User guide for real-time hazardous plume display software

Plumecast®

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All copyright rests with Plumecast Ltd.

Licence

A Plumecast licence covers one installation as an annual license.

The software will only function if a security dongle is connected to a USB port. The program will check for the presence of a valid dongle at start up and every 5 minutes during operation. The dongle is programmed with an expiry date. This will be compared with the PC date. If a no dongle is present, or the dongle is out of date, Plumecast will operate in 'Demo' mode only and will not take sensor data or plot real time plume risk areas.

Version

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USER GUIDE FOR REAL-TIME PLUME DISPLAY SOFTWARE, PLUMECAST

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1. Introduction

Plumecast is a system to provide real time display of possible and actual dispersion of atmospheric pollutants in a release. It shows emergency services, site operators and incident managers the route of any pollutant escapes into the atmosphere to help them implement appropriate emergency procedures.

Plumecast is a combination of software and an anemometer, linked to a PC based monitor. This User Guide describes the software component of the system. The monitor displays the area that would be at risk from an accidental release, and, in an emergency, it can display the estimated location of an airborne plume and areas at risk from its further spread.

The system can be used for emergency response situations, operational risk assessment and post-analysis of an incident.

Plumecast draws two lines from the potential pollution source over a map of the local area. These enclose an 'area at risk', the area over which airborne pollution might pass in the event of a release. These lines are updated continuously even when there is no current release so that in the event of an accident the area at risk is instantly available. There is absolutely no delay in starting dispersion models and the information is available without contacting off-site authorities.

In the event of an accidental release Plumecast can also plot the current location of the plume. This takes the form of a plot overlaid on the local area map and is based on a 'puff-release' model. The plot shows not only where the plume is but also where it has been.

Plumecast is configured for a specific application using a config.ini file (see Appendix B).

2. System requirements

Plumecast will run on Windows 10 or Windows 11.

Minimum PC requirements are Pentium 400 or equivalent, 512MB RAM, 100 MB Free disk space and a suitable port for connection to the sensors.

Some means of backing up archive data is needed. One day of data can be about 2.5 MB.

Monitor screens should have a resolution of 1024 x 768.

3. Data requirements

Plumecast can use the following data formats: -

- NMEA 0183 messages
- Gill Instruments Ltd. 'Windsonic' default data
- ALOHA model format messages
- WeatherFile network message formats

The sensor does not have to be located at exactly the centre of the map. However, the sensor data must be representative of the risk area. The area over which the sensor data may be used will vary according to location.

Data must be based on an averaging period of 1 second or less.

Data messages can be sent at longer intervals so long as the averaging period is still only 1 second or less. The parameter 'Timeout' in the config file (see Appendix B) should be set to a period greater than the message interval. Note this parameter is in milliseconds so that, for example, if the message interval is 5 seconds this should be set to greater than 5,000. Message intervals greater than 5 seconds are not recommended.

Plumecast can take data via. various means: -

- A direct connection to a communication port on a PC.
- From a sensor on a local network (LAN).
- Via. the cloud from a sensor that is part of the 'Weatherfile' network.

4. Installation

Plumecast is installed from files supplied typically on a data stick. To install Plumecast load the stick or files into the PC. If the installation is not new but is an upgrade a folder called 'Plumecast installer [Date] (lite) may be used.

Locate the file *setup.exe* in the folder *'installer\volume'*.

Double click on the *setup.exe* file and then follow the instructions on the screen.

The program may ask you to accept licence terms for National Instruments software. This can be done because a NI licence is included with the Plumecast licence.

The support files install into *'C:\ProgramData\Plumecast'* and the configuration options are stored in *'config.ini'*

The folder *'C:\Program Data'* may be hidden. If so you may have to make it visible by altering the settings on your PC.

In order to enable you to modify the file *'C:\Program Data\Plumecast\Config.ini'* you may have to right click on folder *C:\Program Data\Plumecast* and click *Properties_Security*. Then edit the permissions to allow full control.

Plumecast can then be configured using the *config.ini* file. The parameters set in the *config.ini* file are listed in Appendix B

Note that by default the COM parameter is set to '0'. This means that Plumecast will use dummy data as set by the on-screen slide controls.

The map to be used must be put in the folder *'C:\Program Data\Plumecast\Maps'*

5. Security dongle

The Plumecast licence is protected with a security 'dongle'. This takes the form of a small data stick with a USB connector. If no valid dongle is installed in any USB port, then Plumecast will not function other than in demonstration (DEMO) mode.

If no valid dongle is installed, then the text 'No valid dongle' is shown in the top tool bar. If the dongle is less than 30 days from expiry the days remaining are displayed.

The dongle is marked with a label giving the expiry date.

The presence of a security dongle is checked on start-up and regularly as the program runs.

If the program finds the dongle has expired, it gives a warning "Dongle expires in 0 days" but will continue to function. After 5 minutes the warning "No Valid dongle" is shown and Plumecast switches to 'DEMO MODE'. The data shown and sliders are set to the last data points. See section 20 for details on 'DEMO MODE'.

In addition, the dongle has a serial number. If this does not match the number set in the config file, then Plumecast will not send KML files to the 'Weatherfile' cloud storage. Plumecast will still function normally on site. In this case a warning "Dongle/system mismatch, file upload disabled" is shown at the top of the screen).

6. Starting Plumecast

Ensure a valid USB security dongle is in place.

To start 'Plumecast' double click on the 'Plumecast' Icon.

Plumecast may be run continuously to be available immediately it is needed.

It may also be used in mobile applications noting the following precaution. The sensor feeding data to Plumecast must be in place, correctly aligned and feeding data before Plumecast is started. This is important because otherwise initial predictions will be based on incorrect wind directions or absent data.

When Plumecast starts it will not give any information until 100 seconds have passed. Until then it accumulates data until it has enough to start assessing risk areas. After 100 seconds it can plot a real emission and will generate an area at risk and range rings. Note that unless 1000m of wind data (or an alternative set in the config file) is collected in less than 100 seconds the '<1000m wind data' alarm will remain lit until 1000m wind data is collected even though preliminary guidance is being given.

During the period until 1000m wind data is collected the area at risk is constrained to be a minimum of 45 degrees. It may be more if the preliminary data suggests this, but it will not be less.

7. Scaling

Plumecast can be run one of four scales. The square visible window of the map can be 20km, 10km or 4km as set in the config file. The distance to the range rings drawn on the map represent the distance a plume would travel in 10, 5 or 2 minutes respectively. Note that it is important that the right scale map is used with the scaling set. For a window of 20km square the map should be 40km square, for a window of 10km square the map should be 20km square and for a window 4km square the map should be 8km square.

8. Map

A map for use with Plumecast can be either *.jpg, *.png or *.bmp format but must be 1240 by 1240 pixels. Note *.bmp formats vary slightly, and some may not be compatible with the program language or operating system. The area of the map should be twice as long on a side as the viewed window set in the config file. It should be 40km x 40km if the viewing window is set in the config file to be 20km x 20km, 20km x 20km if the viewing area set is 10km x 10km and 8km x 8km if the viewing area is 4km x 4km. This allows for the plume source to be moved from the centre of the map.

9. Display Settings

Plumecast provides two ways of displaying the likely rate of spread of a toxic plume. One is ‘range-rings’ within the area at risk; the other is a pattern of straight lines drawn at intervals. Both are spaced at intervals equivalent to the expected spread over 10, 5 or 2 minutes according to the scaling set in the config file. The type used is selected by clicking boxes in the display. The range rings are usually the best but lines can be more useful if the wind direction has changed significantly during an incident.

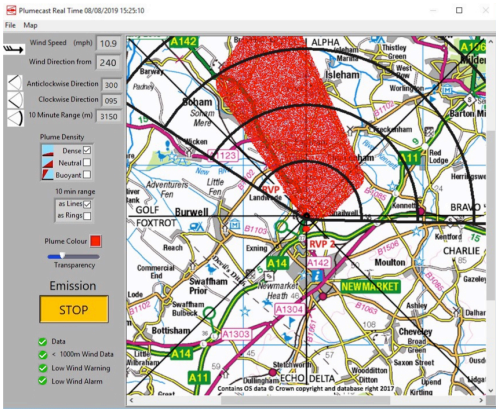


Fig. 8.1 Range indicated by rings

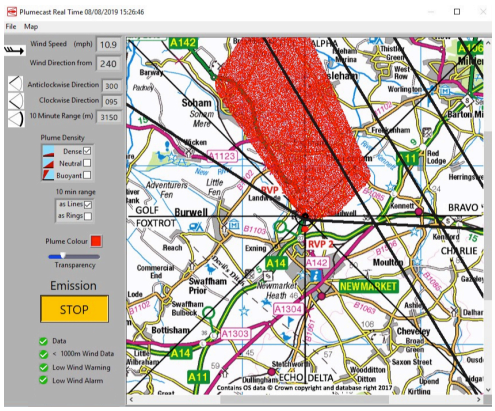


Fig. 8.2 Range indicated by lines

There are two controls for setting the appearance of the plume if the plume plotting option is in use (see section 9). One is an icon showing the plume colour. Clicking on this allows different colours to be selected. The other is a ‘slide control’ labelled ‘transparency'. This adjusts the opacity of the plume. By clicking and dragging the slide the plume becomes more or less opaque. These features can be used to change the plume appearance to make the plume easily visible against various backgrounds or to allow text on the map to be read when overlaid by the plume.

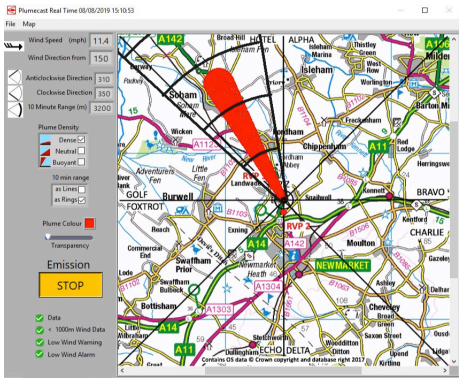


Fig. 8.3 Opaque real time plot

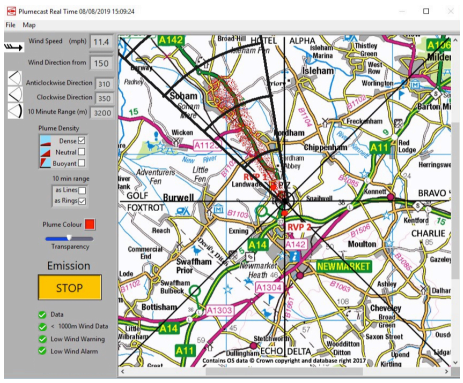


Fig. 8.4 Transparent real time plot

10. Setting the likely density of plume material

Given information on the likely nature of the released material it is possible to narrow down the possible spread of pollution. This is achieved by ticking any combination of three boxes on the display screen. Three options are available and are described below.
The main purpose of setting different plume densities is that, combined with meteorological sensor data, it alters the height the plume is expected to reach. This in turn is important because Plumecast makes allowances for wind speed and direction changes through the atmospheric boundary layer. The depth of this layer varies widely and the heights given below for relevant plume heights are for general guidance only. As a default all options are set and all possible options should be kept set. The options can be changed at any time, including during an emission, but the changes will not be applied retrospectively and will only apply to subsequent movement of the plume.

In case of doubt the best option is to keep all boxes ticked.

High density plume

This should be used if the material is denser than air such as heavy dust or a dense gas such as chlorine. This option used alone gives the narrowest plume but is the most sensitive to the effects of terrain or large buildings. If information on plume height is available this option is appropriate to plumes rising no more than about 30m or 100ft.

Neutral density plume

This should be used if the pollution is likely to have a similar density to the surrounding air, for example a gas with density close to that of air or fine dust. Note that if the pollution is significantly warmer than the surrounding air then the buoyant option should be set also. If information on plume height is available this option is appropriate to plumes rising to roughly 500m or 1500 feet.

Buoyant plume

This should be used if the pollution is likely to be much less dense than air. For example low density gases, hot gases or smoke from an intense fire. This is only a risk at the surface if there is a possibility of fallout. This could be caused by chemical reactions in the plume creating denser material, condensation of vapour to liquid, cooling of a hot plume or smoke particles falling from a plume. The use of this option alone will be rare. It may give very wide areas of risk as wind direction changes over a larger depth of the boundary layer. If information on plume height is available this option is appropriate to plumes rising more than roughly 500m or 1500ft in daytime. At night, especially in winds less than around 5 m/s or 10kts this should be used for plumes rising to 100m or 300 ft.

11. Interpreting the display

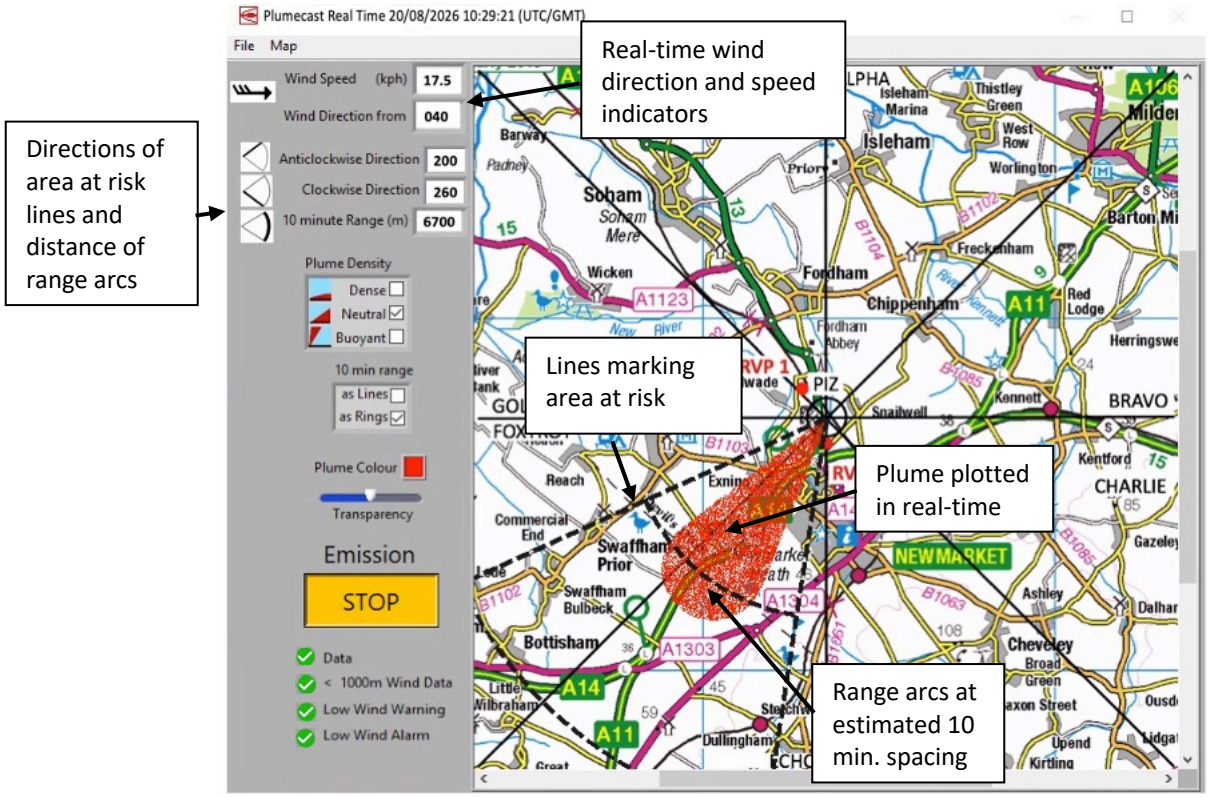


Fig. 10.1 Basic information from a Plumecast screen

The display screen shows a map with the source site at the centre.

If a valid 'area at risk' is available then this is shown in the form of two lines running from the source. The sector between is the area at risk from a plume emitted from the source. This is calculated on the basis of the previous run of wind, the likelihood of a change in mean wind direction through various angles and wind shear and its effect on plumes of different densities.

In addition arcs are shown through the area at risk to indicate the distances the plume is estimated to travel over 10, 5 or 2 minutes according to the scaling set in the config file. Their spacing is based on the recent run of wind and likely windshear. Straight lines at the same intervals, drawn at right angles to the expected plume centreline can be displayed instead.

Plumecast also shows the current wind speed and wind direction (the direction shown is the direction the wind is from). These are not instant values but the values over the averaging period Plumecast is using for its assessment of areas at risk. Units for wind speed can be set to knots, metres per second, kilometres per hour or miles per hour and are specified at the time of ordering or configured later.

Appendix A gives more detail on the Plumecast screen.

12. Moving the source location

This is to allow a Plumecast system to display risk areas from releases at different locations so long as the wind data is appropriate to that location. This allows a single Plumecast installation to give risk areas for an incident at any location for which the sensor data is valid.

An icon labelled 'Map' gives a drop down menu allowing the map to be 'unlocked'. If this is selected the source location on the map can be changed just by clicking on the new location. Sliders are also provided for coarser adjustment over the map. Fig. 11.1 shows a scenario where an incident occurs to the northeast of the current map centre. By clicking on the location of that incident it becomes the source on the map.

The new source location is written into the archive file as latitude and longitude to 4 decimal places.

The KML files generated by Plumecast will be based on the new source location.

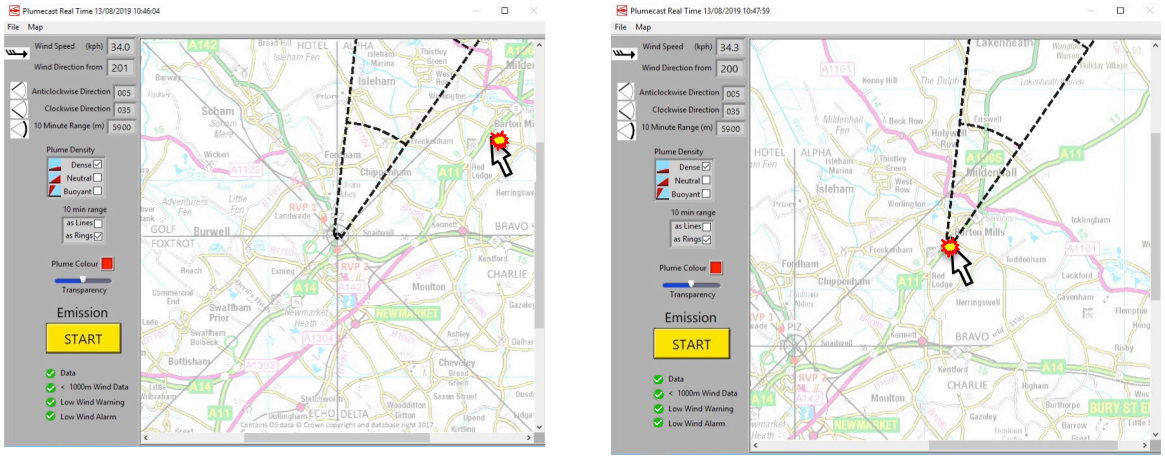


Fig. 11.1 When the map is unlocked placing the cursor on a location and left clicking will move the source to that new location.

Note that if a real time emission is in progress the plume already plotted cannot be moved.

13. Plotting a release in real time.

Click on the large orange emission button ‘START'. This will immediately start a plot of actual plume spread. Note this icon is 'greyed out' until 100 seconds data is available. When clicked the button ‘START’ will be replaced with the text ‘STOP’ indicating that a release is taking place and being plotted.

If 'STOP' is clicked the plume will continue to be plotted but no new emission will be added. The emission button returns to its previous form and is again labelled ‘START’. If this is chosen then a new, additional emission will start immediately.

Note if the plume passes beyond the map boundary plotting will continue as the plume could still spread sideways if wind direction or turbulence characteristics change.

14. Archive

Plumecast generates an archive in the directory ‘*C:/Program Data/Plumecast/Archive*’. One file is generated per day and runs from midnight to midnight. Files are JSON, *.CSV and *.KML files in separate directories.

Each CSV file is labelled with a date, as follows: -

YYYYMMDD where YYYY is the year, MM the month and DD the day. For example dataset 20230801.csv would cover the 1st August 20233.

A whole day dataset occupies about 2.5MB of storage.

Each line represents 1 second of data. The format of each line is: -

HH:MM:SS, DIR, SPEED, SRAD, DIR1, DIR2, RANGE, PUFF, E,D,N,B,LAT,LONG, DE, LT, LW, WD, MAP

Where HH:MM:SS is time, hours, minutes and seconds. This is UTC/GMT.
DIR is wind direction in whole degrees
SPEED is wind speed in m/s with one place of decimals
SRAD is solar radiation in whole W/m^2 (if in use, default ‘0’)
DIR1 is the direction of the anti-clockwise area at risk boundary line
DIR2 is the direction of the clockwise area at risk boundary line
RANGE is the distance to the 10, 5 or 2 minute marker rings in metres
PUFF is the radius of the released puffs in metres

E indicates if an emission is in progress (1 = yes, 0 = no)
D indicated dense plume option is set (1 = yes, 0 = no)
N indicated neutral plume option is set (1 = yes, 0 = no)

B indicated buoyant plume option is set (1 = yes, 0 = no)

LAT is the latitude of the plume source to 4 decimal places, north positive.
LONG is the longitude of the plume source to 4 decimal places, east positive

DE indicates the 'Data' alarm is active (1 = yes, 0 = no)
LT indicates the 'Less Than' x 'm' ' Wind Data Alarm' alarm is active (1 = yes, 0 = no)
LW indicates the 'Low Wind Alarm' alarm is active (1 = yes, 0 = no)
WD indicates there has been a significant 'wind discontinuity' (1 = yes, 0 = no)

MAP is the name of the map in use.

In the example below the line of data was recorded at 22:57:58 UTC, wind direction was 105 degrees, wind speed was 1.9 m/s and SRAD was 0. The area at risk lines were 185 and 310 degrees and the distance to the 10-minute range ring was 5650m. The puff radius was 100m.

There was no emission in progress but all plume density options were set.
The source was located at 52.1212 degrees north and 0.1332 degrees west.
The 'Data' alarm is active but the other three alarms are not.

The map in use is called MAP1.JPG.

22:57:58,105,1.9,0,185,310,5650,100,0,1,1,1,52.1212,-0.1332,1,0,0,0,MAP1.JPG

A subfolder 'KML' contains the KML files produced by Plumecast. This in turn contains a daily folder containing folders created every 10 minutes containing the actual KML files. They are labelled 'Plumecast XXmin AreaATRisk.kml' where XX is the time taken for a plume to reach the end of the risk area, for example 'Plumecast 20min AreaAtRisk would be the risk area appropriate to 10 minutes. Three files are created, each giving the risk area for one of the first 3 range rings.

The path to these files is as the following example (Windows10): -

Windows(C:) > ProgramData > Plumecast > Archive > KML > 2021_08_31 > 1710

15. Plotting from stored data

Click on the ‘File’ icon in the top left of the screen. This gives 3 options. The options ‘close’ and ‘exit’ refer to restarting and exiting the program. ‘Open’ allows ‘Plumecast’ to run on a sample dataset or a dummy dataset for test or training purposes or from an archive dataset.

Plumecast can use NMEA standard datasets in text format (*.TXT), Gill Instruments Ltd. default 'Windsonic' sensor default messages or archive datasets in comma separated variable (*.CSV) format. The programme automatically identifies if an archive dataset is being replayed. Sensor datasets must match the format set in the config file (see Appendix B).

If the selected dataset is in archive format Plumecast gives an option for selecting the start time for running the dataset by entering or editing numbers in display boxes as shown below and clicking on 'SUBMIT'. The default is the time of the first line of the dataset.

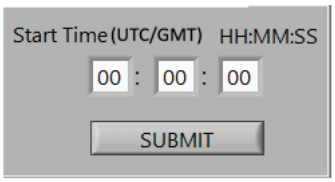


Figure 14.1 Choosing start time for plotting from archive data

There are two options for replaying an archive file. Changing plume density or emission underway may be allowed during replay or the replay may be forced to follow setting in use when the archive was created. These options are set in the config file (see Appendix B). If the option 'RichReplay' is set 'true' then the replay will follow the setting used and follow any movements of plume source or emission when the archive was created.

During a stored data replay the screen shows the relevant time in the dataset not real time.

16. Stopping the display of a plume

If the plume plotting option is in use stopping the plotting of a plume will be by clicking on the ‘File’ icon in the top left of the screen. If clicked this gives 3 options. The ‘Close’ option, after checking for confirmation, ends the current plot and clears the screen. It returns ‘Plumecast’ to its initial state. The option ‘Exit’, also after checking for confirmation, closes the Plumecast programme altogether.

It is important to note the difference between stopping the emission and ‘Close’ as described above. The former means that pollution is no longer leaving the source, existing pollution will continue to be plotted and moved across the map according to received data. The latter means that both emission and plotting stop and the screen is cleared.

Note also that to prevent the accidental ending of an emission in progress the ‘X’ icon in the top right corner is not enabled and cannot be used to close, minimise or exit ‘Plumecast’. It is possible to run additional programmes in windows ‘on top of’ Plumecast but beware of doing this during an incident with programmes that might deprive Plumecast of memory or other resources.

17. Exiting Plumecast

To exit ‘Plumecast’ click on the 'File' icon in the left hand corner. This will give a drop down menu including the option 'Exit'. Clicking this will close the program.

It is important to note the difference between ‘Close’ and ‘Exit’. The former means that the programme is still running and receiving data but the display is cleared. The latter stops ‘Plumecast’ running so that data collection will stop. If Plumecast is restarted it will need to collect the minimum run of data set in the config file.

Note also that to prevent the accidental ending of an emission in progress the ‘X’ icon is not enabled and cannot be used to close, minimise or exit ‘Plumecast’.

18. Warnings and alarms

The following warnings and alarms may be given: -

‘Data’ is red if there is no valid data at the serial port or Weatherfile location for a period set in the config file. Note that if a Gill Instruments Ltd. Windsonic sensor is being used this alarm may be set in the case of very low wind speeds as the sensor does not report wind direction at wind speeds below 0.05m/s and this will necessarily be interpreted as a fault.

‘< 1000m Wind Data’, this is shown red if Plumecast does not have more than a minimum 1000m wind run of data. It does not mean data is not being received. It will only normally be seen when the Plumecast program is first started or when recovering from a light wind alarm or break in data.

‘Low Wind Warning’ is amber if the mean wind speed falls below 3 ms^{-1} (equivalent to 7 mph, 11 kph or 6 knots).

‘Low Wind Alarm’ is red if more than a certain percentage of low wind speeds are being recorded. Plotting of areas at risk and actual plumes will be discontinued. The area at risk is not shown and any displayed plume is frozen. The threshold wind speed and percentage of light winds to trigger the alarm can be set in the config.ini file (see Appendix B). Default values are 0.5m/s and 20%. The latter can be increased to allow calculation of low wind speed spread of a plume in progress.

The ‘Data’ alarm can also be set to make a ‘beeping’ on the host PC. This is configurable and can be de-activated. These settings are controlled in the config.ini file (see Appendix B).

The 'Data' beeping will stop when data is restored and may be silenced by clicking on the alarm icon. The alarm will remain visually active unless data is restored.

19. KML output

Plumecast produces an output of the area at risk in *.KML format. This is intended to allow this information to be shared with other systems and Geographical Information Systems (GIS). If this is to be used then information on the destination file may be needed at the time of installation or a subsequent modification is needed. Refer to your Plumecast supplier for further advice.

The files are labelled 'Plumecast XXmin AreaAtRisk.kml' where XX is the time taken for a plume to reach the end of the risk area, for example 'Plumecast 20min AreaAtRisk would be the risk area appropriate to 20 minutes.

The location information in the KML files follows the source location even if that has been moved.

An archive of KML files is kept in a subfolder of the archive called 'KML'. This in turn contains a daily folder containing folders created every 10 minutes containing the actual KML files. They are labelled 'Plumecast XXmin AreaATRisk.kml' where XX is the time taken for a plume to reach the end of the risk area, for example 'Plumecast 20min AreaAtRisk would be the risk area appropriate to 10 minutes. Three files are created, each giving the risk area for one of the first 3 range rings.

The path to these files is as the following example (Windows10): -

Windows(C:) > ProgramData > Plumecast > Archive > KML > 2021_08_31 > 1710

20. Setting dummy data

It is possible for Plumecast to run on dummy data set by the operator. To do this the COM parameter in the config file must be set to '0' (see Appendix B). When Plumecast opens the displayed wind speed and direction will be set to '0'. Slider controls are revealed below the screen that can be used to set particular values of wind speed and direction. This is mainly used for demonstration or training purposes. Text "DEMO MODE" is displayed to avoid the possibility of a system being inadvertently run in this mode in operational situations.

Note if there is no valid dongle installed Plumecast defaults to 'DEMO MODE'.

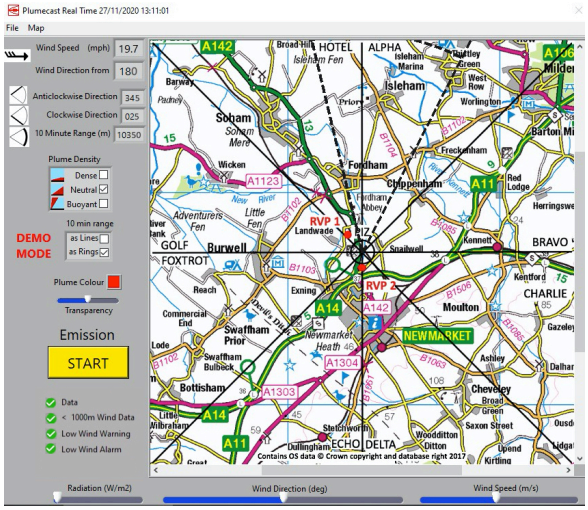


Fig. 19.1 When COM=0 is set in the config file slider controls are revealed. Note the slider marked 'Radiation' is not active in this release.

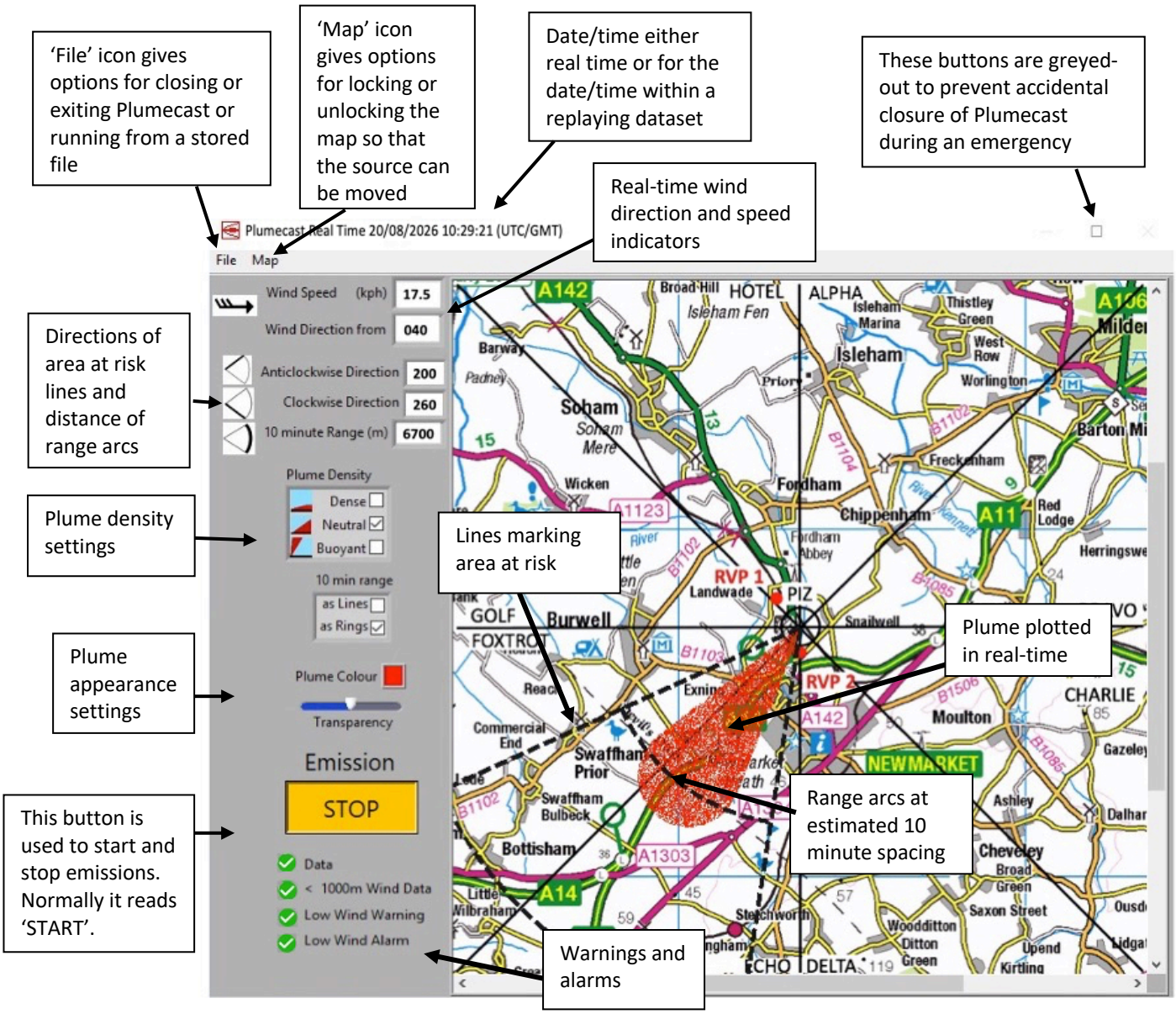
21. Limitations

If there is any terrain with slopes greater than about 1 in 10, averaged over a distance of about 500 metres, in the area of interest then plumes plotted over these areas should be treated with caution. Similarly, very large buildings can distort the plume. Plumes plotted over areas of large buildings should be treated with caution at ranges less than a kilometre or so or if the plume is denser than air. Plumecast takes a fail-safe approach and is suitable for dense, neutral or buoyant plumes. It implicitly includes the risk of precipitation bringing pollution to the surface or condensation related ‘fall out’ from an elevated plume.

It can be run throughout the northern hemisphere but not the southern hemisphere in this version.

Appendix A, Display

Diagram of a typical Plumecast screen.



Appendix B Settings in the Config file

The config file is read on start-up. Subsequent changes will not alter the operation of Plumecast already running.

Note it may be necessary to rename the config file from 'config.ini' to 'config.txt' to edit it. It should then be renamed as 'config.ini'.

Line in Config file	Notes
[Station]	Comment, station information follows.
Name=1	Station name or number.
Grid=OS	Grid used for GIS data, OS = ordnance survey. Only relevant for export of GIS data in future releases.
GridRef=AB12345678	Grid reference in above system. Only relevant for export of GIS data in future releases.
Longitude=0.0000	Longitude of initial source. This is the centre of map in degrees to 4 places of decimals, West is -ve, East is +ve.
Latitude=52.0000	Longitude of initial source. This is the centre of map in degrees to 4 places of decimals, only northern hemisphere is possible in this version.
Map=map.jpg	Name of the map extracted from the map folder.
Scale=20	Sets map scaling. The setting is the side of the visible area in km. Options are 20, 10 and 4.
MeasHeight=10.0	Measurement height in metres.
Number=PLU00123	This is a system number that must match the security dongle if KML files of the risk areas are to be uploaded to the 'Weatherfile' network.
[Origin]	Comment, information on initial plume origin follows.
Horizontal=310	Initial x co-ordinate of plume origin in pixels, should not need changing.
Vertical=310	Initial y co-ordinate of plume origin in pixels, should not need changing.
[FTP]	Comment, information for KML files follows.
Visible=False	Destination FTP file data. Set false if no KML output.
Minute=10	KML file transmission interval.
URL="homepages.fred.net"	Destination FTP file URL.
User="fredbloggs"	Destination FTP file user name.
Password="pword"	Destination FTP file user password.
Account=	Destination FTP file data.
StartPath=	Destination FTP file data.
SendType=True	KML file transmission data, required.
Binary=True	KML file transmission data, required.
Active=False	KML file transmission data, required.

[Options]	Comment, option information follows
RichReplay=True	If set ‘false’ while replaying an archive only wind data is extracted. If set ‘true’ then plume density and map settings are also extracted and cannot be set during replay.
PlotEmission= True	If set false, the option for plotting a real-time plot is disabled and not displayed. The default is true.
WindDisplayUnit=0 0=mps,1=knots, 2=kph, 3=mph	Sets the units for the display of wind speed. The distance to range rings is always in metres.
MinimumWindRun=1000	Sets the run of wind required before plotting calculated values, default 1000. For development and demonstration use only.
Terrain=False	Reserved, default ‘False’.
SolarRadn=False	Reserved, default ‘False’.
Rough=True	Sets surface roughness, 'True' = Rough, 'False' = smooth.
Blinking=True	Reserved
Beeping=2500	Sets whether the ‘Data’ alarm is accompanied with an audible alarm. If set to “0” than there is no sound. Otherwise it sets the period in ms from 1000ms (1s) upwards.
[Risk Pen]	Comment, settings for area at risk lines and Range rings follow.
Width=2	Line width in pixels.
Style=2	Line style (0=Solid, 1=Dash, 2=Dot, 3=DashDot, 4=DashDotDot).
[InitialPuffRadius]	Comment, this is the radius of the area around the centre of the map that is used as the source of material released. The area at risk lines are drawn as tangents to this circle. It also defines the radius of the emitted particles of material released if there is a real emission. It is larger if the dense plume option is set as dense material can spread from a release point by gravity flow.
Normal=10	Source area radius, if dense plume is not set, in metres.
Dense=500	Source area radius, if dense plume is set, in metres.
[LightWinds]	Comment, light wind settings follow.
Threshold=0.5	Threshold speed for light winds in m/s.
Alarm=20	Percentage of light wind for alarm condition, default 20.
[Sensor]	Comment, sensor data to follow.
WDoffset=0.0	Wind direction offset in degrees, if +ve it is added to each direction measurement, if –ve it is subtracted.
Threshold=0	Estimated threshold speed of wind sensor in m/s.
InstrErr=5	Estimated error in measurement, degrees.
[DAQ]	Comment, data acquisition information follows.
RealTime=1000	For demonstration purposes, sets time interval, milliseconds, for display from 'slider' values with COM = 0. Should be 1000 for real applications. Speeds up display by (1000/RealTime).
File=1000	For demonstration purposes, sets time interval, m/s, for display from stored data. Should be 1000 for real applications. Speeds up display by (1000/RealTime).
StabilitySmoothingSamples=600	Sets the number of samples in the rolling average used for wind shear assessment.

[WindDataSource]	Comment, data source settings follow.
WeatherfileLocId="GBR00022"	If data is being collected from a Weatherfile location this gives the ID. Otherwise it should be set to "".
MaxDelay=12	This sets the maximum allowed interval between Weatherfile data messages.
TCPaddress="123456789"	Sets TCP address to use sensor data on an IP address. Should be set "" (double quotation marks) if TCPIP is not used.
TCPport=10	Sets TCP port to use sensor data supplied on an IP address. Should be set 0 if TCPIP is not used.
COM=1	Sets comport to use for serial data from a PC comport. COM=0 sets DEMO mode and enables 'sliders' on display to set values for demonstration purposes. Should be set to '0' if data is being received via. TCP or from a 'Weatherfile' site.
Baud=9600	Setting for serial communications.
Databits=8	Setting for serial communications.
Stopbits=1 (1, 1.5 or 2)	Setting for serial communications.
Parity=0 (0=none, 1=odd, 2=even, 3=mark, 4=space)	Setting for serial communications.
FlowControl=0 (0=none, 1=XON/XOFF, 2=RTS/CTS, 3=XON/XOFF & RTS/CTS, 4=DTR/DSR 5=XON/XOFF & DTR/DSR)	Setting for serial communications.
Timeout=3000	Serial data timeout in milliseconds. If no valid data is received in this period, then the data error alarm is set red and mean wind speed and direction used for computation. It should be set longer than the expected message interval.
Format=0 (0=NMEA, 1=GILL, 2=ALOHA)	Sets the data message format expected. Plumecast can use either standard NMEA wind messages, the default message of the Gill Instruments Ltd. 'Windsonic' sensor or the standard ALOHA message. Note the ALOHA checksum value is not checked.
Checksum=True	Message checksums are checked and if they show an error then the Data error icon is red. Setting "Checksum = false" disables checking but this is normally only used in test and development.

Appendix C Map scaling

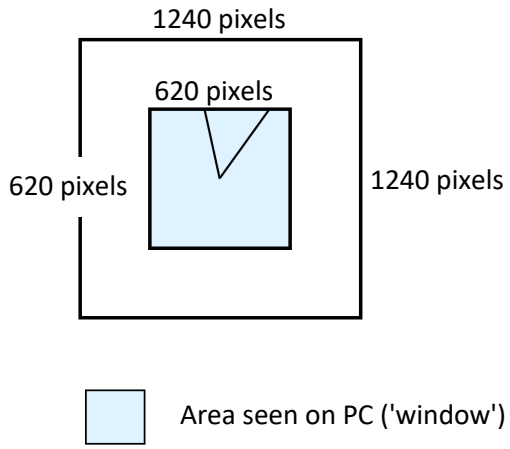


Fig.C.1 Area of full map and visible window in pixels

The full map will always be 1240 pixels square. The area represented varies with the scaling. The scaling factor in the config file sets the size of the map and window in km.

If it is 20 the overall map covers 40km x 40km, the window 20km x 20km.
If it is 10 the overall map covers 20km x 20km, the window 10km x 10km.
If it is 4 the overall map covers 8km x 8km, the window 4km x 4km.