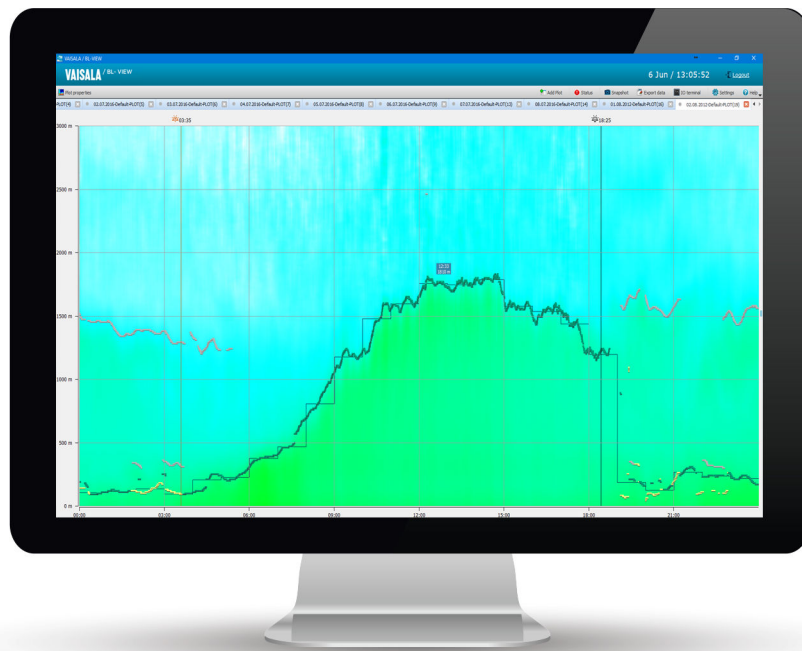


User Guide

Vaisala Boundary Layer View Software

BL-View



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PUBLISHED BY

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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

Document Code	Date	Description
M211185EN-B	June 2017	Release 2.0 contains the following new features: • 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.
M211185EN-A	June 2010	First version of this manual.



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

- BL-View 2.0 software contains the online help.
- 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>

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

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. This affordable package enables automatic 24/7 monitoring and visualization of the mixing layer height (MLH) in all conditions to improve air quality monitoring and forecasting.

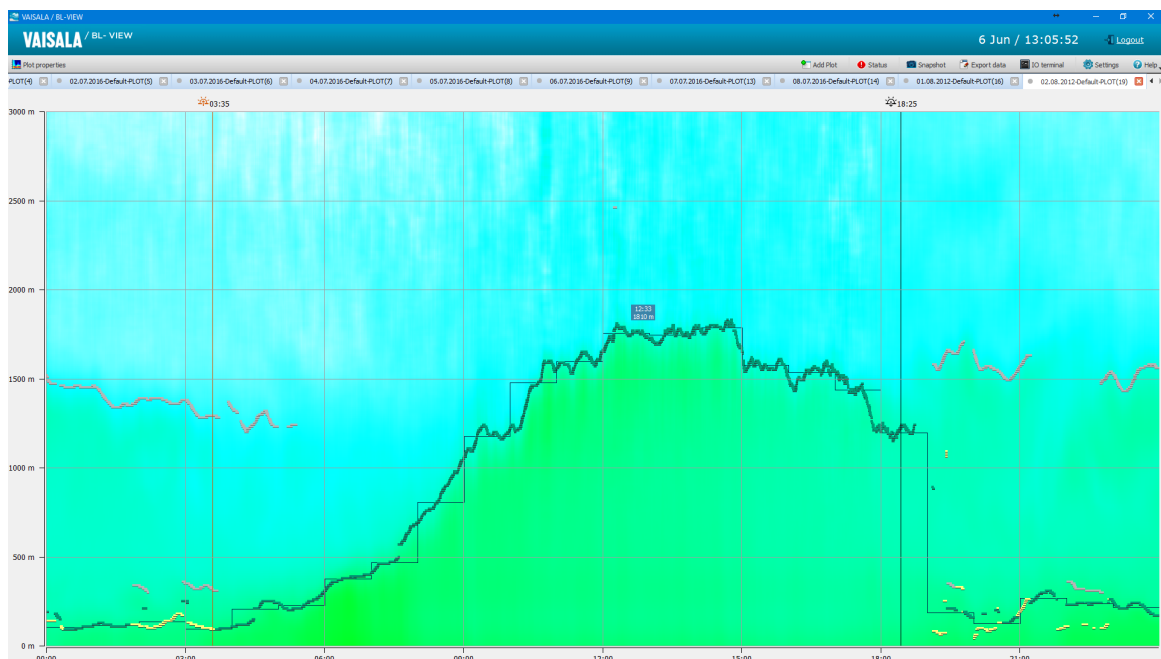


Figure 1 Vaisala Boundary Layer View Software BL-View

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. Under normal conditions this layer follows the convective layer. But in some cases if a strong additional layer forms inside the convective layer, that layer will be 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 PCs running Microsoft Windows[®] and features a user-friendly graphical interface. Communication between the ceilometer and PC is via an Ethernet or serial line, and ceilometer messages are stored in netCDF format on the PC's 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 also reports the hourly average MLH.

It is also 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 warnings and alarms can be investigated. These warnings and alarms are also stored automatically to log files for easy retrieval.

2.1 Supported Ceilometers

BL-View supports a single Vaisala Ceilometer CL31 or CL51.

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: 4 ... 4.5 GB / year (typically)

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.

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 ... 9843 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.

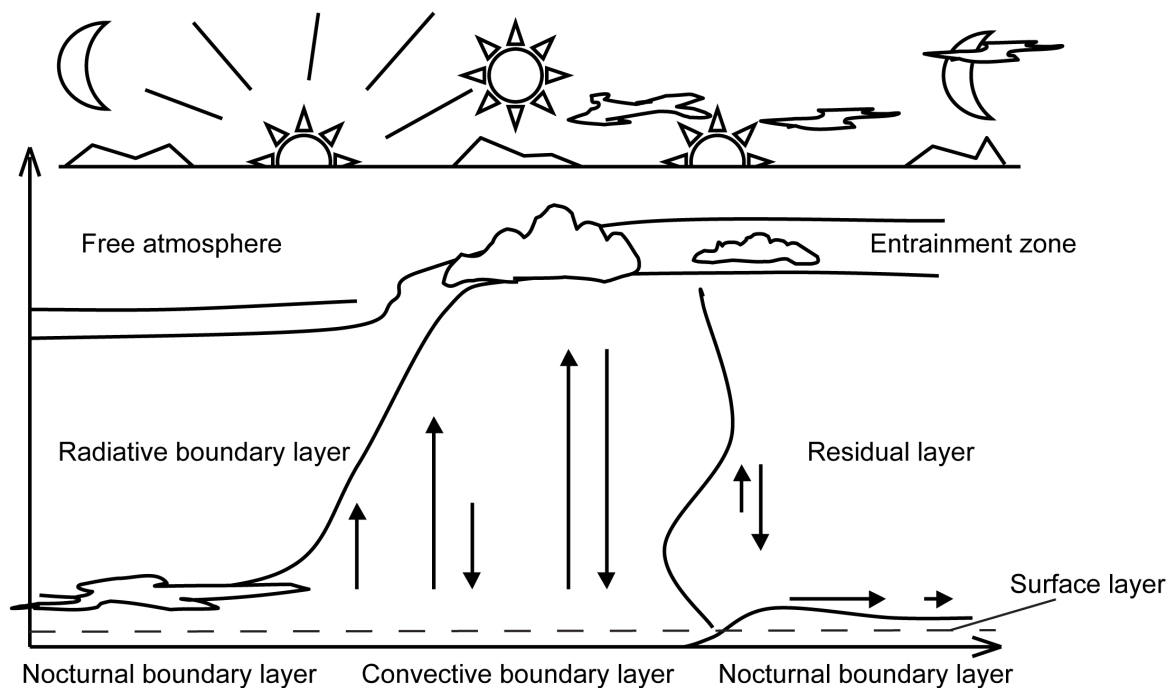


Figure 2 Planetary Boundary Layer Structure and Diurnal Variation

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.

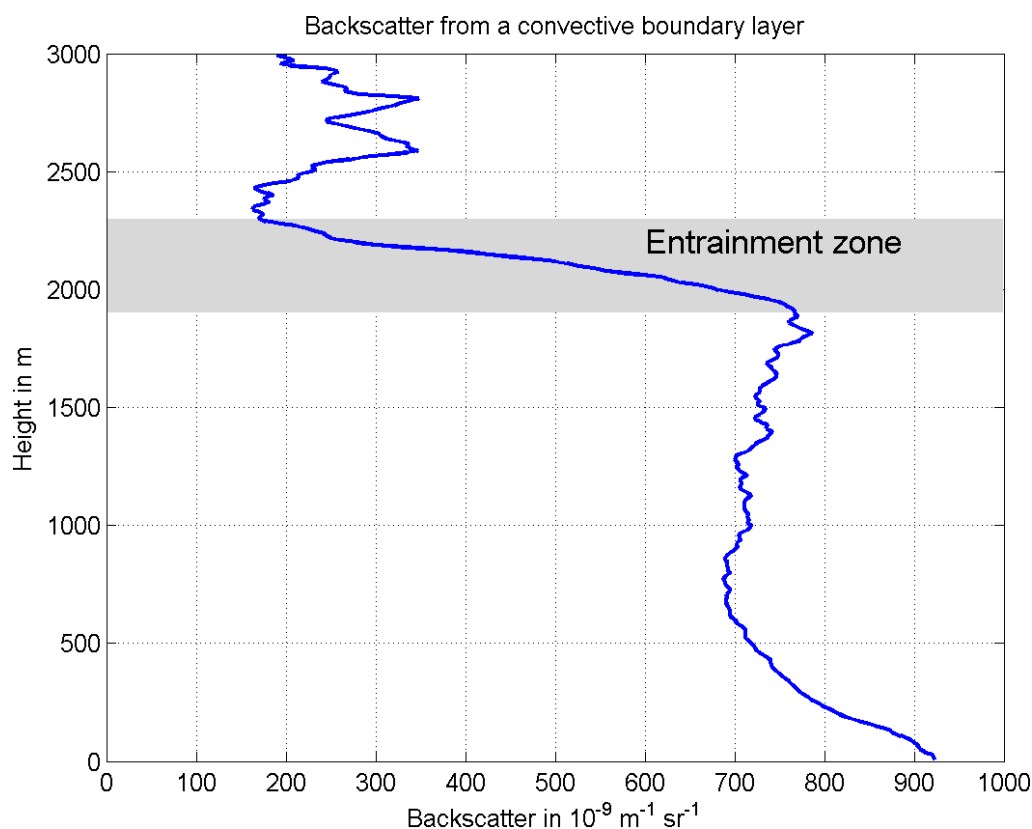


Figure 3 Backscatter Profile from Convective Boundary Layer

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 (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 / 3281 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 one 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 \(page 63\)](#)
- [Modifying Calculation Presets \(page 65\)](#)

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 (4921 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

Removing outliers 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 ... 6562 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 (6562 ... 16 404 ft) and high-layer clouds at height over 5000 m (16 404 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 Ceilometer typically reports 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 in the order presented.

1. [4.1 Backing up BL-View Data \(page 17\)](#)
2. [4.2 Uninstalling BL-View \(page 18\)](#)
3. [4.3 Installing BL-View \(page 18\)](#)
4. (optional) [4.4 Preparing Files for Import \(page 19\)](#)
5. (optional) [4.5 Importing Data \(DAT files\) \(page 20\)](#)

For new installations, see [4.3 Installing BL-View \(page 18\)](#).

4.1 Backing up BL-View Data



Back up all BL-View data before you uninstall the previous version of BL-View.

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

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

3. To back up the BL-View database, type the following command:

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

For example:

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

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



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*).

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.

- ▶ 1. Select **Start > Control Panel**.
- 2. Select **Programs and Features**.
- 3. In the **Uninstall or change a program** window, select **BL-View > Uninstall**.
- 4. Follow the instructions in the **InstallShield Wizard**.

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.



Before you activate the BL-View license, make sure that your computer is connected to the internet.

- ▶ 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 instructions in the **InstallShield Wizard**.
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.
- 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, a 180-day trial license is activated. When you open the application, it shows the number of days after which the trial expires.

More Information

- [Licensing \(page 9\)](#)

4.4 Preparing Files for Import

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

After import, you can view the information in BL-View.

More Information

- [Importing Data \(DAT files\) \(page 20\)](#)

4.4.1 Changing Ceilometer Identification Data in Import Files

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

- Ceilometer name
- 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 Notepad.
3. Make the changes to 2 locations in the file and select **File > Save**.

4.4.2 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 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**.

4.5 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 [4.4.2 Changing Message Interval in Import Files \(page 19\)](#).
- If you want to add the ceilometer name, latitude, longitude, altitude, and UTC offset information to the import files, see [4.4.1 Changing Ceilometer Identification Data in Import Files \(page 19\)](#).

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 the following:

```
cd C:\
```

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

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

7. To restart the service, type the following:

```
roadmin.exe reload
```

8. To run the import, type the following:

```
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.

5. Configuration

BL-View is connected to a ceilometer through a serial line, TCP/IP, or USB 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.
See [5.1 Ceilometer Connection Settings \(page 23\)](#).
2. Check that the ceilometer settings are correctly configured.
See [5.2 Configuring Ceilometer \(page 25\)](#).
3. Add the location parameters of the ceilometer to BL-View.
See [5.3 Adding Ceilometer to BL-View \(page 27\)](#).
4. Configure the BL-View communication settings.
See [5.4 BL-View Communication Settings \(page 29\)](#).



When making changes to INI files, always restart the BL-View service with the `roadmin.exe reload` command.

5.1 Ceilometer Connection Settings

Before you can start using BL-View to view and analyze live data from the ceilometer, you must establish a data connection between the ceilometer and a computer.

To do this, connect to the ceilometer server through a browser. See:

- [5.1.1 Entering TCP Client Mode \(page 23\)](#)
- [5.1.2 Entering UDP Mode \(page 24\)](#)

For more information, see *Vaisala Ceilometer CL31 User Guide* and *Vaisala Ceilometer CL51 User Guide*.

5.1.1 Entering TCP Client Mode

- ▶ 1. Select **Operating Settings**.
- 2. Select a port.

3. In **Operation Mode**, select **TCP Client Mode**.

The screenshot shows the Moxa NPort Web Console interface. The left sidebar contains a navigation menu with options: Main Menu, Overview, Basic Settings, Network Settings, Serial Settings, Operating Settings (selected), Accessible IP Settings, Auto Warning Settings, Monitor, Change Password, Load Factory Default, and Save/Restart. The main content area is titled 'Operating Settings' and is for 'Port 01'. It features a table of settings for 'TCP Client Mode'. The settings include: Operation mode (TCP Client Mode), TCP alive check time (0), Inactivity time (0), Ignore jammed IP (No), Packing length (0), Delimiter 1 (0), Delimiter 2 (0), Delimiter process (Do Nothing), Force transmit (0), Destination IP address 1-4 (all 4001), Designated Local Port 1-4 (5011, 5012, 5013, 5014), and Connection control (Startup/None). A 'Submit' button is at the bottom right.

Operating Settings		Port 01
Operation mode	TCP Client Mode	
TCP alive check time	0 (0 - 99 min)	
Inactivity time	0 (0 - 65535 ms)	
Ignore jammed IP	No Yes	
Data Packing		
Packing length	0 (0 - 1024)	
Delimiter 1	0 (Hex) Enable	
Delimiter 2	0 (Hex) Enable	
Delimiter process	Do Nothing (Processed only when Packing length is 0)	
Force transmit	0 (0 - 65535 ms)	
TCP Client Mode		
Destination IP address 1	4001	
Destination IP address 2	4001	
Destination IP address 3	4001	
Destination IP address 4	4001	
Designated Local Port 1	5011 (0 - 65535, 0 represents assigned automatically.)	
Designated Local Port 2	5012 (0 - 65535)	
Designated Local Port 3	5013 (0 - 65535)	
Designated Local Port 4	5014 (0 - 65535)	
Connection control	Startup/None (Connect on/Disconnect by)	
☐ Apply the above settings to all serial ports		
Submit		

4. In **Destination IP address 1**, type your destination address and port.
You can add four destinations.
5. Select **Submit**.

5.1.2 Entering UDP Mode

1. Select **Operating Settings**.
2. Select a port.

3. In **Operation Mode**, select **UDP Mode**.

The screenshot shows the Moxa NPort Web Console interface. The left sidebar contains a navigation menu with options like Main Menu, Overview, Basic Settings, Network Settings, Serial Settings, and Operating Settings. The main content area is titled 'Operating Settings' and shows configuration for 'Port 01'. The 'Operation mode' is set to 'UDP Mode'. Below this, there are fields for 'Packing length', 'Delimiter 1', 'Delimiter 2', 'Delimiter process', and 'Force transmit'. The 'UDP Mode' section includes a table for 'Destination IP address' with four rows, all showing '4001' in the 'Port' column. The 'Local Listen port' is also set to '4001'. A 'Submit' button is located at the bottom right of the form.

4. In **Destination IP address 1**, type your destination address and port.
You can add four addresses.
5. Select **Submit**.

5.2 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		
Reporting interval	2 ... 75 seconds	16 seconds	36 seconds

- ▶ 1. Open the connection to the ceilometer.
See [9.1 Opening Terminal Connection \(page 75\)](#).
2. Open the communication port to the ceilometer.
See [9.2 Opening and Closing Communication Port \(page 77\)](#).
3. To set advanced level commands, type the following command:
advanced
4. To set the message format, type the following command:
set message type <message format>
 - For CL31: **set message type msg2_10x770**
 - For CL51: **set message type msg2_10x1540**
5. To set the message interval, type the following command:
set message interval <message interval>
 - For CL31: **set message interval 16**
 - For CL51: **set message interval 36**
6. To enable the range gate normalization, type the following command:
set message profile noise_h2 on
The range gate data is always range-normalized, including the noise.
7. To get the factory parameters of CL31, type the following command:
get params factory
8. Check the receiver type for CL31 in the response. If CLR321 appears as the receiver type, go to the next step. Otherwise, change the algorithm parameters with the following command:
set factory algo_sensit high_cloud 5
9. Close the communication port.
See [9.2 Opening and Closing Communication Port \(page 77\)](#).
10. Verify that the output message is correct.

5.3 Adding Ceilometer to BL-View

When you start BL-View the first time, add the ceilometer information to BL-View.

This information is used as parameters in the netCDF files.

- ▶ 1. Select **Start > All Programs > Vaisala > BL-View > BL-View**.
- 2. In BL-View, select **Settings > Communication**.

3. Set the following:

Name

Type a name for the ceilometer.

Latitude

Type the latitude coordinate of the ceilometer.

Give the coordinates according to the standard WGS84: -90.0000 ... 90.0000 degrees south, north.

Longitude

Type the longitude coordinate of the ceilometer.

Give the coordinates according to the standard WGS84: -180.0000 ... 180.0000 degrees west, east.

UTC offset

Select the time zone.

BL-VIEW - Settings

Display Presets Communication

Sensor

Name:

Latitude:
Give the coordinates according to the standard WGS84
-90.0000 ... 90.0000 degrees south, north

Longitude:
-180.0000 ... 180.0000 degrees west, east

UTC offset:

Connection

Connection type:

Message type:

Message interval:

Baud rate:

Serial port number:

Data bits:

Stop bits:

Parity:

Save OK Cancel

4. Select **Save** and **OK**.

5.4 BL-View Communication Settings

The following connection types are available for connecting BL-View to the ceilometer: serial line connection, UDP connection, and TCP/IP connection.

5.4.1 Configuring Serial Line Connection

Select the settings for serial communication with the ceilometer.

1. In BL-View, select **Settings**.

2. In the **Communication** tab, set the following for the **Connection**:

Connection type

Select **Serial**.

Message type

Select the ceilometer data 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		
Reporting interval	2 ... 75 seconds	16 seconds	36 seconds

Message interval

Set the message interval in seconds. The available range is 2 ... 75. The default value is 16.

Baud rate

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

Serial port number

Select a COM port to communicate with the ceilometer. The available range is COM1 ... COM8.

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 parity bit in each character can be set to **None**, **Odd**, **Even**, **Mark**, or **Space**.

The image shows a screenshot of the 'BL-VIEW - Settings' dialog box. It has three tabs: 'Display', 'Presets', and 'Communication'. The 'Communication' tab is selected. Under the 'Sensor' section, there are fields for 'Name' (labeled 'ined Ceilometer name'), 'Latitude' (12.9716), 'Longitude' (77.5946), and 'UTC offset' (2). Below these is a 'Connection' section with fields for 'Connection type' (Serial), 'Message type' (msg1_10x1540), 'Message interval' (16), 'Baud rate' (38400), 'Serial port number' (COM1), 'Data bits' (8), 'Stop bits' (1), and 'Parity' (None). At the bottom right are 'Save', 'OK', and 'Cancel' buttons.

3. Select **Save** and **OK**.

5.4.2 Configuring UDP Connection

Select the settings for UDP communication with the ceilometer.

- ▶ 1. In BL-View, select **Settings**.

2. In the **Communication** tab, set the following:

Connection type

Select **UDP**.

Message type

Select the ceilometer data 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		
Reporting interval	2 ... 75 seconds	16 seconds	36 seconds

Message interval

Set the message interval in seconds. The available range is 2 ... 75. The default value is 16.

Local port

Select the local port to match the setting in ceilometer.

Remote host

Select the remote host to match the setting in ceilometer.

Remote port

Select the remote port to match the setting in ceilometer.

The screenshot shows the 'BL-VIEW - Settings' dialog box with the 'Communication' tab selected. The 'Sensor' section contains fields for Name (filled with 'ined Ceilometer name'), Latitude (filled with '12.9716'), Longitude (filled with '77.5946'), and UTC offset (set to '2'). Below these is a note: 'Give the coordinates according to the standard WGS84'. The 'Connection' section includes a 'Connection type' dropdown (set to 'UDP'), a 'Message type' dropdown (set to 'msg1_10x1540'), a 'Message interval' spinner (set to '16'), and empty text boxes for 'Local port:', 'Remote host:', and 'Remote port:'. At the bottom right are 'Save', 'OK', and 'Cancel' buttons.

3. Select **Save** and **OK**.

5.4.3 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 **Settings**.

2. In the **Communication** tab, set the following:

Connection type

Select **TCP Server**.

Message type

Select the ceilometer data 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		
Reporting interval	2 ... 75 seconds	16 seconds	36 seconds

Message interval

Set the message interval in seconds. The available range is 2 ... 75. The default value is 16.

Local port

Select the local port to match the setting in ceilometer.

BL-VIEW - Settings

Display Presets Communication

Sensor

Name:

Latitude: Give the coordinates according to the standard WGS84

Longitude: -90.0000 ... 90.0000 degrees south, north

UTC offset: -180.0000 ... 180.0000 degrees west, east

Connection

Connection type:

Message type:

Message interval:

Local port:

Save OK Cancel

3. Select **Save** and **OK**.

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.

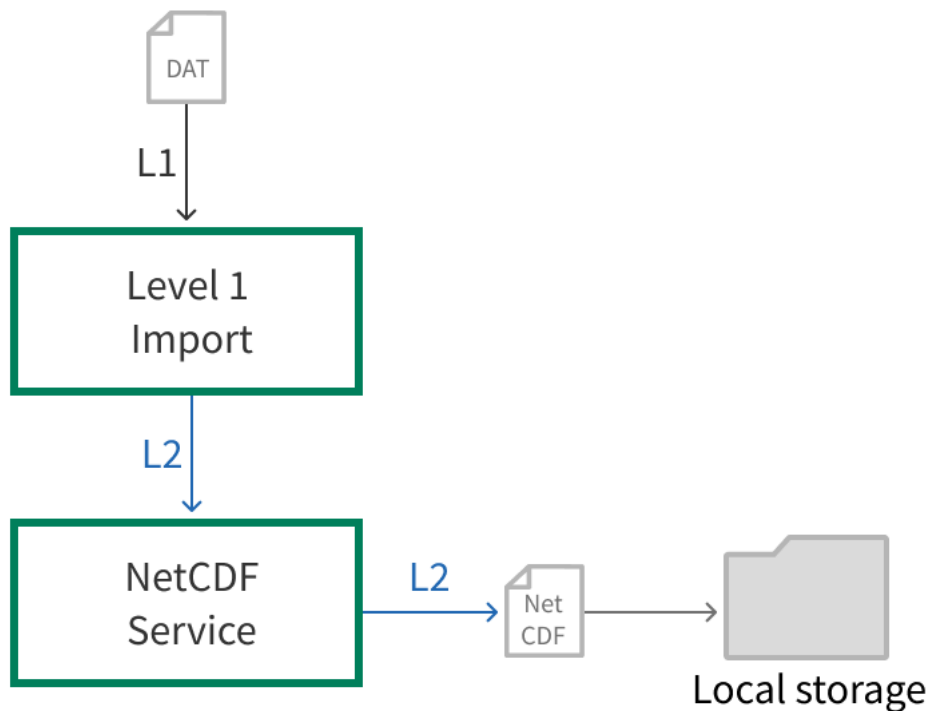


Figure 4 BL-View Import Data

More Information

- › [Accessing netCDF Files \(page 72\)](#)
- › [Adding Archive Plots \(page 61\)](#)
- › [Importing Data \(DAT files\) \(page 20\)](#)

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.

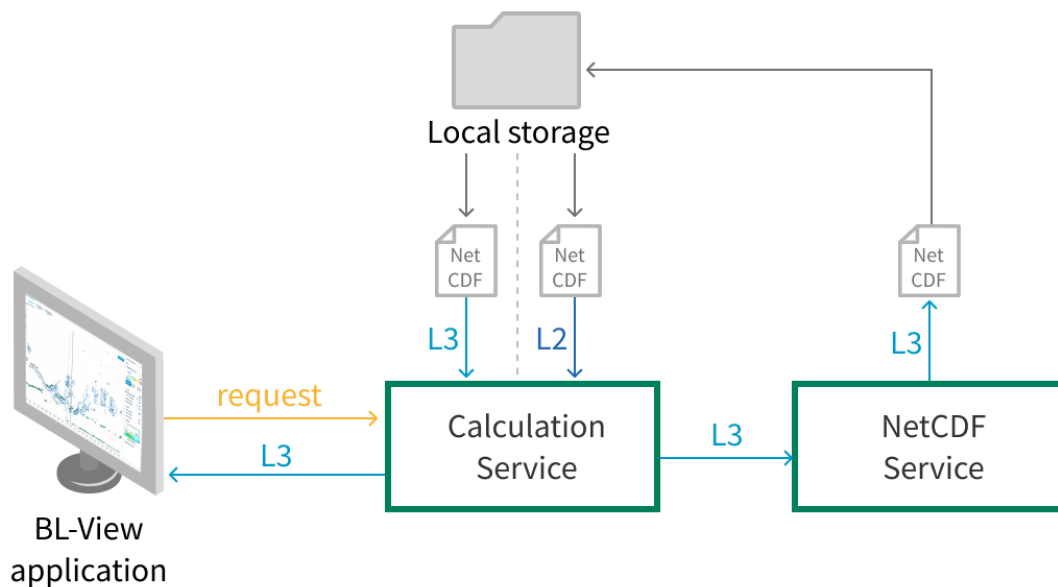


Figure 5 BL-View Archive Data

More Information

- ▶ [Adding Archive Plots \(page 61\)](#)
- ▶ [NetCDF Files \(page 41\)](#)

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) raw 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.

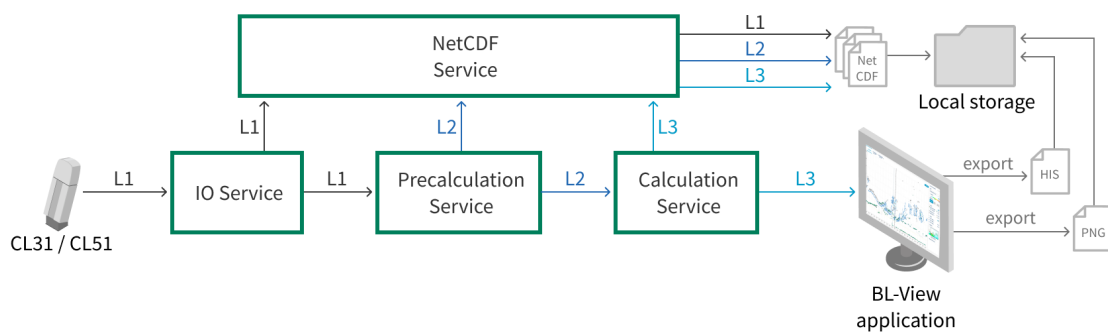


Figure 6 BL-View Live Data and Data Outputs

More Information

- [Adding Live Plots \(page 59\)](#)
- [Data Outputs \(page 39\)](#)

6.3 Data Outputs

BL-View supports the creation of several file types.

6.3.1 Image Files

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

You can easily save the view in an image file.

The saved image displays information about the used algorithm.

More Information

- [Taking Snapshots \(PNG Files\) \(page 71\)](#)

6.3.2 HIS Files (ASCII)

HIS files are log files that contain level 3 data.

Table 4 Level 3 HIS Files

Property	Description
CREATEDATE	Time stamp in format YYYY-MM-DD hh:mm:ss (UTC)
UNIXTIME	Time stamp (UNIX time)
CEILOMETER	Ceilometer identifier
PERIOD	Data update period in seconds (constant 16)
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_INDEX_1	Quality index for first boundary layer height candidate (-999 if no candidate)
BL_HEIGHT_2	Second boundary layer height candidate (meters) (-999 if no candidate)
BL_INDEX_2	Quality index for second boundary layer height candidate (-999 if no candidate)
BL_HEIGHT_3	Third boundary layer height candidate (meters) (-999 if no candidate)
BL_INDEX_3	Quality index for third boundary layer height candidate (-999 if no candidate)
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

The following is an example of a HIS file with custom parameters.

```
History file
CREATEDATE, UNIXTIME, CEILOMETER, PERIOD, SAMPLe_COUNT, BL_HEIGHT_1,
BL_INDEX_1, BL_HEIGHT_2, BL_INDEX_2, BL_HEIGHT_3, BL_INDEX_3, CLOUD_STATUS,
CLOUD_1, CLOUD_2, CLOUD_3, PARAMETERS
2010-06-01 00:00:00, 1275350400, DEVICE_1, 16, 187, 150, 3, -999, -999, -999,
-999, 0, -999, -999, -999, 1_360_0_3000_10_30_4000_3
```

Property	Description/Value
CREATEDATE	2010-06-01 00:00:00
UNIXTIME	1275350400
CEILOMETER	DEVICE_1
PERIOD	16
SAMPLE_COUNT	187
BL_HEIGHT_1	150
BL_INDEX_1	3
BL_HEIGHT_2	-999 (no candidate)
BL_INDEX_2	-999 (no candidate)
BL_HEIGHT_3	-999 (no candidate)
BL_INDEX_3	-999 (no candidate)
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_0_3000_10_30_4000_3

More Information

- [Exporting Data \(HIS Files\) \(page 71\)](#)

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 1 netCDF file for L1 data, 1 netCDF file for L2 data, and 3 for L3 data: 1 with default profile settings, 1 with customized profile settings, and 1 for archive data. The service creates the files every 24 hours.

The extension of netCDF files is .nc. The files are stored in directory: *C:\BLViewData*.

To read the data and other necessary parameters to create the netCDF files, the service uses the *bl_calc_srv.ini* configuration file.

Table 5 Parameters of bl_calc_srv.ini File

Parameter	Description	Type	Possible Values
STATION_NAME	Name of the measuring station. STATION_NAME is used in the netCDF file name.	String	Any valid string
INSTRUMENT_IDENTIFIER	Identifier for the ceilometer (for example, CL31 or CL51) Currently not in use.	String	Any valid string
FREE_FORMAT	Custom text. FREE_FORMAT is used in the netCDF file name.	String	Any valid string
PATH	Directory for storing netCDF files.	String	Any valid directory path

If no file exists, the service creates the file along with the dimension, attribute, and variable information that are required for writing data.

If the file exists, the service reads the unlimited time dimension to fetch number of records present in the file, and reads and initializes variable information.

More Information

- [NetCDF Example File \(page 85\)](#)
- [Accessing netCDF Files \(page 72\)](#)
- [Changing Storage Location of netCDF Files \(page 72\)](#)

6.3.3.1 NetCDF L1 File Format

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

NetCDF L1 file names have the following format:

L1_<STATION_NAME>_YYYYMMDDHHMM_<FREE_FORMAT>.nc

Table 6 Fields of L2 File Names

Name	Description
L1	Identification of the data level
STATION_NAME	Ceilometer name that is defined in the <i>netcdf_srv.ini</i> file
YYYYMMDDHHMM	UTC time
FREE_FORMAT	Text that is defined in the <i>netcdf_srv.ini</i> file

Example: **L1_06610_201609290722**

The following `global attributes` are used:

- site_location
- instrument_type

Table 7 L1 Dimensions

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

Table 8 NetCDF L1 Data File Fields

Variable Name	Attributes	Description
time	Units = days Type = double Dimension = time axis = T	Units as days since 1970-01-01 00:00:00.000
name	Dimension = time	Data identifier (ceilometer name) as defined in Settings > Communication
range	Dimension = range	
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 time stamp in textual form (yyyy-MM-dd hh:mm:ss), expressed as units as days since 1970-01-01 00:00:00.000
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).

Variable Name	Attributes	Description
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)
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
rsc_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 file names have the following format:

L2_<STATION_NAME>_YYYYMMDDHHMM_<FREE_FORMAT>.nc

Table 9 Fields of L2 File Names

Name	Description
L2	Identification of the data level
STATION_NAME	Ceilometer name that is defined in the <i>netcdf_srv.ini</i> file
YYYYMMDDHHMM	UTC time
FREE_FORMAT	Text that is defined in the <i>netcdf_srv.ini</i> file

Example: **L2_06610_201609290722**

Table 10 L2 Dimensions

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

Table 11 NetCDF L2 Data File Fields

Variable Name	Attributes	Description
time	Units = days Type = double Dimension = time axis = T	Units as days since 1970-01-01 00:00:00.000
name	Dimension = time	Data identifier (ceilometer name) as defined in Settings > Communication
version	Dimension = time	Ceilometer version number
date_stamp	Units = days Type = double Dimension = time axis = T	Measurement time stamp in textual form (yyyy-MM-dd hh:mm:ss), expressed as units as days since 1970-01-01 00:00:00.000
range	Dimension = range	
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 ... 25 263 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)

Variable Name	Attributes	Description
longitude	Dimension = time	Longitude of each measurement. Based on ceilometer location as defined in Settings > Communication
latitude	Dimension = time	Latitude of each measurement. Based on ceilometer location as defined in Settings > Communication
altitude	Dimension = time	Altitude above sea level
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 file names have the formats that are shown in the following table.

Table 12 Naming of NetCDF L3 Files

L3 File Type	File Name
L3 with default profile settings	<i>L3_Default_<STATION_NAME>_YYYYMMDDHHMM_<ParameterKey>_<FREE_FORMAT>.nc</i>
L3 with custom profile settings	<i>L3_Custom_<STATION_NAME>_YYYYMMDDHHMM_<ParameterKey>_<FREE_FORMAT>.nc</i>
L3 for archive plot	<i>L3_OFFLINE_<STATION_NAME>_YYYYMMDDHHMM_<ParameterKey>_<FREE_FORMAT>.nc</i>

Table 13 Fields of L3 File Names

Name	Description
L3	Identification of the data level
Default	Identification of the L3 file type
Custom	
OFFLINE	
STATION_NAME	Ceilometer name that is given in the <i>netcdf_srv.ini</i> file
YYYYMMDDHHMM	UTC time
FREE_FORMAT	Text that is defined in the <i>netcdf_srv.ini</i> file

Name	Description
ParameterKey	Identification of the advanced algorithm settings

Example:

L3_DEFAULT_06610_201701160000_1_360_1_3120_10_30_4000_3_0_1_500_1000_4000_60.nc

The following `global` attribute is used:

- `site_location`

Table 14 L3 Dimensions

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

Table 15 NetCDF L3 Data File Fields

Variable Name	Attributes	Description
<code>time</code>	<code>Units = days</code> <code>Type = double</code> <code>Dimension = time</code> <code>axis = T</code>	Units as days since 1970-01-01 00:00:00.000
<code>name</code>	<code>Dimension = time</code>	Data identifier (ceilometer name) as defined in Settings > Communication
<code>bl_height_length</code>	<code>Dimension = time</code>	Number of boundary layer height candidates found (0 ... 3)
<code>date_stamp</code>	<code>Units = days</code> <code>Type = double</code> <code>Dimension = time</code> <code>axis = T</code>	Measurement time stamp in textual form (yyyy-MM-dd hh:mm:ss), expressed as units as days since 1970-01-01 00:00:00.000
<code>range</code>	<code>Dimension = range</code>	
<code>period</code>	<code>Dimension = time</code>	Sending frequency of ceilometer data message in seconds

Variable Name	Attributes	Description
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_index	Dimension = time	Quality indices for boundary layer height candidates
bl_height	Dimension = time	Boundary layer height candidates (meters)
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	
ec_profile_data	Dimension = time, range	
ec_profile_range	Dimension = time	
ec_profile_opacity	Dimension = time	
vrh_height_averaging	Dimension = time	True = Use variable height averaging (default) False = Use user-defined constant height averaging
vrh_time_averaging	Dimension = time	True = Use variable time averaging (default) 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 / 98 ... 1640 ft, default 98 ft)

Variable Name	Attributes	Description
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_lat	Dimension = time	Latitude of each measurement. Based on ceilometer location as defined in Settings > Communication
location_lon	Dimension = time	Longitude of each measurement. Based on ceilometer location as defined in Settings > Communication
location_utc_offset	Dimension = time	UTC offset of each measurement. Based on ceilometer location as defined in Settings > Communication
algorithm_method	Dimension = time	
parameter	Dimension = time	
sunrise_utc	Dimension = time	
sunset_utc	Dimension = time	
Mean_Layer_Height	Dimension = time	Mean mixing layer height for the period of 1 hour
Mean_Layer_QualityIndex	Dimension = time	Mean mixing layer quality index for the period of 1 hour
Mean_Layer_Calculation_time	Dimension = time	Mean layer calculation time for 1-hour interval

More Information

- [NetCDF Example File \(page 85\)](#)

7. 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).

7.1 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.

7.2 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:

- **Navigator** shows which section of the plot is currently displayed.
- 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.
- **Information** shows the selected algorithm parameters and the update status.

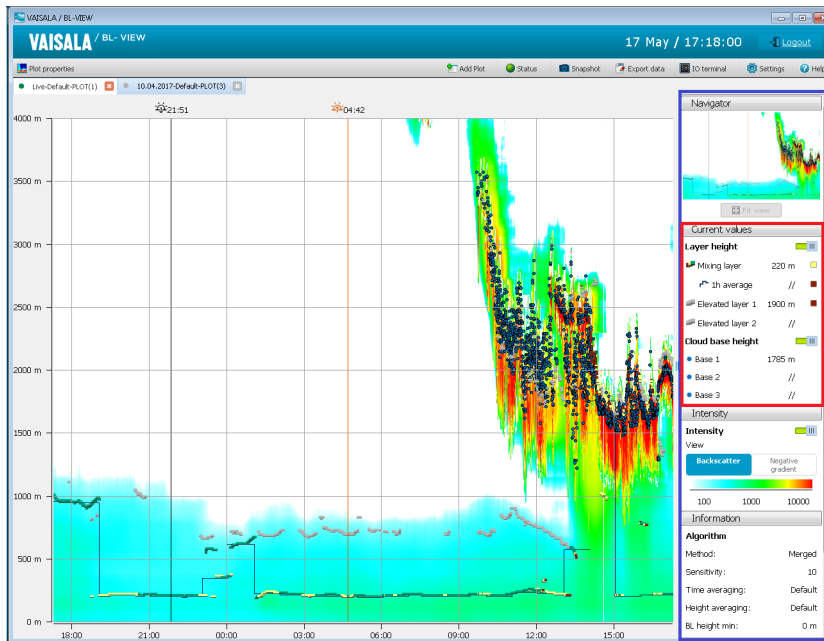


Figure 7 BL-View Panel: Live Plot

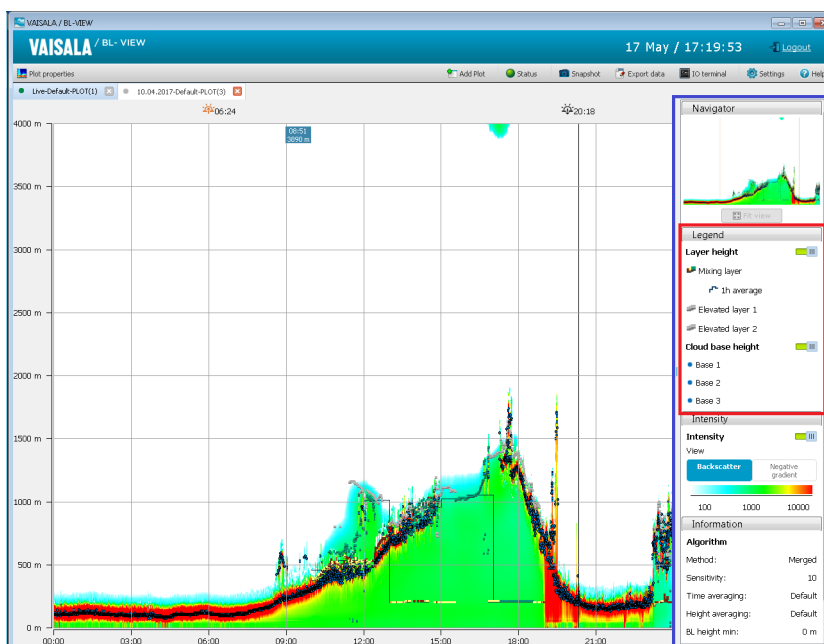


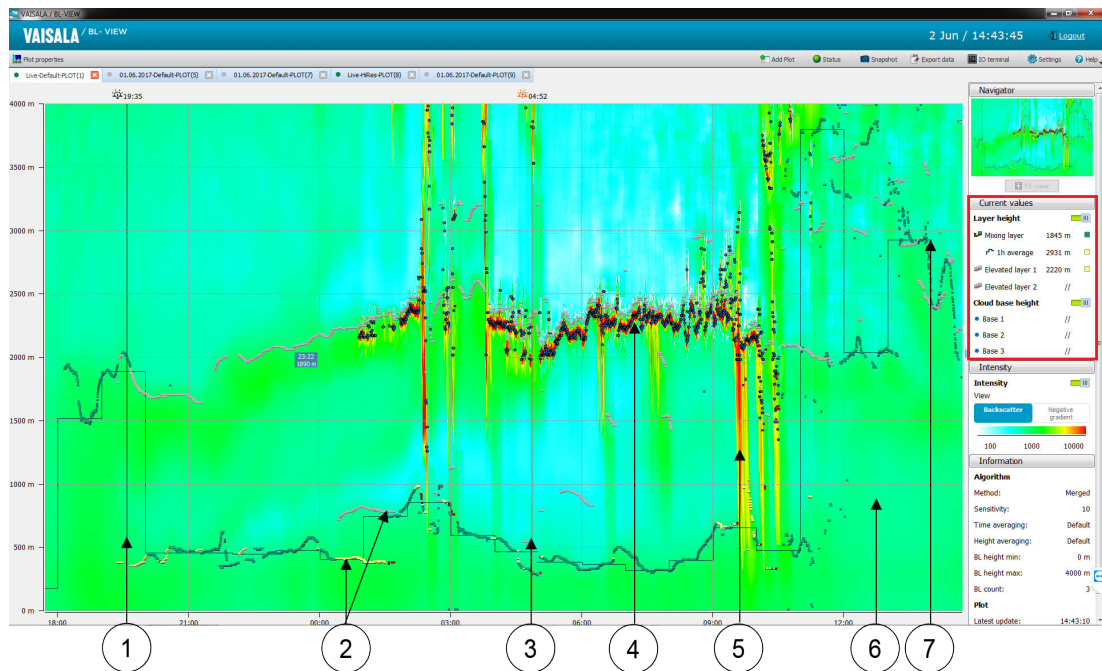
Figure 8 BL-View Panel: Archive Plot

7.2.1 Reading Boundary Layer and Cloud Detection Graphs

The **Current values** information shows the most recent height information for each boundary layer and cloud base that are visible in the graph area.

You can enable/disable **Layer height** and **Cloud base height** to show and hide the information on the display.

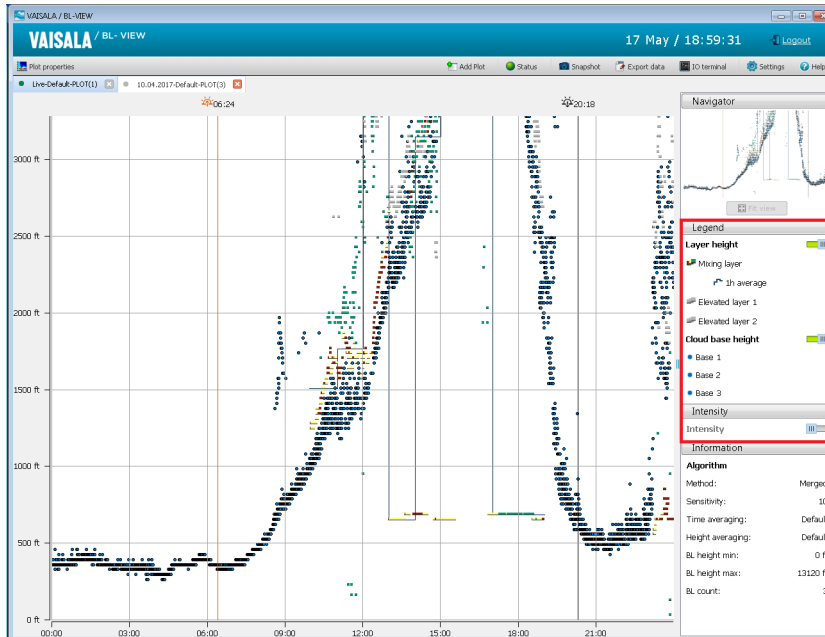
- ▶ 1. To read boundary layer and cloud base height data, see the **Current values** panel. The information includes:
 - **Mixing layer:** the height of the mixing layer
 - **1-hour average:** 1-hour average mixing layer height. The information is updated every hour.
 - **Elevated layer 1** and **Elevated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



If a valid parameter is not correctly measured, its value is replaced with 2 slash characters (/).

- 1 Sunset indicator (black)
- 2 Boundary layer heights (dark red/yellow/green) and elevated layers (gray)
- 3 Sunrise indicator (yellow)
- 4 Cloud base heights (blue dots)
- 5 Signal from clouds and precipitation (red)
- 6 Aerosol backscatter signal (light blue to yellow)
- 7 1-hour average mixing layer height (blue lines)

- To view only boundary layer height and cloud base height information, disable **Intensity**.



The following markers are used in the graphs:

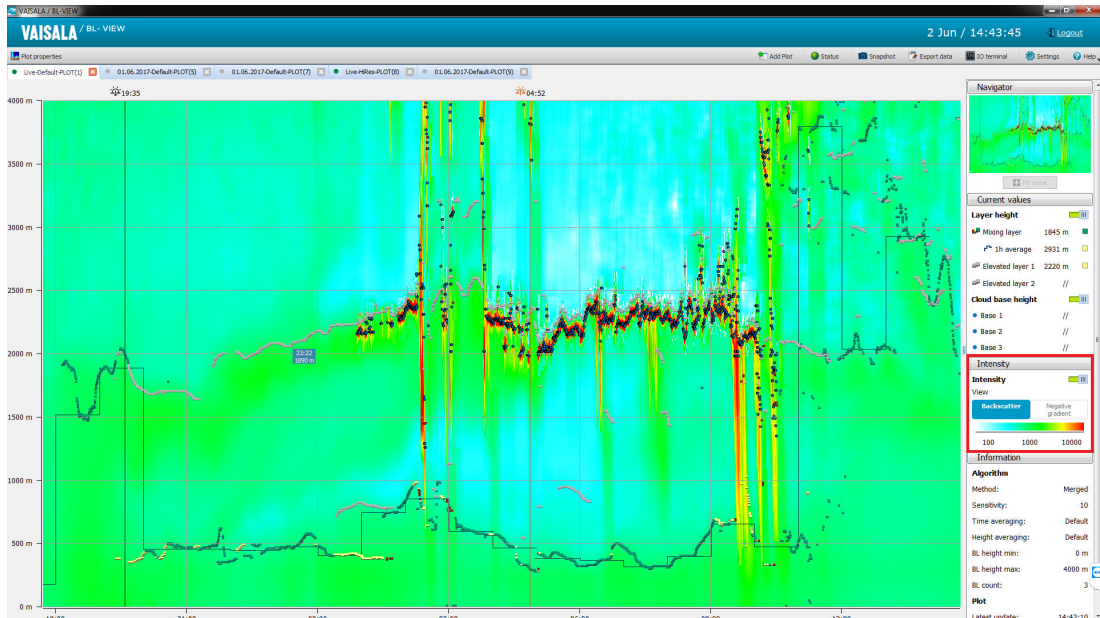
- Dark red/yellow/green rectangles: Boundary layer heights. The colors indicate the quality of the data.
- Blue lines: 1-hour average mixing layer height.
- Gray rectangles: Additional boundary layer heights (elevated layers).
- Blue dots: Cloud base heights.

7.2.2 Reading Cloud Intensity Graphs

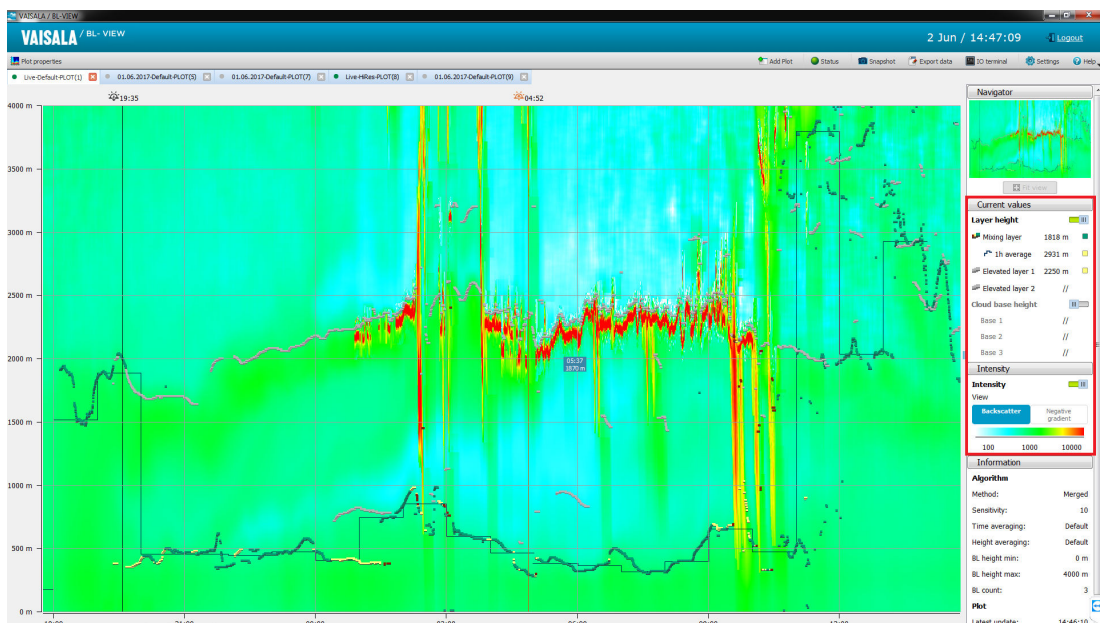
The **Intensity** information indicates the intensity of the backscatter or negative gradient signal.

You can enable/disable **Intensity** to show and hide the information on the display. When enabled, you can view intensity in **Backscatter** or **Negative gradient**.

1. In the **Intensity** panel, make sure that you have enabled **Intensity**.



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



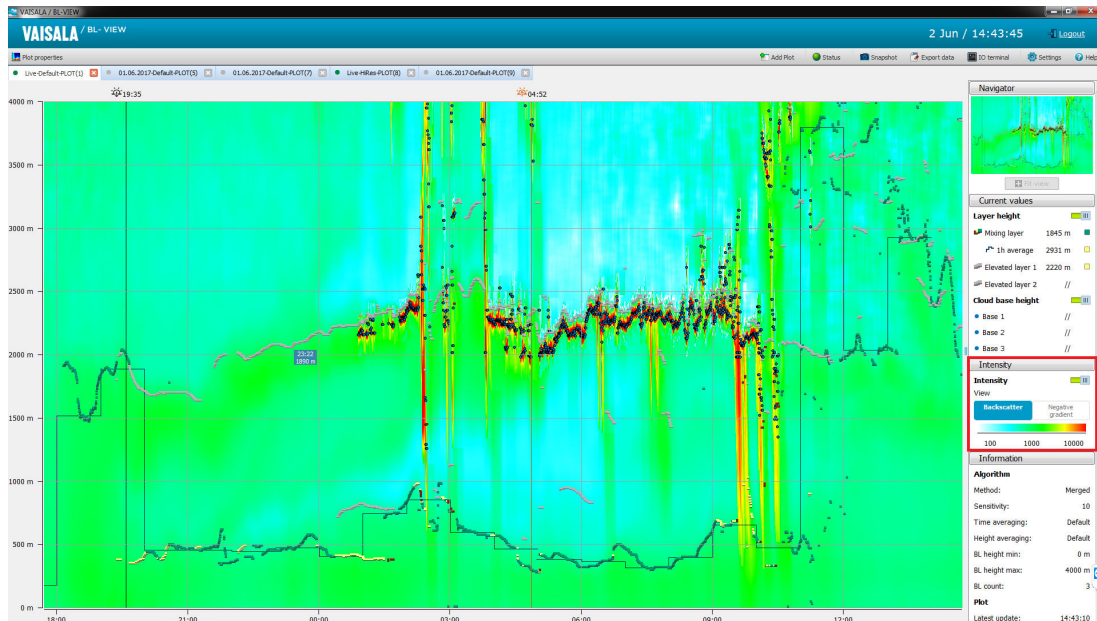
7.2.3 Using Backscatter View

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.

- ▶ 1. In the **Intensity** panel, make sure that you have enabled **Intensity**.
 2. In the **Intensity** panel, select **Backscatter**.
- The following figure shows an example of the backscatter view.



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

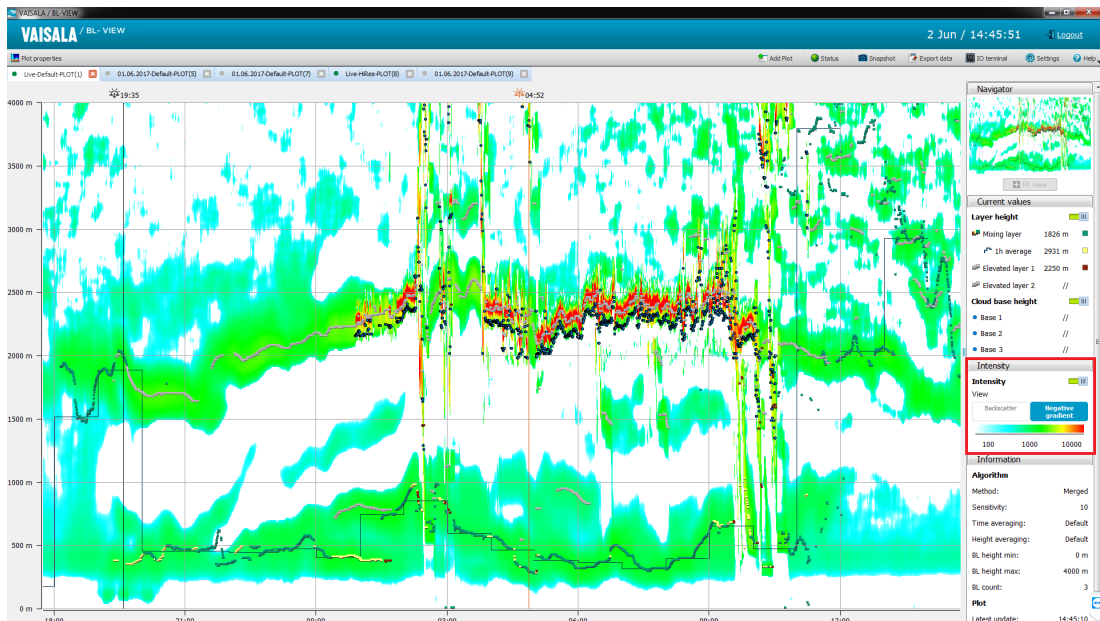
- ▶ [Managing Plots \(page 59\)](#)
- ▶ [Managing Calculation Presets \(page 63\)](#)
- ▶ [Cloud and Precipitation Filter \(page 15\)](#)

7.2.4 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 **Intensity** panel, make sure that you have enabled **Intensity**.
 2. In the **Intensity** panel, select **Negative gradient**.
- The following figure shows an example of the negative gradient view.



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 Plots \(page 59\)](#)
- ▶ [Managing Calculation Presets \(page 63\)](#)

7.3 Managing Display Settings

You can select whether the data in BL-View is shown in meters or feet, and adjust the time range on the horizontal axis and the height range on the vertical axis.

1. Select **Settings > Display**.
2. Set the following display settings:

Default units

Select whether you want to display the data in meters or feet.

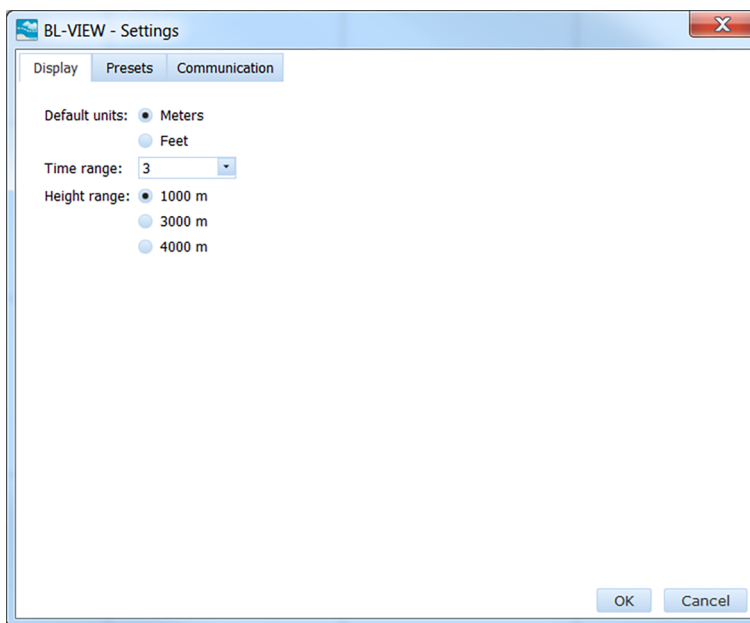
Time range

Select the time range (in hours) for the data displayed on the screen: 3, 6, 9, 12, 15, 18, 21, or 24 hours.

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

Height range

Select the maximum height that is displayed for the plot: 1000, 3000, or 4000 m (5000, 10000, or 13000 ft).



3. Select **OK**.



The new settings are not applied to the currently active plot. To create a plot with the modified settings, select **Add Plot**.



In addition, you can:

- Use your mouse to zoom in and out. Zooming is limited to 3 hours and 200 m (656 ft).
- Right-click in the graph area and select **Refresh** to refresh the view, **Grid** to hide or show the grid, **Plot properties** to change time or height range, or **Fit view** to zoom out.

More Information

- [Adding Live Plots \(page 59\)](#)
- [Adding Archive Plots \(page 61\)](#)

7.4 Managing Plots

A density plot is the graph that visualizes ceilometer data in BL-View.

You can manage plots in several ways.

7.4.1 Adding Live Plots

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



You can only view 1 default live plot and 1 custom live plot simultaneously.

- ▶ 1. Select **Add Plot > Live**.

2. Set the following properties:

Preset

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

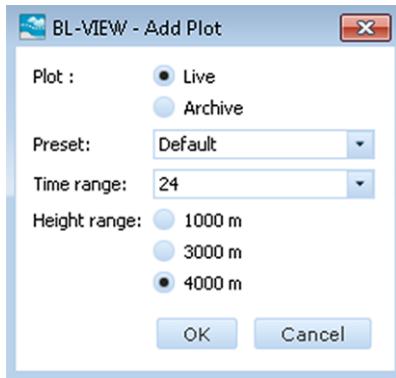
Time range

Select the time range (in hours) for the plot: 3, 6, 9, 12, 15, 18, 21, or 24 hours.

This property is only available for live plots.

Height range

Select the maximum height that is displayed for the plot: 1000, 3000, or 4000 m (5000, 10000, or 13000 ft).



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>-PLOT. Live plots have a green circle in front of the name.

More Information

- ▶ [Live Data \(page 38\)](#)
- ▶ [Managing Calculation Presets \(page 63\)](#)

7.4.1.1 Changing Overlap Correction Factors

To adjust the near-range performance of a ceilometer, edit the file *overlap_correction_profile.dat*.

The overlap correction factor affects the default live plot.

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

2. Open the file *overlap_correction_profile.dat* 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.

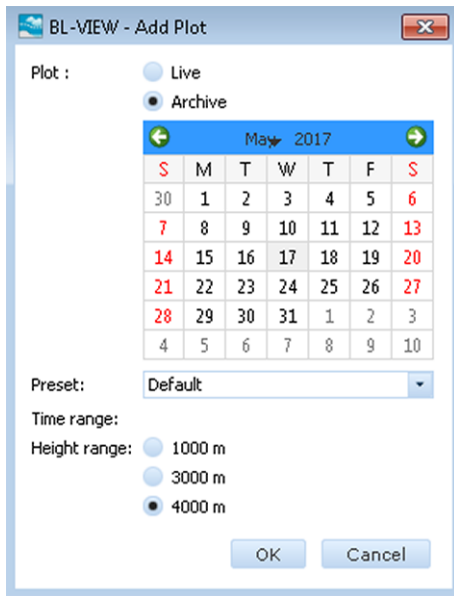
3. Save and close the file.

7.4.2 Adding Archive Plots

You can create density plots to view archived data.

1. Select **Add Plot > Archive**.

2. Select a date in the calendar.



3. Set the following properties:

Preset

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

Height range

Select the maximum height that is displayed for the plot: 1000, 3000, or 4000 m (5000, 10000, or 13000 ft).

4. Select **OK**.

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

More Information

- [Archive Data \(page 38\)](#)
- [Managing Calculation Presets \(page 63\)](#)

7.4.3 Modifying Plots

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

1. Select the tab for the plot you want to modify.
2. Select **Plot properties**.

3. Modify the properties.

Time range

Select the time range (in hours) for the data displayed on the screen: 3, 6, 9, 12, 15, 18, 21, or 24 hours.

Height range

Select the maximum height that is displayed for the plot: 1000, 3000, or 4000 m (5000, 10000, or 13000 ft).

4. Select **OK**.
The new properties are applied to the plot immediately.
5. You can also show/hide the grid and refresh the view. To show/hide the grid and refresh the view, right-click on the plot and select **Grid** or **Refresh**.

7.5 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.

You can manage the calculation presets in several ways.

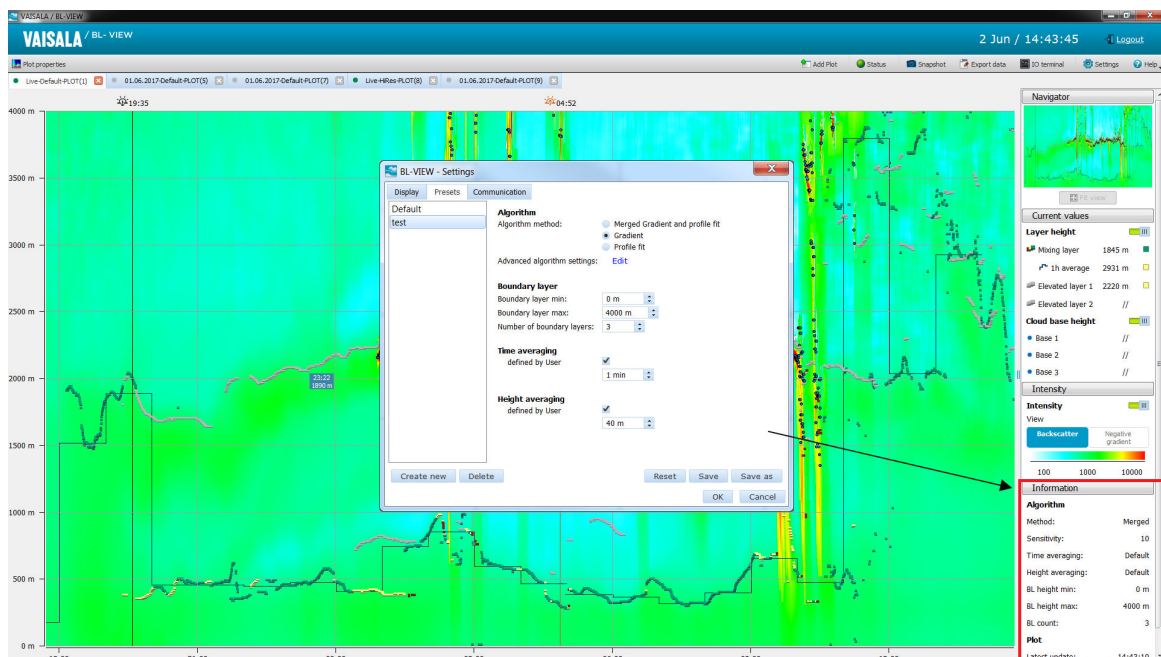


Figure 9 BL-View Algorithm Settings

7.5.1 Creating Calculation Presets

You can create calculation presets to use in plots.

1. Select **Settings > Presets**.

- 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 [7.5.3 Modifying Algorithm Settings of Calculation Presets \(page 67\)](#).

Boundary layer min

Set the lowest reported boundary layer height. The available range is 0 ... 500 m (0 ... 1640 ft). The default value is 0 m (0 ft).

Boundary layer max

Set the highest reported boundary layer height. The available range is 200 ... 4000 m (656 ... 13120 ft). The default value is 4000 m (13120 ft).

Number of boundary layers

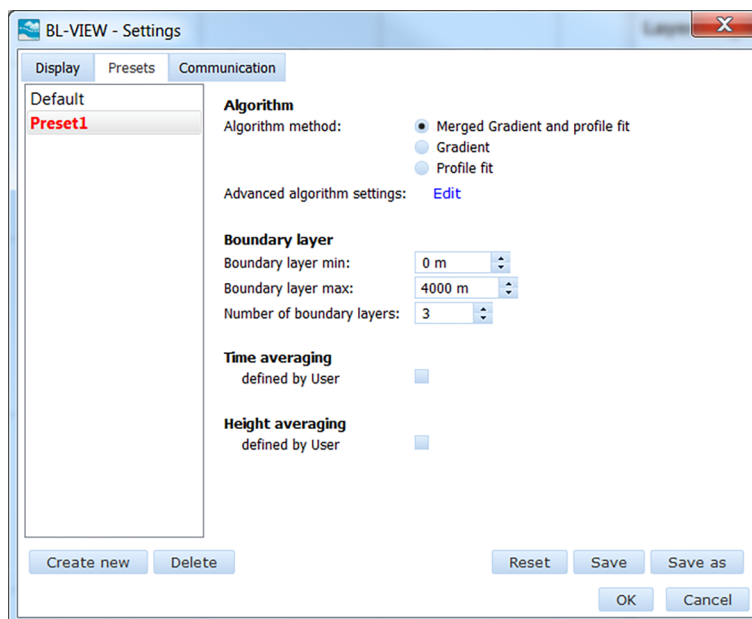
Set the maximum number of boundary layers shown in BL-View. The available range is 1 ... 3. The default value is 3.

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 **OK**.



Selecting only **OK** does not save the settings.

More Information

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

7.5.2 Modifying Calculation Presets

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

- ▶ 1. Select **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 [7.5.3 Modifying Algorithm Settings of Calculation Presets \(page 67\)](#).
- To modify an existing preset, edit the values:

Boundary layer min

Set the lowest reported boundary layer height. The available range is 0 ... 500 m (0 ... 1640 ft). The default value is 0 m (0 ft).

Boundary layer max

Set the highest reported boundary layer height. The available range is 200 ... 4000 m (656 ... 13120 ft). The default value is 4000 m (13120 ft).

Number of boundary layers

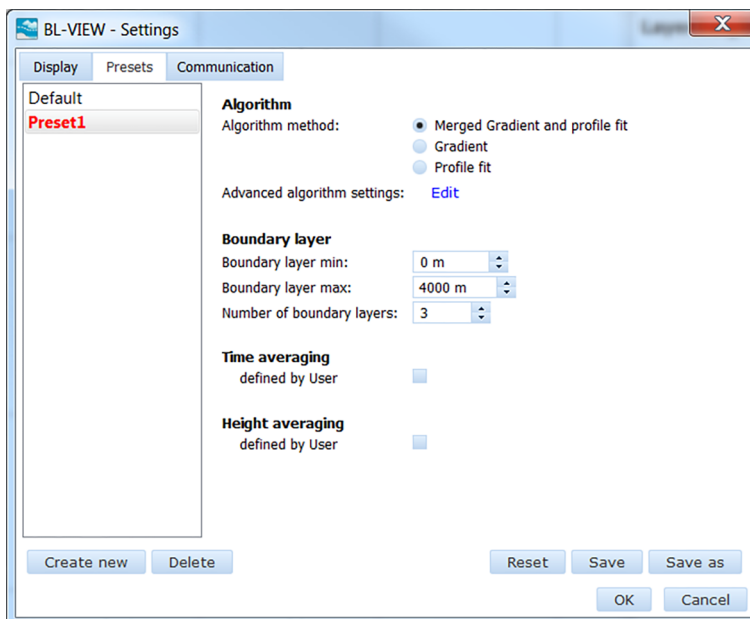
Set the maximum number of boundary layers shown in BL-View. The available range is 1 ... 3. The default value is 3.

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 > OK**.



Selecting only **OK** does not save the settings.

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

More Information

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

7.5.3 Modifying Algorithm Settings of Calculation Presets

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

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

- ▶ 1. Select **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 number of settings to modify depends on the selected algorithm.

Algorithm sensitivity

Set the algorithm sensitivity. The available range is 0 ... 20. The default value is 5.

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

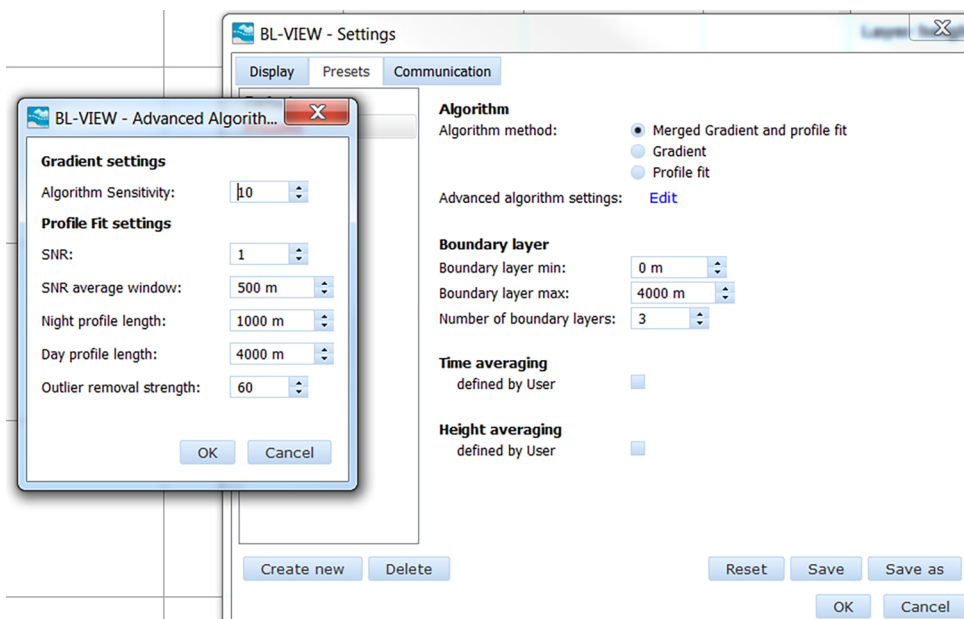
Set the length of the night profile. The available range is 10 ... 4500 m (33 ... 14760 ft). The default value is 1000 m (3280 ft).

Day profile length

Set the length of the day profile. The available range is 10 ... 4500 m (33 ... 14760 ft). The default value is 4000 m (13120 ft).

Outlier removal strength

Set the outlier removal strength. The available range is 0 ... 500. The default value is 60.



5. Select **OK > Save > OK**.



Selecting only **OK** does not save the settings.

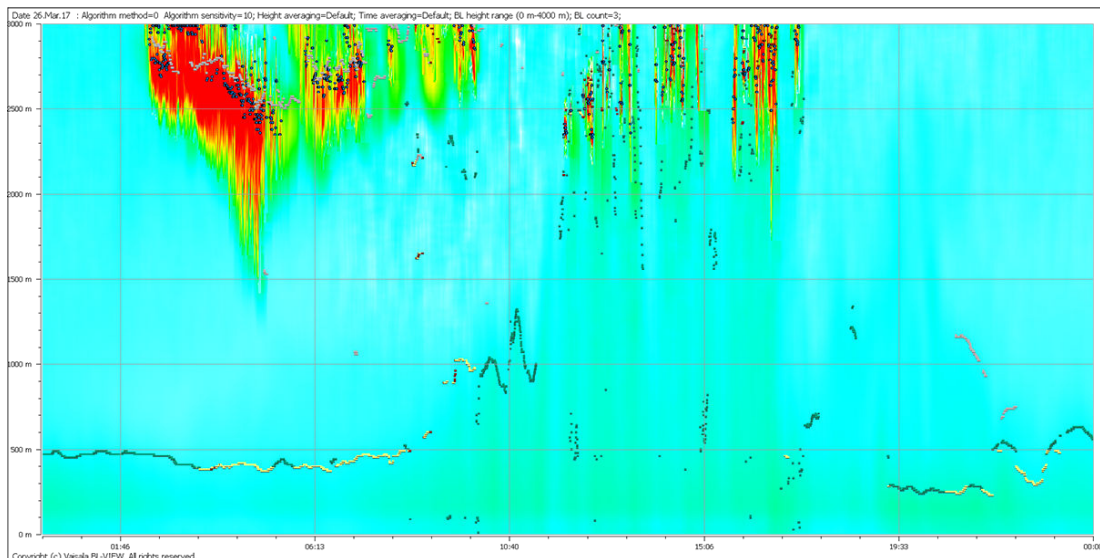
8. Data Reporting

BL-View supports various data export formats to store data for use outside BL-View.

8.1 Taking Snapshots (PNG Files)

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

- ▶ 1. In BL-View, select **Snapshot**.
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 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

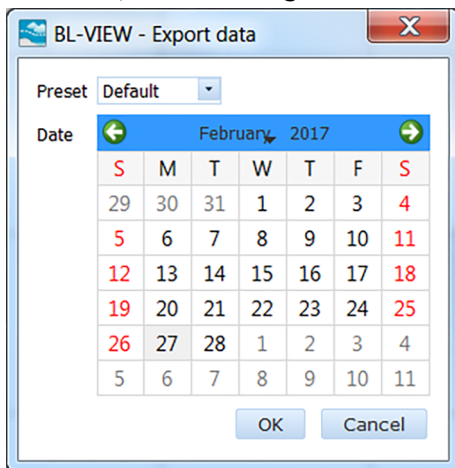
- ▶ [Image Files \(page 39\)](#)

8.2 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 **Export data**.

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



3. In the calendar, select the date for the archived data and select **OK**.
4. 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:\BL-View\History*.

More Information

- [HIS Files \(ASCII\) \(page 39\)](#)

8.3 Accessing netCDF Files

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

- ▶ 1. To access the netCDF files, go to folder *C:\BLViewData*.

More Information

- [NetCDF Files \(page 41\)](#)

8.3.1 Changing Storage Location of netCDF Files

You can change the location where BL-View stores the netCDF files.

- ▶ 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** and edit the path information. The default path is *C:\BLViewData*:

```
;NetCDF File Path
PATH=[S]"C:\BLViewData"
```

3. Save and close the file.
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 the following:

```
cd C:\
```

6. To go to the folder that contains the application for restarting the service, type the following:

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

7. Restart the service by typing the following:

```
roadmin.exe reload
```

More Information

- [NetCDF Files \(page 41\)](#)

9. Managing Ceilometers

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



When the IO Terminal connection to the ceilometer is open, no ceilometer data is sent to BL-View.

More Information

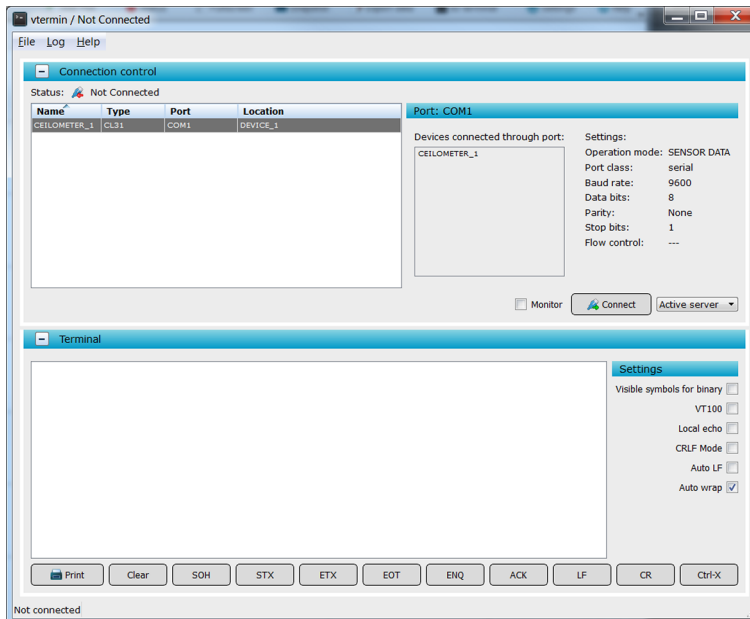
- [Configuring Ceilometer \(page 25\)](#)

9.1 Opening Terminal Connection

Use the terminal connection to connect to the ceilometer.

- ▶ 1. In BL-View, select **IO terminal**.

2. In the **Connection control** panel, select **Connect** and 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.

9.1.1 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.

9.2 Opening and Closing Communication Port

The communication port that is used in serial communication has the following 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 [9.1 Opening Terminal Connection \(page 75\)](#).
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.

9.3 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.

9.4 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, select **Edit > Paste** and save the file.
- 3. To print all text from the **Terminal** panel, select **Print**.

9.5 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.

9.6 Closing IO Terminal

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

10. Troubleshooting

To access the BL-View alerts, select **Status**.

To view ceilometer alerts in BL-View, select **IO terminal**.

10.1 Viewing BL-View Alerts

To access the BL-View alerts, select **Status**.

The **Status** icon is:

- Green when everything is working normally.
- Yellow when there is 1 alarm, warning, or notification.
- Red when there are open alarms or warnings.

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

- BL-View software
- Ceilometer status
- Interface between the ceilometer and BL-View
- RX platform

Table 16 BL-View Alarms and Warnings

Status Message Info	Status	Reason	Instructions
Sensor data message interval is not optimal for BL-View (16 or 36 seconds)	Warning	Selected sensor data message sending frequency is not optimal (16 or 36 seconds).	Set the message interval to optimal according to the ceilometer type: • CL31: 16 seconds • CL51: 36 seconds
MISSING CEILOMETER DATA	Alarm	Sensor is not connected.	Check that IO terminal connection to the ceilometer has been disconnected. Change if necessary.
	Alarm	Sensor communication settings are not correct.	Check that the communication settings of the ceilometer and BL-View match.
PORT ERROR	Alarm	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.

Status Message Info	Status	Reason	Instructions
Unable to parse ceilometer data message	Alarm	BL-View cannot parse the ceilometer message.	Check that the message type selected in BL-View communication settings matches the ceilometer settings. Change if necessary.
REMOTE OBJECT MONITOR FAULT DETECTED BY SERVER A	Alarm	RX platform error.	Contact Vaisala technical support.
OBJECT INFORMATION CONFLICT DETECTED BY SERVER A			
ERROR WHEN READING FILES LISTED IN ROAPERS.INI ON SERVER A			

10.2 Viewing Ceilometer Alerts

- ▶ 1. To view ceilometer alerts in BL-View, select **IO terminal**.

Table 17 Ceilometer Status, Warnings

Status Message Info	Reason	Instructions
Window contamination warning (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 warning (continuous)	For example, bird droppings, leaves, or dust have contaminated the window.	Clean the window.
Battery low warning	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.
Transmitter expires warning	Laser diode is too old.	Replace Transmitter CLT321. The measurement data is valid, but it is possible that some clouds are missed.
High humidity warning (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.
Blower failure warning	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.

Status Message Info	Reason	Instructions
Humidity sensor failure warning (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 Vaisala Ceilometer to Service Center for the humidity sensor to be replaced.
Heater fault warning	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 warning	Direct sunlight.	In case there are no alarms, the measurements are OK. If there is an alarm, the measurements are invalid.
Ceilometer engine board failure warning	Non-critical fault in ceilometer engine board CLE321.	Replace ceilometer engine board CLE321.
Battery failure warning	Battery is dead.	Replace the battery.
Laser monitor failure warning	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.
Tilt angle > 45° 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°.

Table 18 Ceilometer Status, Alarms

Problem	Reason	Instructions
Transmitter shut-off alarm (Laser temperature > 85 °C)	Direct sunlight has heated the laser.	Wait for the sun to exit the field-of-view. The Vaisala Ceilometer returns to normal operation.
	Environment temperature is too high.	Check if there is a specific reason for the high temperature.
Transmitter failure alarm	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 .

Problem	Reason	Instructions
Receiver failure alarm	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.
Voltage failure alarm	Ceilometer Engine Board CLE321 is damaged.	Replace CLE321.
Memory error alarm	A failure in the CLE321 memory.	Replace CLE321.
Light path obstruction alarm	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.
Receiver saturation alarm	Direct sunlight.	Wait for the sun to exit the field-of-view. The Vaisala Ceilometer returns to normal operation.
	Something is partially blocking the laser beam.	Check the clarity of the optical path.
COAXIAL CABLE FAILURE	Coaxial cable disconnected or broken.	Verify the connection or replace the coaxial cable.
CEILOMETER ENGINE BOARD FAILURE	Ceilometer Engine board is damaged.	Replace CLE321.

10.3 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 troubleshooting.

Appendix A. NetCDF Example File

NetCDF L3 Example File: Default Parameters

```
{
dimensions:
    time = UNLIMITED ; // (3 currently)
    name = 1 ;
    date_stamp = 1 ;
    period = 1 ;
    cloud_status = 1 ;
    cloud_data = 3 ;
    bl_height_length = 1 ;
    bl_index = 3 ;
    bl_height = 3 ;
    Bs_prof_length = 1 ;
    Ng_prof_length = 1 ;
    Ec_prof_length = 1 ;
    Ec_prof_range = 1 ;
    Ec_prof_opacity = 1 ;
    vrb_height_averaging = 1 ;
    vrb_time_averaging = 1 ;
    Height_averaging_param = 1 ;
    Time_averaging_period = 1 ;
    algorithm_sensitivity = 1 ;
    boundary_layer_min = 1 ;
    boundary_layer_max = 1 ;
    number_of_boundary_layers = 1 ;
    Location_latitude = 1 ;
    Location_longitude = 1 ;
    location_utc_offset = 1 ;
    Alogrithm_Method = 1 ;
    parameter_key = 1 ;
    sunrise_utc = 1 ;
    sunset_utc = 1 ;
    range = 450 ;
variables:
    int time(time) ;
        time:Units = "days since 1970-01-01 00:00:00.000" ;
        time:Type = "double" ;
        time:Dimension = "time" ;
        time:axis = "T" ;
    string name(time, name) ;
    string date_stamp(time, date_stamp) ;
    int period(time, period) ;
    int cloud_status(time, cloud_status) ;
    int cloud_data(time, cloud_data) ;
    int bl_height_length(time, bl_height_length) ;
    int bl_index(time, bl_index) ;
```

```

    int bl_height(time, bl_height) ;
    int Bs_prof_length(time, Bs_prof_length) ;
    int Bs_profile_data(time, range) ;
    int Ng_prof_length(time, Ng_prof_length) ;
    int Ng_profile_data(time, range) ;
    int Ec_prof_length(time, Ec_prof_length) ;
    int Ec_profile_data(time, range) ;
    int Ec_prof_range(time, Ec_prof_range) ;
    int Ec_prof_opacity(time, Ec_prof_opacity) ;
    int vrb_height_averaging(time, vrb_height_averaging) ;
    int vrb_time_averaging(time, vrb_time_averaging) ;
    int Height_averaging_param(time, Height_averaging_param) ;
    int Time_averaging_period(time, Time_averaging_period) ;
    int algorithm_sensitivity(time, algorithm_sensitivity) ;
    int boundary_layer_min(time, boundary_layer_min) ;
    int boundary_layer_max(time, boundary_layer_max) ;
    int number_of_boundary_layers(time, number_of_boundary_layers) ;
    float Location_latitude(time, Location_latitude) ;
    float Location_longitude(time, Location_longitude) ;
    float location_utc_offset(time, location_utc_offset) ;
    int Alogrithm_Method(time, Alogrithm_Method) ;
    string parameter_key(time, parameter_key) ;
    float sunrise_utc(time, sunrise_utc) ;
    float sunset_utc(time, sunset_utc) ;
    int range(range) ;

// global attributes:
    :site_location = "DEVICE_1" ;
data:

    time = 1476959616, 1476959632, 1476959648 ;

    name =
        "DEVICE_1",
        "DEVICE_1",
        "DEVICE_1" ;

    date_stamp =
        "2016-10-20-10:33:36",
        "2016-10-20-10:33:52",
        "2016-10-20-10:34:08" ;

    period =
        16,
        16,
        16 ;

    cloud_status =
        0,
        0,
        0 ;

    cloud_data =
        -999, -999, -999,
        -999, -999, -999,

```

```

-999, -999, -999 ;

bl_height_length =
  1,
  1,
  1 ;

bl_index =
  3, -999, -999,
  3, -999, -999,
  3, -999, -999 ;

bl_height =
  380, -999, -999,
  380, -999, -999,
  380, -999, -999 ;

Bs_prof_length =
  450,
  450,
  450 ;

Bs_profile_data =
  852, 816, 765, 709, 660, 625, 590, 557, 523, 506, 491, 495, 503, 512, 522,
  532, 542, 554, 566, 574, 568, 569, 568, 568, 568, 571, 577, 578, 574,
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```

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-580, -594, -648, -687, -682, -655, -647, -659, -634, -670, -727, -764,
-747, -744, -734, -701, -745, -786, -788 ;
```

```
Ng_prof_length =
450,
450,
450 ;
```

```
Ng_profile_data =
-384, -363, -349, -337, -312, -281, -238, -189, -138, -90, -46, -6, 29, 55,
66, 69, 61, 51, 44, 39, 33, 26, 15, 0, -14, -27, -39, -48, -62, -78, -98,
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More Information

- [NetCDF Files \(page 41\)](#)

Glossary

atmospheric boundary layer

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

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](#).

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 \(page 95\)](#).

planetary boundary layer

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.

VAISALA

