000 m (3280 ft).	1000
Day profile length	The available range is 10 ... 4500 m (33 ... 14 760 ft). The default value is 4000 m (13 120 ft).	4000
Outlier removal strength	The available range is 0 ... 500. The default value is 60.	60

The following **global attribute** is used:

- **site_location**

Table 17 L3 Dimensions

Dimension Name	Description
time	Number of profiles
range	Number of vertical bins

Table 18 NetCDF L3 Data File Fields

Variable Name	Attributes	Description
time	Units = days Type = double Dimension = time axis = T	Unix time
name	Dimension = time	Data identifier (ceilometer name) as defined in System > Settings > Devices
date_stamp	Units = days Type = double Dimension = time axis = T	Measurement timestamp in textual form (yyyy-MM-dd hh:mm:ss)
period	Dimension = time	Sending frequency of ceilometer data message in seconds
Mean_Layer_Height	Dimension = time	Average mixing layer height for the period of 1 hour
Mean_Layer_QualityIndex	Dimension = time	Average mixing layer quality index for the period of 1 hour
Mean_Layer_Calculation_Time	Dimension = time	Average layer calculation time for the 1-hour interval
cloud_status	Dimension = time	0 = no significant backscatter/some obscuration but determined to be transparent 1 = one cloud layer 2 = two cloud layers or full obscuration (vertical visibility and highest signal detected) 3 = three cloud layers
cloud_data	Dimension = time	Cloud bases or vertical visibility/highest signal detected (meters or feet)
bl_height_length	Dimension = time	Number of boundary layer height candidates found (0 ... 3)
bl_index	Dimension = time	Quality indices for boundary layer height candidates
bl_height	Dimension = time	Boundary layer height candidates (meters)

Variable Name	Attributes	Description
Bs_profile_length	Dimension = time	Number of samples in ceilometer signal backscatter profile (450)
bs_profile_data	Dimension = time, range	Ceilometer signal backscatter profile (10-m / 33-ft resolution, 450 samples up to height of 4500 m / 14 764 ft)
Ng_profile_length	Dimension = time	Number of samples in negative gradient profile (450)
ng_profile_data	Dimension = time, range	Negative gradient profile (10-m / 33-ft resolution, 450 samples up to height of 4500 m / 14 764 ft)
Ec_profile_length	Dimension = time	Number of samples in ceilometer signal extinction coefficient profile (450)
ec_profile_data	Dimension = time, range	Extinction coefficient (EC) profile (10-m / 33-ft resolution, 450 samples up to height of 4500 m / 14 764 ft)
Ec_profile_range	Dimension = time	Range in meters to which the extinction coefficient (EC) profile data is valid. Above that range data is 0
Ec_profile_opacity	Dimension = time	Opacity (or aerosol optical depth, AOD) of the extinction coefficient (EC) profile in units of 0.01; it is the integral of EC up to that range
vrh_height_averaging	Dimension = time	1 = True, use variable height averaging (default) 0 = False, use user-defined constant height averaging
vrh_time_averaging	Dimension = time	1 = True, use variable time averaging (default) 0 = False, use user-defined constant time averaging
Height_averaging_param	Dimension = time	Height averaging parameter (40 ... 600 m, default 360 m / 131 ... 1969 ft, default 1181 ft) Used only if vrh_height_averaging = false
Time_averaging_period	Dimension = time	Time averaging period (60 ... 3000 seconds, default 3000) Used only if vrh_time_averaging = false
algorithm_sensitivity	Dimension = time	Algorithm sensitivity (0 ... 20, default 10) Smaller value means higher sensitivity
boundary_layer_min	Dimension = time	Minimum height for a boundary layer height candidate (30 ... 500 m, default 30 m / 99 ... 1640 ft, default 99 ft)
boundary_layer_max	Dimension = time	Maximum height for a boundary layer height candidate (200 ... 4000 m, default 4000 / 656 ... 13 123 ft, default 13 123 ft)
number_of_boundary_layers	Dimension = time	Maximum number of boundary layer height candidates to be reported (1 ... 3, default 3)
Location_latitude	Dimension = time	Latitude of each measurement. Based on ceilometer location as defined in System > Settings > Devices

Variable Name	Attributes	Description
Location_longitude	Dimension = time	Longitude of each measurement. Based on ceilometer location as defined in System > Settings > Devices
location_utc_offset	Dimension = time	UTC offset of each measurement. Based on ceilometer location as defined in System > Settings > Devices
Algorithm_Method	Dimension = time	0 = Merged gradient and profile fit 1 = Gradient 2 = Profile fit
parameter_key	Dimension = time	See Table 16 (page 50) .
sunrise_utc	Dimension = time	UTC sunrise time in hours
sunset_utc	Dimension = time	UTC sunset time in hours
LevelTwoCount		Number of level 2 (L2) samples used to create level 3 (L3) sample
range	Dimension = range	4500 m (14 764 ft), values with 10 m (33 ft) resolution meaning 450 samples

7. Using BL-View

7.1 Using BL-View

BL-View offers different views to data, for example backscatter and negative gradient views, and it is easy to filter out data to focus on only boundary layer height, cloud data height, and/or intensity information. BL-View plots the boundary layer and cloud base data according to specified settings. Use the live and archive plot options and adjust the algorithm settings (calculation presets).

7.2 Opening BL-View

- ▶ 1. To open BL-View, select **Start > (> All Programs >) > Vaisala > BL-View > BL-View**. BL-View opens and shows live real-time data.

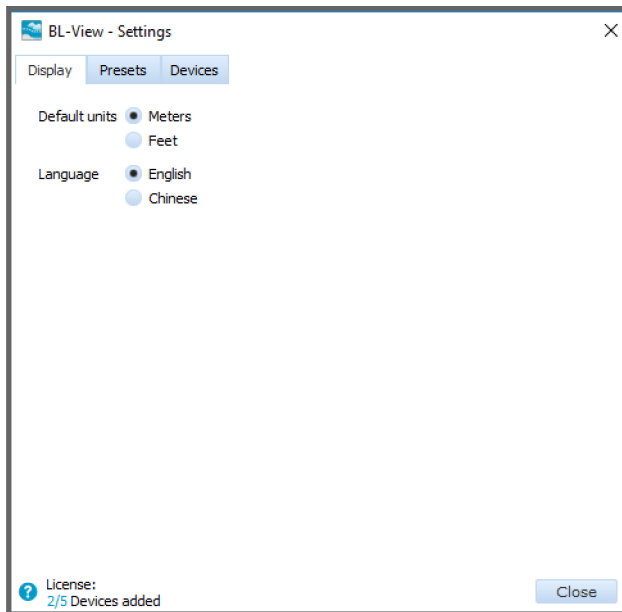
7.3 Selecting Display Settings

You can select the display language and whether the data in BL-View is shown in meters or feet.

The selection does not affect the data in the HIS and netCDF files which is always in English and in meters.

- ▶ 1. In BL-View, select **System > Settings > Display**.

2. In **Default units**, select whether you want to display the data in meters or feet. The unit setting is applied to the display data in BL-View.



3. Select the language.
4. Select **Close**.

8. Working with Graphs

8.1 Reading Graphs

In BL-View, the boundary layer information is illustrated on the screen as density plots. You can create plots to view and analyze live and archive data. Each new plot opens as a new tab.

The panel on the right displays the following information:

- **Data** lets you select between mixing layer height data (**MLH data**) and **Profile data**.
- For live plots: **Current values** shows the boundary layer and cloud base height in the density plot that is currently open.
- For archive plots: **Legend** shows the boundary layer and cloud base markers. Height information is not available.
- **Intensity** shows the intensity scale for the displayed boundary layer information in backscatter or negative gradient view.
- **Navigator** shows which section of the plot is currently displayed.
- **Information** shows the selected algorithm parameters and the update status.



If you choose to view profile data, **Current values** / **Legend** shows only cloud base information and **Information** does not show algorithm information.

The following markers are used in the graphs:

- Dark red/yellow/green rectangles: Boundary layer heights. The colors indicate the quality of the data.
- Blue line: 1-hour average mixing layer height.
- Gray rectangles: Additional boundary layer heights (elevated layers).
- Blue dots: Cloud base heights.

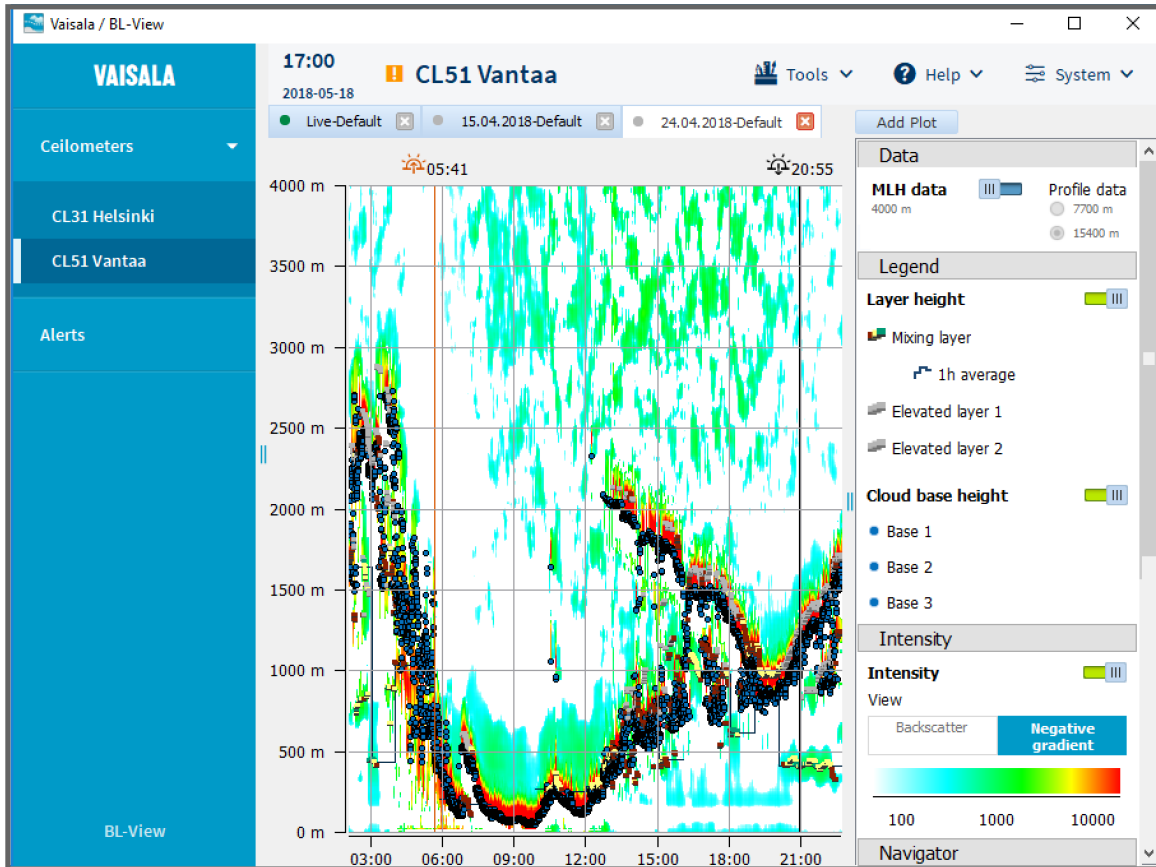



Figure 7 BL-View Panel: Archive Plot

8.1.1 Viewing Live Data

You can create density plots to view real-time data from the ceilometer.

 You can view 1 default live plot and 1 custom live plot simultaneously for each ceilometer.

- ▶ 1. In BL-View, select **Add Plot**.

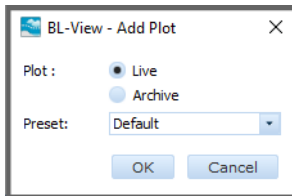
2. Set the following properties:

Plot

Select **Live**.

Preset

Select the preset (set of algorithm parameters) for analyzing the data.



3. Select **OK**.



There can be a 1-minute delay before the live data is shown in BL-View.

The plot opens with the following name: **Live-`<name of preset>`**. Live plots have a green circle in front of the name.

If you want to view the plot with a different preset, first check that you have the preset available or create it (**System > Settings > Presets**). After that, add a plot using that preset.

More Information

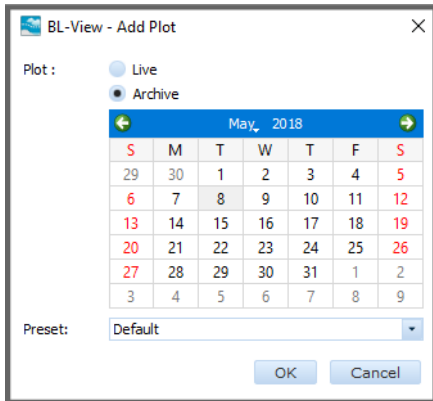
- [Live Data \(page 40\)](#)
- [Managing Calculation Presets \(page 69\)](#)

8.1.2 Viewing Archive Data

You can create density plots to view archived data.

- ▶ 1. In BL-View, select **Add Plot**.

- In **Plot** select **Archive** and a month and date in the calendar.



- In **Preset**, select the preset (set of algorithm parameters) for analyzing the data.
- Select **OK**.

The plot opens with the following name: <date>-<name of preset>. Archive plots have a gray circle in front of the name.

If you want to view the plot with a different preset, first check that you have the preset available or create it (**System > Settings > Presets**). After that, add a plot using that preset.

More Information

- ▶ [Archive Data \(page 40\)](#)
- ▶ [Managing Calculation Presets \(page 69\)](#)

8.1.3 Zooming Plots

You can change the time and height range settings of the plot that you are viewing.

- Select the tab for the plot you want to modify.
- Use your mouse to zoom in. Zooming is limited to 3 hours and 200 m (656 ft).



When the time range is 9 hours or less, the grid displays all hours in the selected range. When the time range is 12 ... 24 hours, the grid displays every third hour of the selected range.

Property	CL31	CL51
Measurement range, MLH data	0 ... 4000 m (0 ... 13 120 ft)	0 ... 4000 m (0 ... 13 120 ft)
Measurement range, profile data	0 ... 7700 m (0 ... 25 260 ft)	0 ... 15 400 m (0 ... 50 520 ft)

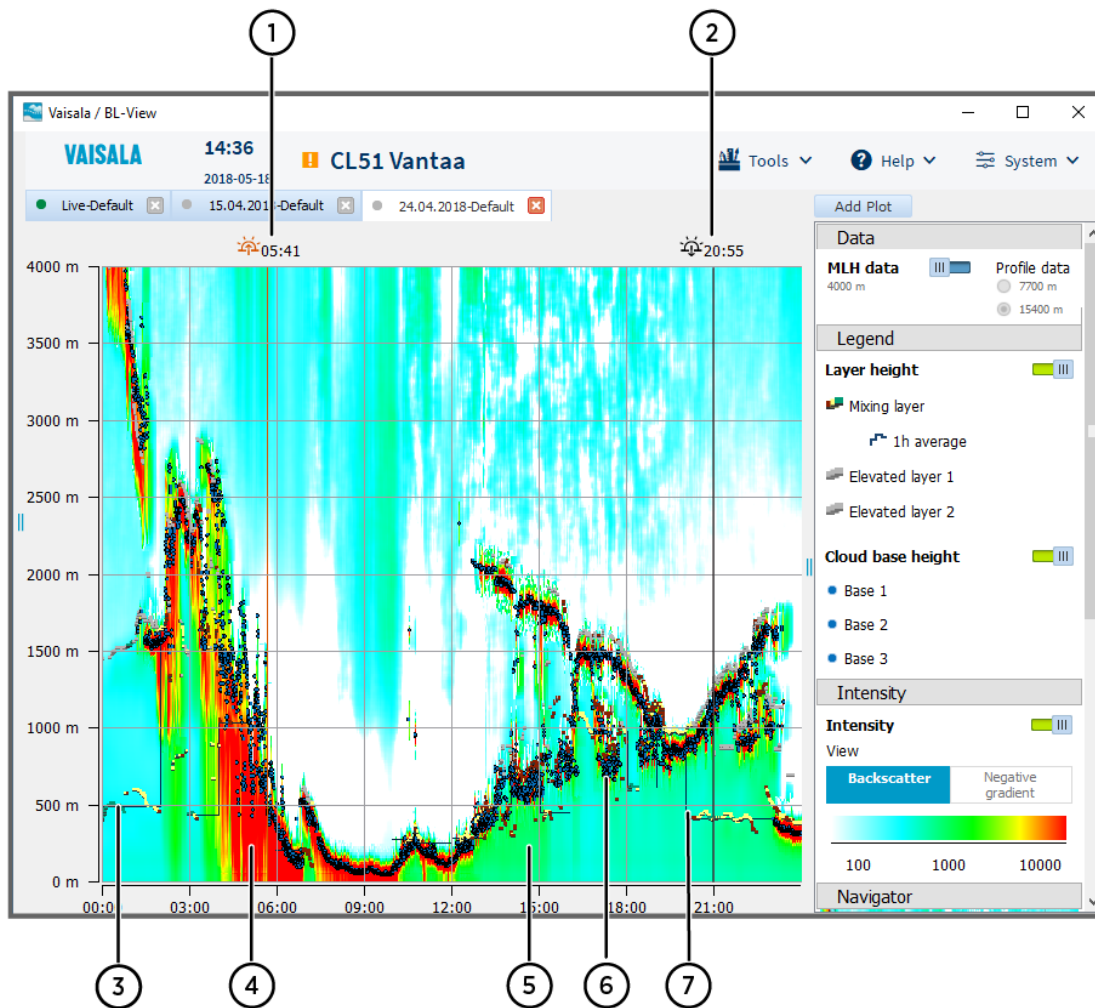
- To zoom out, right-click and select **Fit view**.
- You can also show/hide the grid and refresh the view. Right-click on the plot and select **Grid** or **Refresh**.

8.1.4 Reading Boundary Layer and Cloud Detection Graphs

You can show and hide **Layer height** and **Cloud base height** data in plots.

- ▶ 1. To view boundary layer and cloud base height data, see **Current values/Legend**, which includes:
 - **Mixing layer**: the height of the mixing layer
 - **1h average**: 1-hour average mixing layer height. The information is updated every hour.
 - **Elevated layer 1** and **Elevated layer 2**: elevated aerosol layers
 - **Cloud base height**: height of cloud base 1, 2, and 3

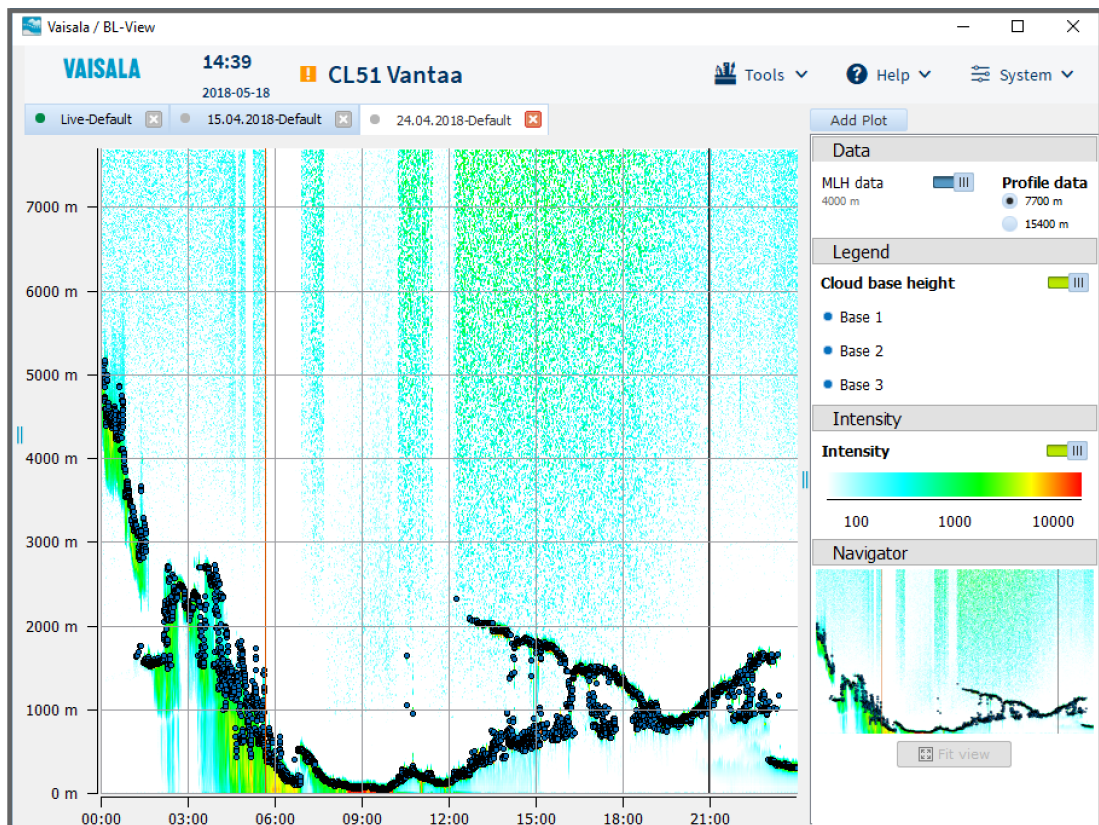
- To view layer height data, select **MLH data**.



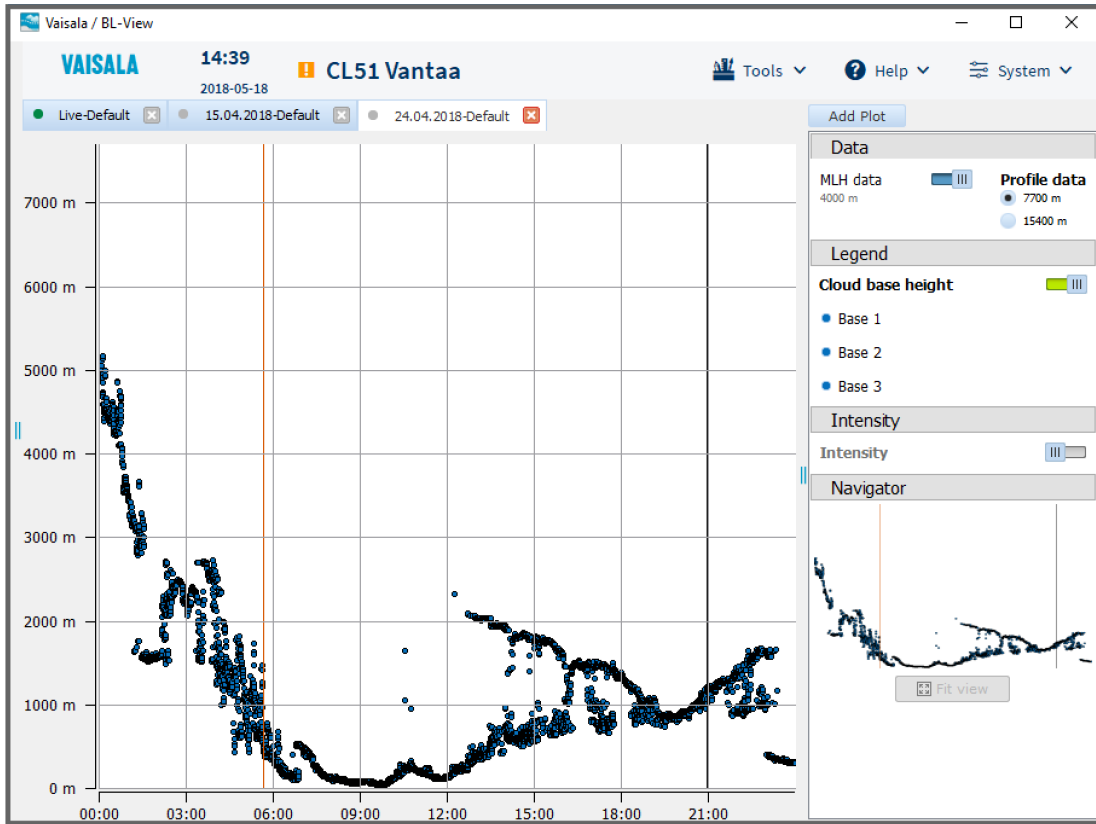
With a live plot, if a valid parameter is not correctly measured, its value is replaced with 2 slash characters (//).

- Sunrise indicator (yellow)
- Sunset indicator (black)
- Boundary layer heights (dark red/yellow/green) and elevated layers (gray)
- Signal from clouds and precipitation (red)
- Aerosol backscatter signal (light blue to yellow)
- Cloud base heights (blue dots)
- 1-hour average mixing layer height (blue lines)

- To view the whole profile with cloud base data, select **Profile data**.



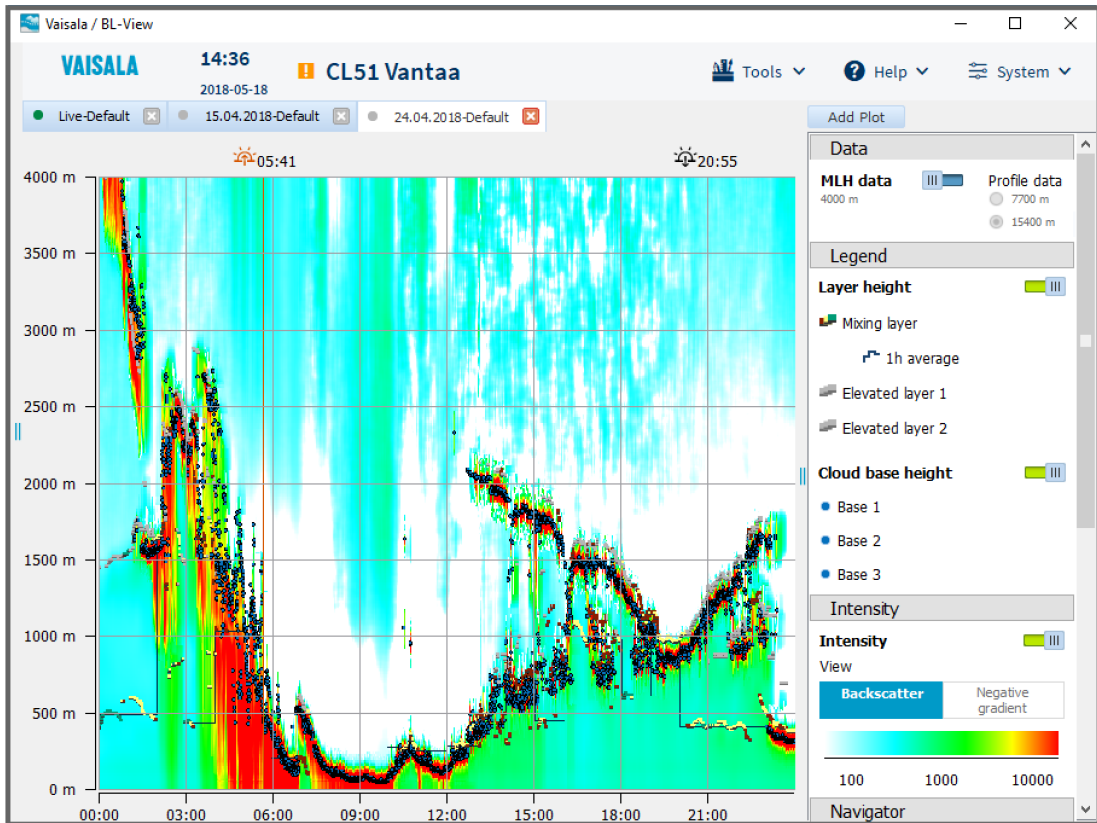
4. To view the whole profile with cloud base data and without intensity, select **Profile data** and disable **Intensity**.



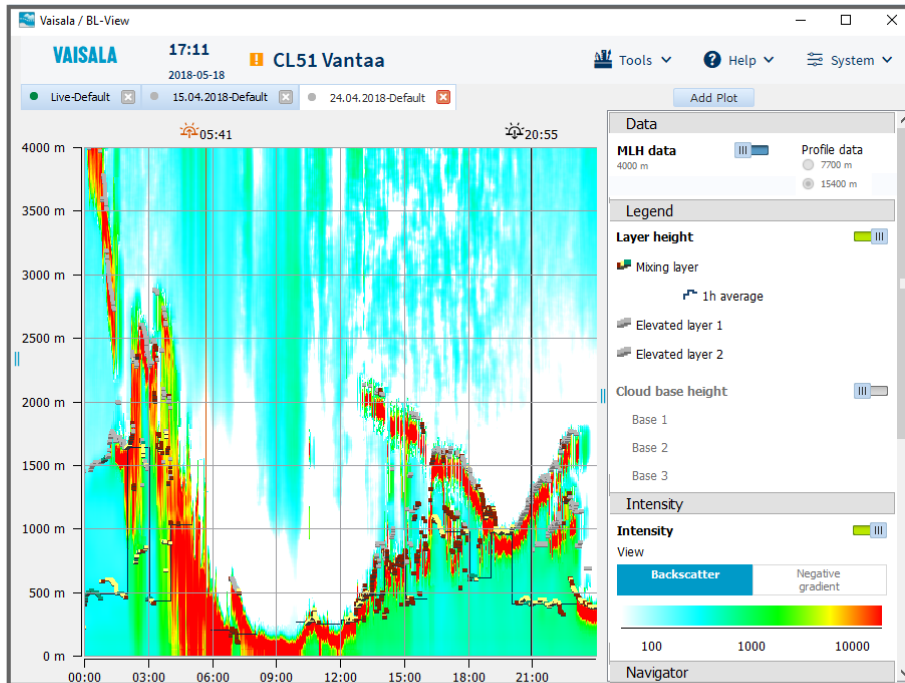
8.1.5 Reading Cloud Intensity Graphs

The **Intensity** information indicates the intensity of the backscatter or negative gradient signal. You can show and hide intensity data in plots.

1. To view intensity data, enable **Intensity** and select **Backscatter** or **Negative gradient**.



- To view only layer height and intensity information without cloud base information, disable **Cloud base height**.



8.1.6 Using Backscatter View

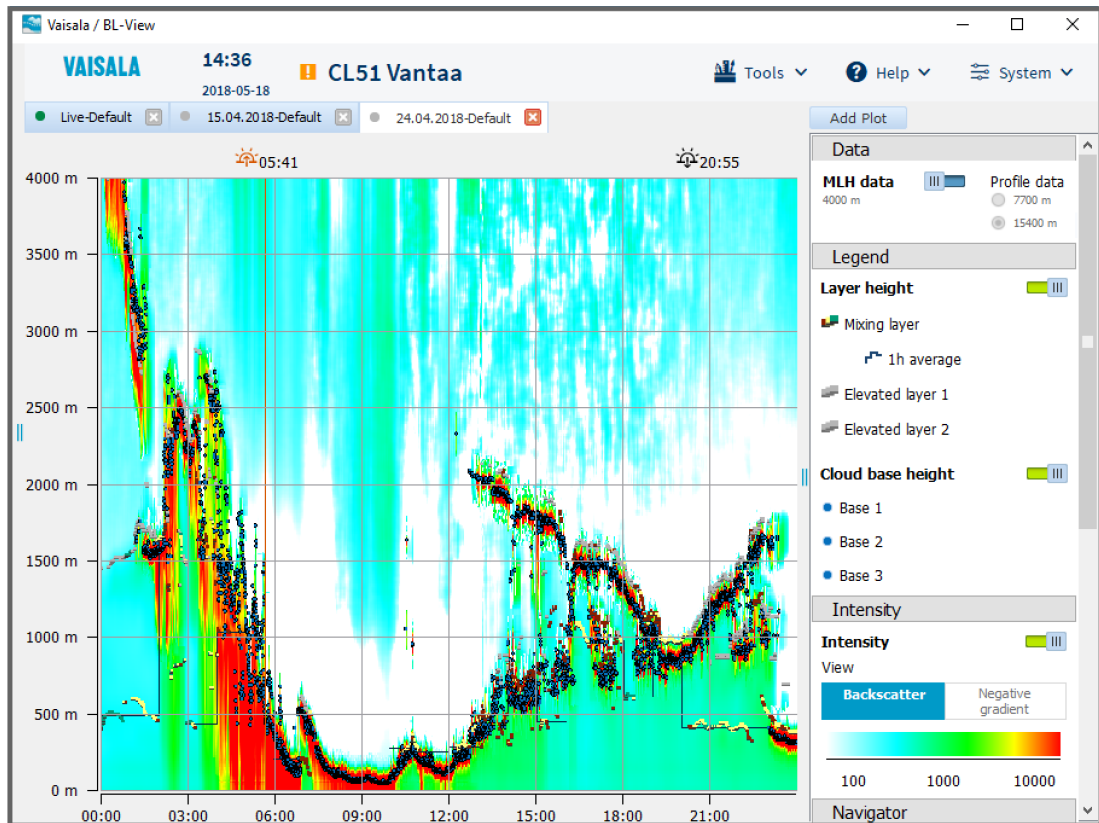
You can choose to view ceilometer data in BL-View in the **Backscatter** view.

Use the backscatter view for general analysis of the planetary boundary layer structure. The colors in the intensity legend indicate the intensity of the backscatter signal in units of $10^{-9} \text{ m}^{-1} \text{ sr}^{-1}$.

For live data, the backscatter profile updates every minute.

- In the **Data** panel, enable **MLH data**.

- In the **Intensity** panel, enable **Intensity** and select **Backscatter**.



The backscatter view uses the following colors:

- Red in the plot: Signal from clouds and precipitation.
- Light blue to yellow in the plot: Aerosol backscatter signal.



The algorithm settings do not affect the displayed cloud base heights because these calculations are performed in the ceilometer.

Fixed logarithmic scaling provides optimal signal dynamics and makes it easier to compare the results from different days.

The backscatter view shows profiles that are rendered with the selected algorithm parameters. The cloud and precipitation filter is always applied.

More Information

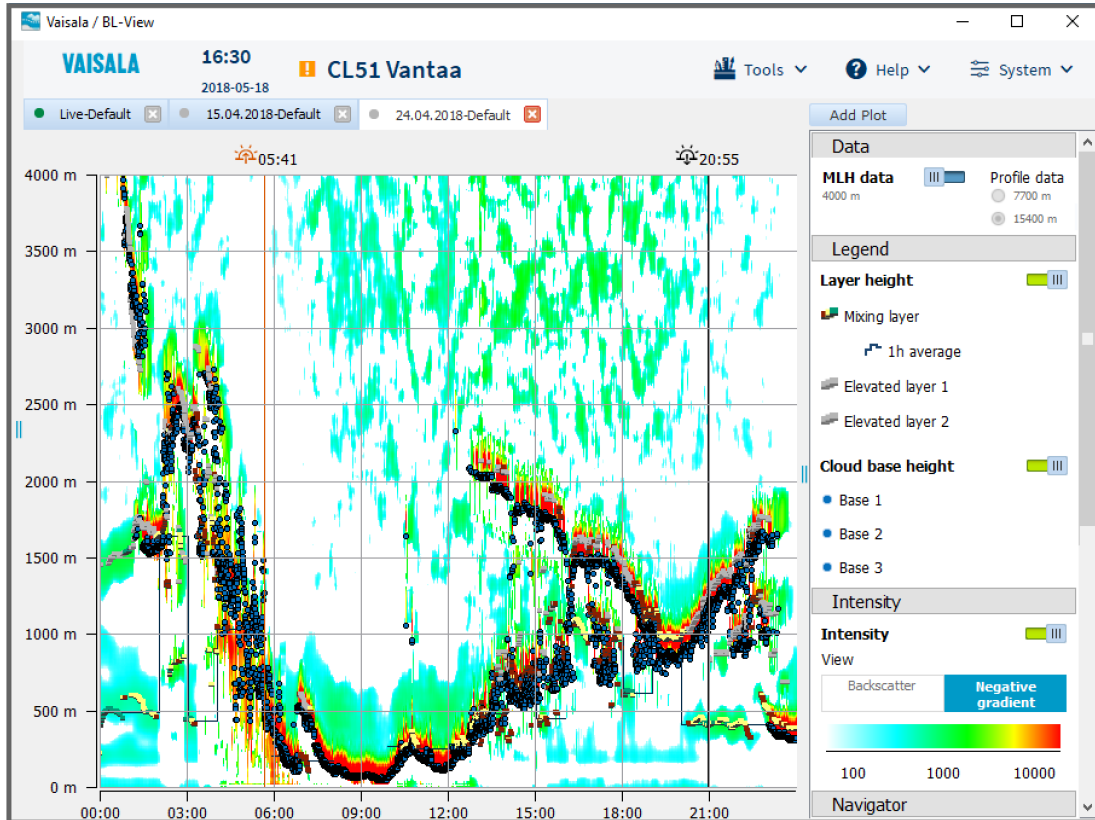
- [Managing Calculation Presets \(page 69\)](#)
- [Cloud and Precipitation Filter \(page 15\)](#)

8.1.7 Using Negative Gradient View

You can choose to view ceilometer data in BL-View in the **Negative gradient** view.

Use the negative gradient view for detailed analysis of the mixing height.

- ▶ 1. In the **Data** panel, enable **MLH data**.
2. In the **Intensity** panel, enable **Intensity** and select **Negative gradient**.



The negative gradient view uses the following colors:

- Red in the plot: Strong signal decrease in clouds or precipitation.
- Light blue to yellow in the plot: Negative gradient signal.

The colors in the intensity legend indicate the intensity of the negative gradient signal in arbitrary internal units. This gives a better view on all local gradient minima than showing a gradient density plot.



Not all local gradient minima qualify as boundary layer heights.

More Information

- ▶ [Managing Calculation Presets \(page 69\)](#)

8.2 Managing Calculation Presets

A preset is a set of algorithm parameters that are used in the calculations. For live plots, the **Information** panel shows the preset values of the currently open density plot.

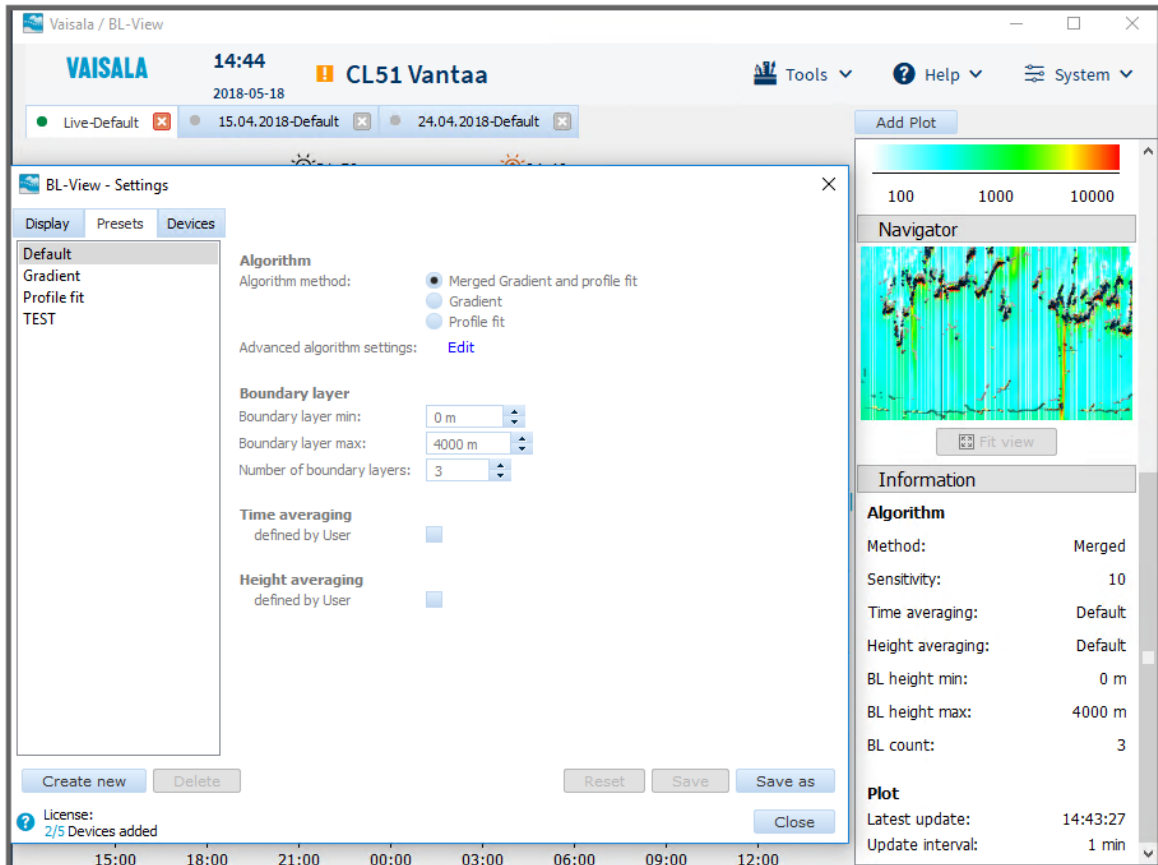


Figure 8 BL-View Algorithm Settings

You can manage the calculation presets in several ways.

8.2.1 Creating Calculation Presets

You can create calculation presets to use in plots.



Saving a new or an edited preset closes all open plots except the live default plot and resets the view.

1. In BL-View, select **System > Settings > Presets**.

2. To create a new preset, select **Create new**, type a name, and select **OK**. In the **Settings** window, set the following:

Algorithm method

Select **Merged Gradient and profile fit**, **Gradient**, or **Profile fit**.

Advanced algorithm settings

For information about modifying advanced algorithm settings, see [Modifying Algorithm Settings of Calculation Presets \(page 73\)](#).

Boundary layer min

Set the lowest reported boundary layer height. The available range is 30 ... 500 m (99 ... 1640 ft). The default value is 30 m (99 ft).

Boundary layer max

Set the highest reported boundary layer height. The available range is 200 ... 4000 m (656 ... 13 120 ft). The default value is 4000 m (13 120 ft).

Number of boundary layers

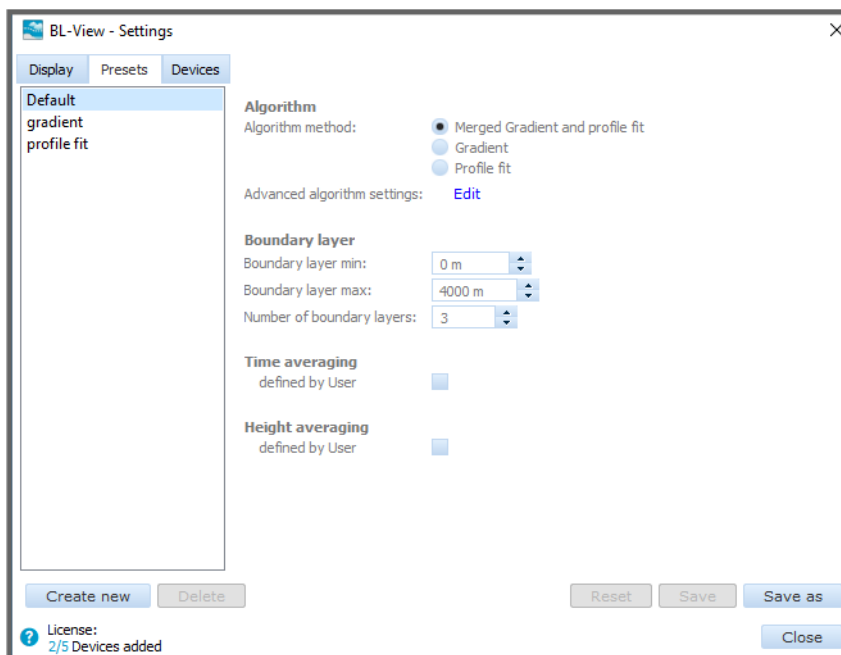
Set the maximum number of boundary layers shown in BL-View. The available range is 1 ... 3. The default value is 3.

Time averaging

Select **defined by User** and set the time averaging interval. The default value is 30 minutes.

Height averaging

Select **defined by User** and set the height averaging interval. The default value is 360 m (1181 ft).



3. Select **Save** and **Close**.

To use the new preset, select **Add Plot** and for **Preset** select the preset you created.

More Information

- ▶ [Mixing Height Algorithm \(page 13\)](#)

8.2.2 Modifying Calculation Presets

You can modify values of calculation presets, reset presets to default values, and delete presets.



Saving a new or an edited preset closes all open plots except the live default plot and resets the view.

- ▶ 1. In BL-View, select **System > Settings > Presets**.
- 2. Select a preset from the list on the left.



You cannot modify the **Default** preset.

3. Select one of the following:
 - To reset the settings to default values, select **Reset**.
 - To delete a preset, select **Delete**.
 - To modify the algorithm settings, see [Modifying Algorithm Settings of Calculation Presets \(page 73\)](#).
 - To modify an existing preset, edit the values:

Boundary layer min

Set the lowest reported boundary layer height.

The available range is 30 ... 500 m (99 ... 1640 ft). The default value is 30 m (99 ft).

Boundary layer max

Set the highest reported boundary layer height.

The available range is 200 ... 4000 m (656 ... 13 120 ft). The default value is 4000 m (13 120 ft).

Number of boundary layers

Set the maximum number of boundary layers shown in BL-View.

The available range is 1 ... 3. The default value is 3.

Time averaging

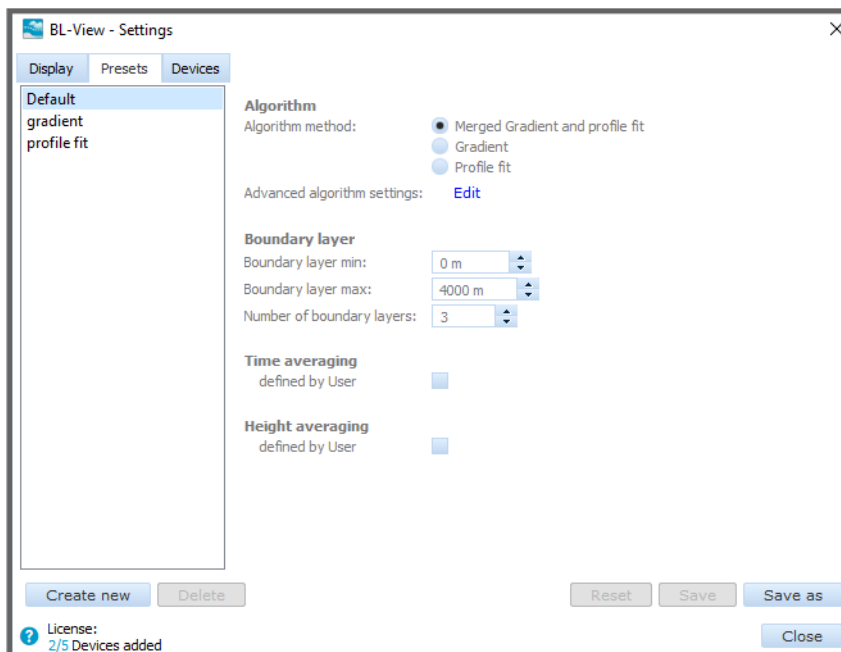
Select **defined by User** and set the time averaging interval.

The default value is 30 minutes.

Height averaging

Select **defined by User** and set the height averaging interval.

The default value is 360 m (1181 ft).



4. Select **Save** and **Close**.

The changes are reflected in the **Information** panel for those plots that use the modified preset.

More Information

- ▶ [Mixing Height Algorithm \(page 13\)](#)

8.2.3 Modifying Algorithm Settings of Calculation Presets

You can modify the algorithm settings for **Merged Gradient and profile fit**, **Gradient**, and **Profile data**.

The modifications apply to that preset only. Other presets that use the same algorithm remain unchanged.



Saving a new or an edited preset closes all open plots except the live default plot and resets the view.

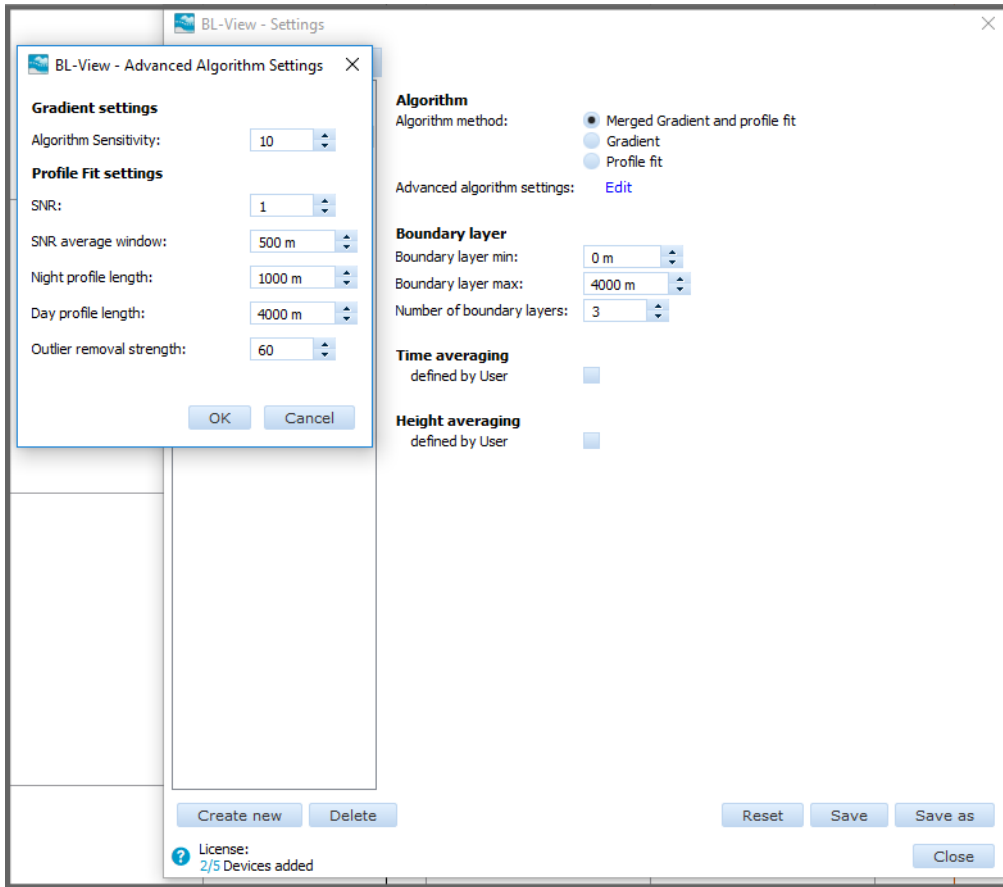
- ▶ 1. In BL-View, select **System > Settings > Presets**.
- 2. Select a preset from the list on the left.



You cannot modify the **Default** preset.

- 3. In **Algorithm method**, select the algorithm to modify, and select **Edit**.

4. In **Advanced algorithm settings**, modify the settings.



The available settings depend on the selected algorithm.

5. For **Gradient settings**, set the **Algorithm sensitivity**.
The available range is 0 ... 20. The default value is 5.

6. For **Profile Fit settings**, set the following:

SNR

Set the signal-to-noise ratio.

The available range is 0 ... 100. The default value is 1.

SNR average window

Set the average window for the signal-to-noise ratio.

The available range is 20 ... 1000 m (66 ... 3280 ft). The default value is 500 m (1640 ft).

Night profile length

Set the length of the night profile.

The available range is 10 ... 4500 m (33 ... 14 760 ft). The default value is 1000 m (3280 ft).

Day profile length

Set the length of the day profile.

The available range is 10 ... 4500 m (33 ... 14 760 ft). The default value is 4000 m (13 120 ft).

Outlier removal strength

Set the outlier removal strength.

The available range is 0 ... 500. The default value is 60.

7. Select **OK**.

8. Select **Save** and **Close**.

The changes are reflected in the **Information** panel for those plots that use the modified preset.

To use the modified preset, select **Add Plot** and for **Preset**, select the preset you modified.

8.3 Changing Overlap Correction Factors

The overlap correction factors affect the default live plots.

You can define whether overlap correction factors are applied to the data, and which overlap correction factors to use.

- ▶ 1. On your computer, go to the following folder:
C:\Program Files (x86)\Vaisala\BL-View\config.

2. Open the file *bl_calc_srv.ini* in Notepad.

For each device, the file contains 2 settings that are related to overlap correction:

```
USE_OVERLAP_CORRECTION=[S]"YES"
OVERLAP_CORRECTION_FILE=[S]"C:\Program Files (x86)\Vaisala\BL-View\config
\overlap_correction_profile.dat"
```

Parameter	Description/Value
USE_OVERLAP_CORRECTION	Defines whether to apply overlap correction factors to data No (default) Yes
OVERLAP_CORRECTION_FILE	Defines the location and name of the overlap correction file. Default location is <i>C:\Program Files (x86)\Vaisala\BL-View\config</i> Default file name is <i>overlap_correction_profile.dat</i>

3. If you want to define device-specific overlap correction factors, create separate overlap correction files for each device.

a. For example, for 2 devices, create the following files in folder

C:\Program Files (x86)\Vaisala\BL-View\config:

- *overlap_correction_profile_CL31_Helsinki.dat*
- *overlap_correction_profile_CL51_Vantaa.dat*

Copy the file content from the existing file *overlap_correction_profile.dat*.

b. Go to folder *C:\Program Files (x86)\Vaisala\BL-View\config* and open the file *bl_calc_srv.ini* in Notepad.

c. In *bl_calc_srv.ini*, define the location and name of the overlap correction files.

```
[CEILOMETER_1]
...
OVERLAP_CORRECTION_FILE=[S]"C:\Program Files (x86)\Vaisala\BL-View
\config\overlap_correction_profile_CL31_Helsinki.dat"
```

```
[CEILOMETER_2]
...
OVERLAP_CORRECTION_FILE=[S]"C:\Program Files (x86)\Vaisala\BL-View
\config\overlap_correction_profile_CL51_Vantaa.dat"
```

- To adjust the near-range performance of a ceilometer, adjust the overlap correction factors.

Go to folder `C:\Program Files (x86)\Vaisala\BL-View\config` and open the correct overlap correction profile file in Notepad, and edit the information.

The overlap correction factor is used to multiply the backscatter value at the specified height in level 2 (L2) profile. Here is an example of how to change the overlap correction factor for 10 m (3 ft 3 in) from 1.02 to 1.00.

Original settings:

```
TERENO Fendt correction factors
1.3   Version of this correction file
1.2   Sensitivity correction factor

Overlap correction factors
1.02   10 m
1.01   20 m
1.01   30 m
1.02   40 m
...
```

Modified settings:

```
TERENO Fendt correction factors
1.3   Version of this correction file
1.2   Sensitivity correction factor

Overlap correction factors
1.00   10 m
1.01   20 m
1.01   30 m
1.02   40 m
...
```

Above 360 m (1181 ft), the overlap correction factor is 1.0.

- Save and close the file.

9. Working with Files

9.1 Importing DAT Files

Use the import service to import CL-VIEW DAT files to BL-View. After import, you can view the information in BL-View.

Before you import DAT files to BL-View, you can add information to the files and change the message interval in the DAT files.



Take a backup of the INI file before making changes to it. You can restore the data later on if needed.

9.1.1 Changing Ceilometer Identification Data in Import Files

Before you import DAT files to BL-View, you can add information to the files such as:

- Latitude, longitude, and altitude information
- UTC offset

- ▶ 1. Go to the following folder on your computer:
C:\Program Files (x86)\Vaisala\BL-View\config
2. Open the file *level_one_import.ini* in Windows Notepad.
3. Make the changes to 2 locations in the file and select **File > Save**.

9.1.2 Changing Message Interval in Import Files

BL-View uses the 16-second message interval when plotting data.

If your DAT files contain data that has been logged with other than the 16-second interval, you must change the settings of the DAT files. The conversion service needs the information so that BL-View can display the data correctly.

- ▶ 1. Go to the following folder on your computer:
C:\Program Files (x86)\Vaisala\BL-View\config
2. Open the file *level_one_import.ini* in Windows Notepad.

3. Change the instances information from:

```
[__INSTANCES__]
L1_INPUT_AUTO=YES
L1_INPUT_USER_DEF=NO
```

to:

```
[__INSTANCES__]
L1_INPUT_AUTO=NO
L1_INPUT_USER_DEF=YES
```

4. Change the message interval information.

The message interval of the DAT files must be 2 ... 75 seconds.

For example, if the DAT files were logged with the 30-second interval, change the information from:

```
[L1_INPUT_USER_DEF]
DIRECTORY=[S]"LevelOneImport"
RUN_MODE=[S]"UserDefined"
    ; Message interval (2-75 seconds, default 16).
MESSAGE_INTERVAL=[I]16
    ; Time span of one DAT file (1-24 hours, default 6).
DAT_FILE_SIZE=[I]6
```

to:

```
[L1_INPUT_USER_DEF]
DIRECTORY=[S]"LevelOneImport"
RUN_MODE=[S]"UserDefined"
    ; Message interval (2-75 seconds, default 16).
MESSAGE_INTERVAL=[I]30
    ; Time span of one DAT file (1-24 hours, default 6).
DAT_FILE_SIZE=[I]6
```

5. Select **File > Save**.

9.1.3 Importing Data (DAT files)

Use the import service to import CL-VIEW DAT files to BL-View.



- If the DAT files have been logged with other than the 16-second interval, see [Changing Message Interval in Import Files \(page 79\)](#).
- If you want to add the ceilometer name, latitude, longitude, altitude, and UTC offset information to the import files, see [Changing Ceilometer Identification Data in Import Files \(page 79\)](#).

- ▶ 1. Create a folder named *LevelOneImport* to the following location:
C:\Program Files (x86)\Vaisala\BL-View\bin
2. Copy the files that you want to import to the folder that you created:
C:\Program Files (x86)\Vaisala\BL-View\bin\LevelOneImport
3. Check that the file *level_one_import.ini* is in the following folder:
C:\Program Files (x86)\Vaisala\BL-View\config
4. To open command prompt, select **Start**, right-click on **Command Prompt**, and select **Run as administrator**.
5. In command prompt, to go to the main level, type:

```
cd C:\
```

6. To go to the folder that contains the application for running the import, type:

```
cd C:\Program Files (x86)\Vaisala\BL-View\bin
```

7. To restart the service, type:

```
roadmin.exe reload
```

8. To run the import, type:

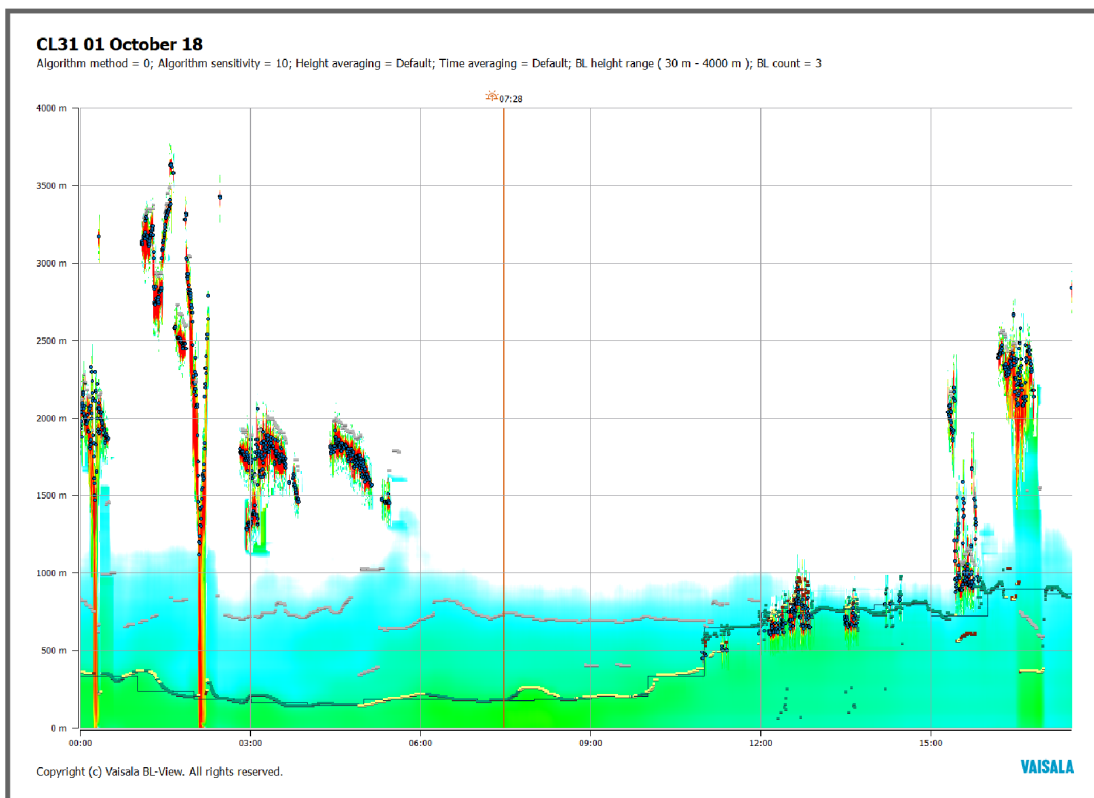
```
level_one_import.exe
```

The import can take a long time depending on the number of DAT files. The import stops when all DAT files are processed.

9.2 Taking Instant Snapshots (PNG Files)

You can take snapshots to export the current plot as an image file (PNG).

- ▶ 1. In BL-View, select **Tools > Snapshot > Instant**.
2. Type a name for the image and select the directory where you want to save it.
3. Select **Save**.
The saved image displays the device name, date, and information about the used algorithm at the top of the image.
If you have zoomed in the density plot, the image contains the enlarged view.



More Information

- ▶ [Image Files \(PNG\) \(page 41\)](#)

9.3 Scheduling Snapshots (PNG Files)

You can schedule snapshots to be taken at specific intervals. The plots are saved as image files (PNG).

- ▶ 1. In BL-View, select the ceilometer.
2. If you want to schedule the snapshots for a custom plot, open a custom live plot.
3. Select **Tools > Snapshot > Scheduled**.

4. In **Scheduled Snapshot**, set the following:

Scheduled snapshot

Select **On**.

Plot

Select the live or custom plot. You can schedule the snapshot of a custom plot only when a custom live plot is open.

You can schedule only one custom live plot per device.

Snapshot time

Select the time when for the first snapshot of the day.

The setting is applied at the start of every 24 hour-period.

Snapshot frequency

Select how often to take snapshots.

The available range is 1 ... 24 hours. The default value is 1.

For example, if you set the snapshot time to 9.15 and snapshot frequency to 5, the first image is taken at 9.15, the next ones 14.15, 19.15, 00.15, 5.15, and then again at 9.15 the next day.

File path

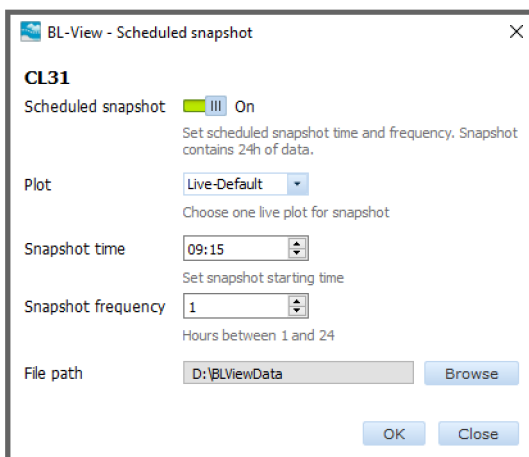
Select the directory where to save the snapshots.

In the directory that you specify, a folder named *Snapshot* is created, in which each device has a separate folder for the files.

The *Snapshot* directory is used for the scheduled snapshots of all devices and live plots.

The default directory is *C:\BLViewData* where also netCDF files are saved.

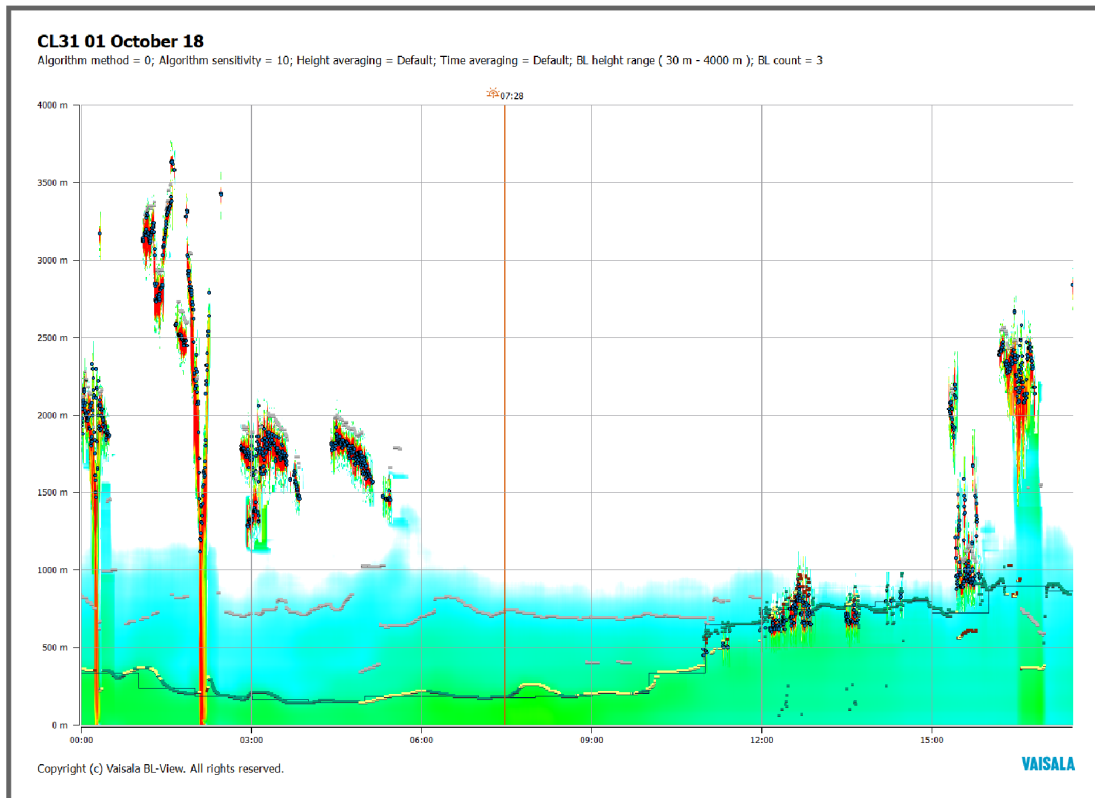
Changing the file path here does not affect the storage location of the netCDF files.



5. Select **OK**.

The saved image displays the device name, date, and information about the used algorithm at the top of the image.

If you have zoomed in the density plot, the image contains the enlarged view.



To keep the scheduling, note the following:

- If you close a plot for which scheduling is enabled, select **Cancel** when asked whether to disable the scheduling.
- If you have defined scheduled snapshot for the default and a custom live plot and you close BL-View, the scheduling is saved. The next time you open BL-View, it shows the default and custom live plot.

More Information

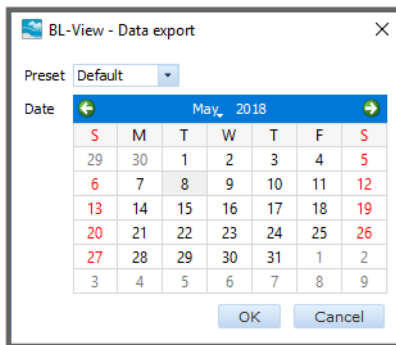
- [Image Files \(PNG\) \(page 41\)](#)
- [Viewing Live Data \(page 58\)](#)

9.4 Exporting Data (HIS Files)

You can export archive ceilometer data from BL-View to HIS files. The files are in ASCII format.

1. In BL-View, select the ceilometer.
2. Select **Tools > Data Export**.

- In **Preset**, select the algorithm for analyzing the data.



- In the calendar, select the date for the archived data and select **OK**.
- Select one of the following:
 - To view the data, select **Open**.
 - To access the files later on, select **Close**.

The files are stored in the following directory:

C:\Program Files (x86)\Vaisala\BL-View\bin\History\<month>.

More Information

- [HIS Files \(ASCII\) \(page 42\)](#)

9.5 Accessing netCDF Files

BL-View automatically stores live and archive data to netCDF files.



You can share netCDF files with other users for viewing on different computers and in BL-View. Use L2 files for this purpose.

- To access the netCDF files, go to folder that you have specified as the storage location. The default storage location is *C:\BLViewData*. Each device has a separate folder for the files.
- To change the storage location, select **System > Settings > Devices** in BL-View. In **Data** and **File path**, select **Browse** to define where to store the netCDF files. A folder is created in this directory for the specified device name.

More Information

- [NetCDF Files \(page 44\)](#)

9.6 Sharing netCDF Files

You can open in BL-View level 2 (L2) netCDF files that your colleagues have shared with you.

More Information

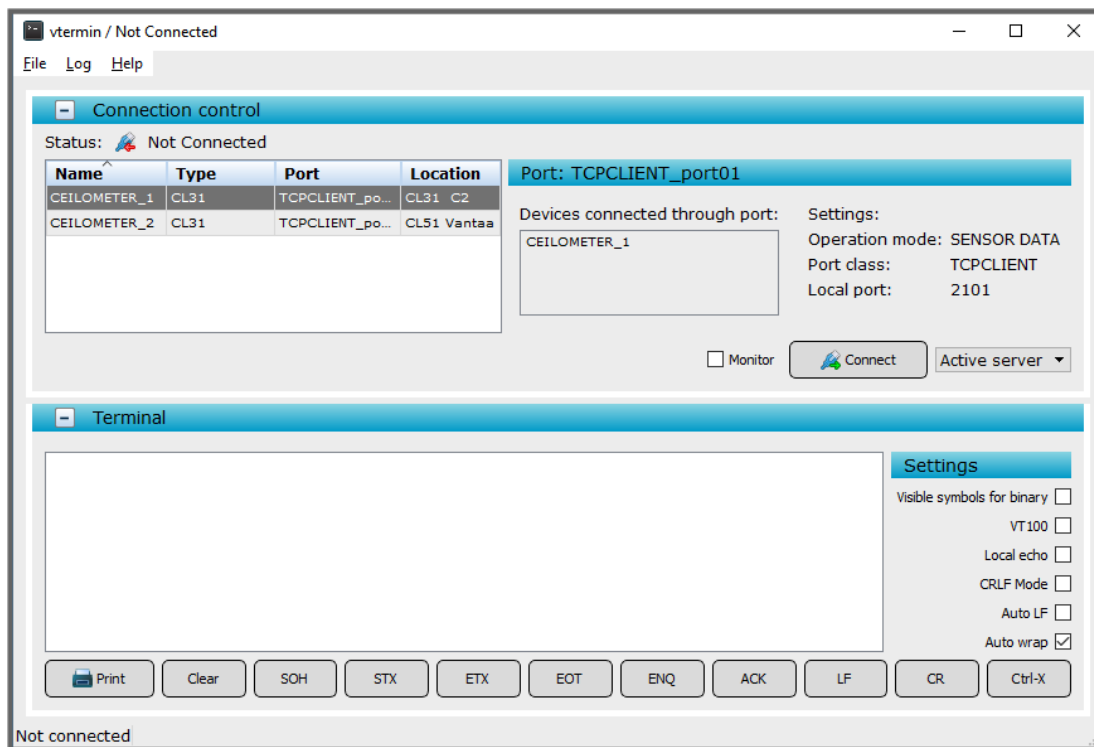
- [NetCDF Files \(page 44\)](#)
- [Fetching Data Gathered with Other BL-View Version \(page 36\)](#)

10. Managing Ceilometers

10.1 Opening Terminal Connection

BL-View offers a connection to the ceilometer using the IO Terminal. IO Terminal connects to the ceilometer through the communication port.

- ▶ 1. In BL-View, select **Tools > IO Terminal**.
2. In the **Connection control** panel, select the ceilometer and **Connect**. In the **Warning** window, select **OK**.



The connection opens. The status bar displays the connection status. If the ceilometer is in auto-send mode, the messages appear in the **Terminal** panel.



CAUTION! When the IO Terminal connection to the ceilometer is open, the ceilometer does not send data to BL-View.



IO Terminal always shows **CL31** as the ceilometer type even if CL51 is installed.

10.1.1 Modifying Terminal Display Settings

You can modify the terminal settings with the selections in the **Settings** frame of the **Terminal** panel. The settings define the way sensor messages and commands are displayed in the **Terminal** panel.

- Select **Visible symbols for binary** to show the non-printable characters (binary values) as symbols.
- Select **VT100**, if you wish the application to emulate a VT100 terminal.
- Select **Local echo** to display the commands you type in the **Terminal** panel on the screen. In this case, the commands may be shown on the screen twice: once by your workstation and once by the field device.
- Select **CRLF Mode** to make the system insert the carriage return (CR) and line feed (LF) characters after each message line.
- Select **Auto LF** to make the system insert a new line on the screen after each message line that is received from the field device. This makes it easier to read the field device messages.
- Select **Auto wrap** to make the system start a new line on the screen after 80 characters. This way you can see all text on the screen without having to scroll.

10.2 Opening and Closing Communication Port

The communication port that is used in serial communication has 2 internal states:

- **CLOSED**: This is the transmitting state of a measurement data message. In this state, messages are transmitted. User commands are not accepted, except for the **open** command, which turns the line into the open state.
- **OPEN**: This is the user dialog state. In this state, the device responds to user commands and command input is echoed. No automatic transmission of the measurement data message is executed in the open state.

- ▶ 1. Open the connection to the ceilometer. See [Opening Terminal Connection \(page 87\)](#).
2. To open the communication port to the ceilometer, type **open** in the **Terminal** panel and press **ENTER**.
The command mode starts, and the following command prompt is displayed on the screen:

```
CEILO >
```

The ceilometer is ready for command input from the user.

For the complete list of commands, see *Vaisala Ceilometer CL31 User Guide* and *Vaisala Ceilometer CL51 User Guide*.

3. To close the communication port to the ceilometer, type **close** in the **Terminal** panel and press **ENTER**.

The data messages from the ceilometer are shown in the **Terminal** panel.

10.3 Logging Data

You can log data from the IO Terminal to a directory.

- ▶ 1. To start logging data to a temporary directory, select **Log > Log to file**. The directory is defined by the user's TMP environment variable.
- 2. To add timestamps at the beginning of each line, select **Log > If logging use timestamps**.



Logging ends automatically when you close the IO terminal.

10.4 Saving Ceilometer Messages

For troubleshooting purposes, you can save or print the ceilometer messages and the sent commands that are shown in the **Terminal** panel.

- ▶ 1. To copy all text from the **Terminal** panel, right-click the **Terminal** panel and select **Copy**.
- 2. Open a text editor, such as Windows Notepad. Copy-paste the text there and save the file.
- 3. To print all text from the **Terminal** panel, select **Print**.

10.5 Closing Terminal Connection



CAUTION! When the IO Terminal connection to the ceilometer is open, the ceilometer does not send data to BL-View.

Close the terminal connection to the ceilometer. Closing the connection resumes ceilometer data logging in BL-View.

- ▶ 1. In IO terminal, select **Disconnect**. The connection closes. The status bar displays the connection status.

10.6 Closing IO Terminal




To close IO Terminal, select **File > Exit**.

11. Troubleshooting

11.1 Viewing Alerts

The icon next to the ceilometer name indicates the alert status.

Table 19 Alert Status

Icon	Description
	No alerts
	1 or more warnings Measurement data is valid
	1 or more alarms, and possibly also warnings Measurement data may be invalid

To view active alerts in BL-View, select **Alerts**.

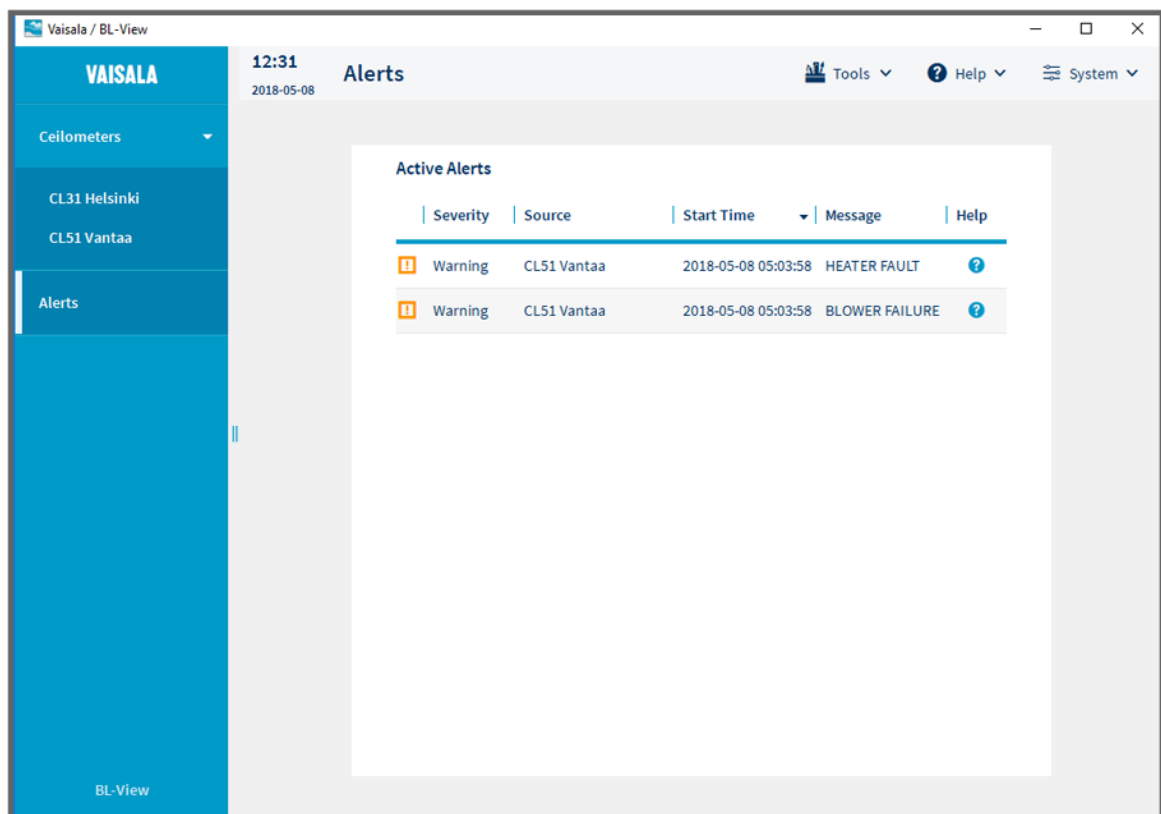


Figure 9 BL-View Alerts Window

BL-View reports alarms and warnings about the following issues:

- BL-View software
- Ceilometer status
- Interface between the ceilometer and BL-View
- System errors

11.1.1 BL-View Alerts

Table 20 BL-View Status, Warnings

Status Message	Reason	Instructions
Disk space low	The free disk space allocated for the history files in the history folder has decreased to the amount indicated in the message. The system still continues saving history files.	Make more disk space available in the history folder.
Message interval warning	Selected sensor data message sending frequency is not optimal for BL-View (16 or 36 seconds).	Set the message interval according to the ceilometer type: <ul style="list-style-type: none"> • CL31: 16 seconds • CL51: 36 seconds See Configuring Ceilometer (page 25) .
Too old archive directories found	The history files contain too old directories that automatic clean-up reports.	By default, automatic disk clean-up is disabled. Contact Vaisala technical support.

Table 21 BL-View Status, Alarms

Status Message	Reason	Instructions
Checksum error	Error in checksum calculation.	By default, the checksum calculation is disabled. Contact Vaisala technical support.
Configuration alarm	There is not enough space for temporary XOA files.	Make more disk space available.
Message interval error	Sensor data interval has to be between 2 and 75 seconds.	Set the sensor data message sending frequency to 2 ... 75 seconds. See BL-View Connection Settings (page 30) .
Missing ceilometer data	Sensor is not connected.	Check that IO terminal connection to the ceilometer has been disconnected. Change if necessary.
	Sensor communication settings are not correct.	Check that the communication settings of the ceilometer and BL-View match.

Status Message	Reason	Instructions
Out of disk space	The free disk space allocated for history files in the history folder has fallen below the predefined limit. The system has stopped saving data in the history files.	Make more disk space available in the history folder so that saving can continue. The system continues saving history files when enough free disk space is available in the folder.
Output directory error	Invalid directory path specified.	Restart your computer.
Port error	BL-View cannot open the serial port.	Make sure that the computer has the corresponding serial port. If you are using a USB extender, verify that it is connected, working properly, and not reserved by another application.
Unable to parse ceilometer data message	BL-View cannot parse the ceilometer data message.	Check that the message type selected in BL-View communication settings matches the ceilometer settings. Change if necessary.
Roaccontrol	Remote object monitor fault detected.	System error. Contact Vaisala technical support.
Roobject	Object information conflict detected.	
Roapersdatabase	Error when reading files listed in <i>roapers.ini</i> .	
Roasuser	Wrong configuration.	

11.1.2 Ceilometer Alerts



For more information, see:

- *Vaisala Ceilometer CL31 User Guide*
- *Vaisala Ceilometer CL51 User Guide*

Table 22 Ceilometer Status, Warnings

Status Message	Reason	Instructions
Battery failure	Battery is dead.	Replace the battery.
Battery voltage low	The unit has been powered too long using the backup battery.	Connect the line voltage or replace the battery.
	Battery fails to recharge.	If the battery is old, replace it. If the battery is OK, check the operation of ceilometer engine board CLE321.

Status Message	Reason	Instructions
Blower failure	Blower cable is not connected.	Check that the blower cable is connected.
	Window blower circuit breaker is not ON.	Check that the window blower circuit breaker is ON.
	Line voltage level is not correct.	Check that the line voltage is present and correct.
	Blower is stuck.	Check if visible obstacles disable blower operation.
	Blower is damaged.	Replace the blower.
	Blower is blowing, but only cool air. The blower heater is malfunctioning.	Replace the blower.
Ceilometer engine board failure	Non-critical fault in ceilometer engine board CLE321.	Replace ceilometer engine board CLE321.
Heater fault	Window blower circuit breaker is not ON.	Check that the window blower circuit breaker is ON.
	Line voltage level is not correct.	Check that the line voltage is present and correct.
	Heater is damaged.	Replace the heater.
High background radiance	Direct sunlight.	In case there are no alarms, the measurements are OK. If there is an alarm, the measurements are invalid.
High humidity (option)	Relative humidity > 85 %. Water has been condensed inside the ceilometer. Leakage in the enclosure or leakage in the door.	Take the ceilometer inside, open the maintenance door and let it dry in a warm air conditioned place. Condensed water on optical surface may disturb the measurement. There is a danger of short circuits.
Humidity sensor failure (option)	Humidity sensor is not connected.	Connect the humidity sensor or disable the option in the software.
	Humidity sensor is damaged.	Contact technical support and send the ceilometer to Service Center for the humidity sensor to be replaced.
Laser monitoring failure	Laser power monitor board CLM311 has failed.	Replace CLM311.
	Laser power measurement on ceilometer engine board CLE321 has failed.	Replace CLE321.
Receiver warning	A non-critical CLR321 receiver failure.	Replace CLR321.

Status Message	Reason	Instructions
Tilt angle > 45 degrees warning	The unit is not correctly installed or the tilt angle is larger than 45°.	Check the installation. The height measurement accuracy is lost with tilt angles greater than 45°.
Transmitter expires	Laser diode is too old.	Replace Transmitter CLT321. The measurement data is valid, but it is possible that some clouds are missed.
Window contamination (appears from time to time and lasts < 5 min)	Usually drizzle drops on the window.	The blower cleans the window. If clouds are detected, the height information is correct. If no clouds are detected, it is possible that high clouds are missed.
Window contamination (continuous)	For example, bird droppings, leaves, or dust have contaminated the window.	Clean the window.
Working from battery	The unit has battery power left for a maximum of 1 ... 2 hours.	Connect the line voltage or replace the battery.

Table 23 Ceilometer Status, Alarms

Status Message	Reason	Instructions
Ceilometer engine board failure	Ceilometer engine board is damaged.	Replace ceilometer engine board CLE321.
Coaxial cable failure	Coaxial cable disconnected or broken.	Verify the connection or replace the coaxial cable.
Light path obstruction	Window is badly contaminated or severely scratched.	Clean the window or in case of damage, replace CLW311.
	Something blocks the laser beam.	Check the clarity of the optical path.
Memory error	A failure in the CLE321 memory.	Replace CLE321.
Receiver failure	Receiver CLR321 is damaged.	Replace CLR321.
	Loose cable connection.	Check that the cables from Receiver CLR321 and Ceilometer Optics CLO321 are undamaged and correctly connected.
	Receiver test not operating.	Check that the Optics unit CLO321 is not misplaced or damaged. If the CLO321 unit is damaged or missing, contact Vaisala for repair and replacement, since the CLO321 unit is not field replaceable.

Status Message	Reason	Instructions
Receiver saturation	Direct sunlight.	Wait for the sun to exit the field-of-view. The ceilometer returns to normal operation.
	Something is partially blocking the laser beam.	Check the clarity of the optical path.
Transmitter failure	Laser is worn out or damaged.	Replace Laser Transmitter CLT321.
	Laser does not get electrical power.	Check from the status message that the line Voltages is marked OK .
Transmitter shut-off (Laser temperature > 85 °C)	Direct sunlight has heated the laser.	Wait for the sun to exit the field-of-view. The ceilometer returns to normal operation.
	Environment temperature is too high.	Check if there is a specific reason for the high temperature.
Voltage failure	Ceilometer engine board CLE321 is damaged.	Replace CLE321.

11.2 Viewing Event Log

BL-View keeps a system-level event log that shows the alerts history. The events of one day are logged in the file.

1. To access the event log, go to `C:\BL-View\History\. There is one file for each day. The filename is of format B_EVENTS_<day of month>.his.`

```
History file
TIME, SITE, MSG, CAT, ST, STATUSTEXT
2018-04-17 05:21:23, CL31 C2, BLOWER IS ON, TECH, 4, INFO
2018-04-17 05:21:23, CL31 C2, BLOWER HEATER IS ON, TECH, 4, INFO
1970-01-01 00:00:22, DEFAULT, OBJECT INFORMATION CONFLICT DETECTED BY
SERVER A, TECH, 2, ALARM
2018-04-17 05:22:42, DEFAULT, OBJECT INFORMATION CONFLICT DETECTED BY
SERVER A, TECH, 2, ALARM
2018-04-17 05:22:42, DEFAULT, OBJECT INFORMATION CONFLICT DETECTED BY
SERVER A, TECH, 0, OVER
```

Table 24 Event Log Information

Name	Description	Details
TIME	Time the event occurred	Format YYYY-MM-DD HH:MM:SS
SITE	Device name as defined in System > Settings > Devices .	-
MSG	Description of the event	See BL-View Alerts (page 92) and Ceilometer Alerts (page 93)
CAT	Event category	Technical (TECH), operational (OPER), messages (MES)
ST	Status of the event	0 = over 1 = acknowledged 2 = alarm 3 = warning 4 = info 5 = linger
STATUSTEXT	Severity of the event	INFO, WARNING, ALARM

11.3 Writing Problem Report

When troubleshooting the product, write a problem report including:

- What failed (what worked / did not work)?
- Where did it fail (location and environment)?
- When did it fail (date, immediately / after a while / periodically / randomly)?

- How many failed (only one defect / other same or similar defects / several failures in one unit)?
- What was done when the failure was noticed?
- What was connected to the product and to which connectors?
- Input power source type, voltage, and list of other items (such as lighting, heaters, and motors) that were connected to the same power output.
- Are all parts connected and grounded properly? Take a photo to help the troubleshooting.

Glossary

atmospheric boundary layer

See [planetary boundary layer \(page 99\)](#).

backscatter

Backscatter is the reflection of waves, particles, or signals back to the direction from which they came.

BL-View

See [Vaisala Boundary Layer View Software \(page 99\)](#).

boundary layer

Boundary layer is the air layer near the ground that is affected by diurnal heat, moisture, or momentum transfer to or from the surface.

calculation preset

Calculation preset is a set of algorithm parameters that is used in plotting the boundary layer.

cloud base

Cloud base is the lowest altitude of the visible portion of the cloud. Cloud base is expressed either in meters or feet above mean sea level (or planetary surface), or as the corresponding pressure level in hectopascal (hPa, equivalent to millibar).

IO Terminal

IO Terminal is terminal software that connects to sensors and other field devices through a communication port.

mixing layer height

Mixing layer height is the height up to which atmospheric properties or substances originating from the Earth's surface are dispersed by turbulent vertical mixing processes.

MLH

See [mixing layer height \(page 99\)](#).

planetary boundary layer

Planetary boundary layer is the air layer near the ground affected by diurnal heat, moisture, or momentum transfer to or from the surface. Planetary boundary layer is the lowest part of the atmosphere.

plot

Plot is a graphic representation of data in BL-View. There are archive and live plots.

Vaisala Boundary Layer View Software

Vaisala Boundary Layer View Software is an application that is used for planetary boundary layer analysis.

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Technical Support



Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information:

- Product name, model, and serial number
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see www.vaisala.com/support.

Recycling



Recycle all applicable material.



Follow the statutory regulations for disposing of the product and packaging.

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